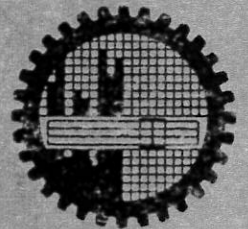


# CALENDAR

1990-91



BANGLADESH  
ENGINEERING

UNIVERSITY OF  
AND TECHNOLOGY

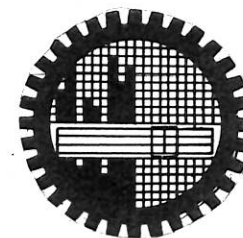




# CALENDAR

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1990-91



BANGLADESH UNIVERSITY OF  
ENGINEERING AND TECHNOLOGY

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**Chancellor and Vice-Chancellor** of the  
Bangladesh University of Engineering and Technology

**CHANCELLOR**

**Abdur Rahman Biswas**

President

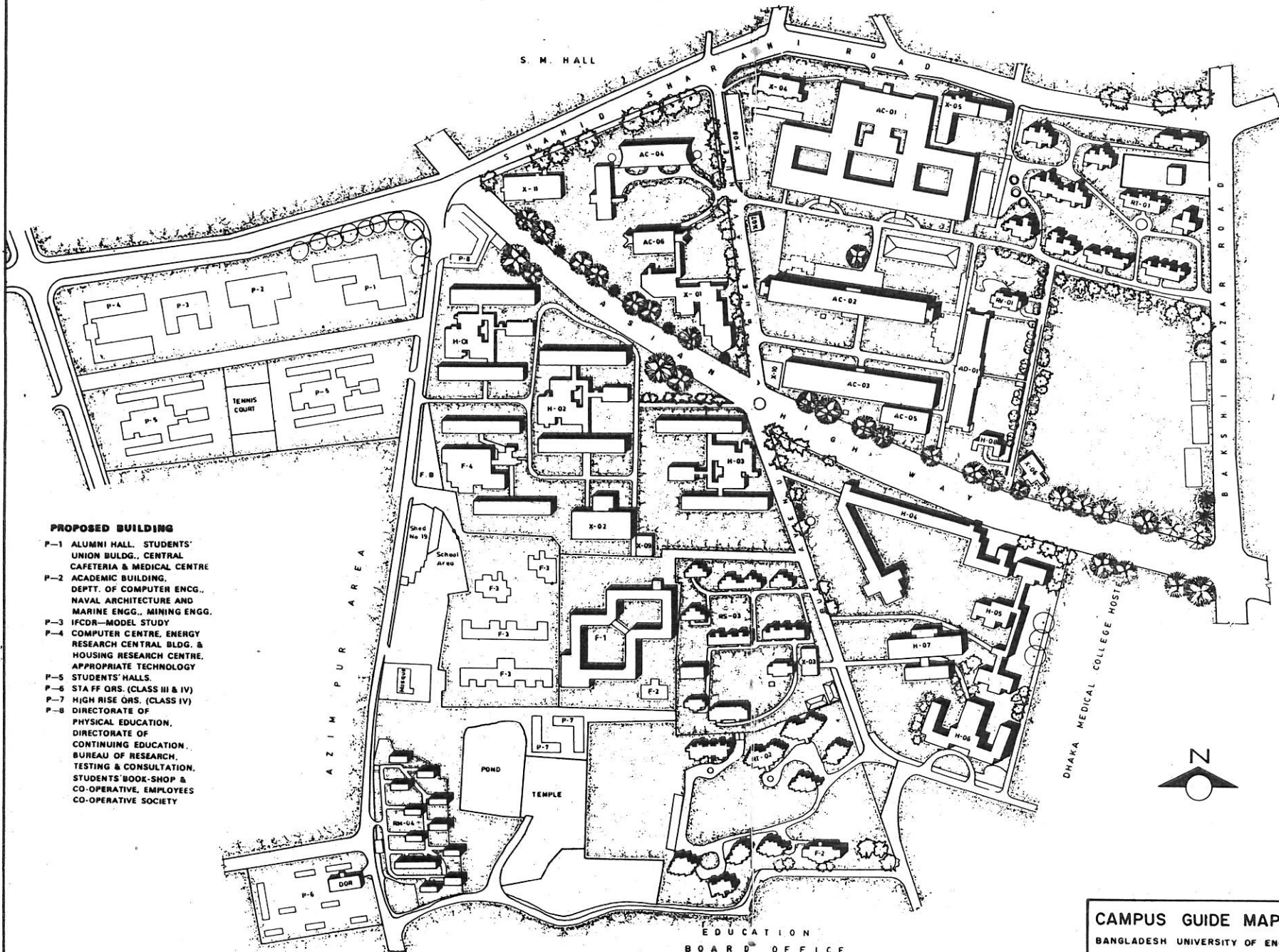
The People's Republic of Bangladesh

**VICE-CHANCELLOR**

**Professor M. Shahjahan**

Ph.D, F.I.E.

# DHAKA UNIVERSITY AREA



## PROPOSED BUILDING

- P-1 ALUMNI HALL, STUDENTS' UNION BLDG., CENTRAL CAFETERIA & MEDICAL CENTRE
- P-2 ACADEMIC BUILDING, DEPTT. OF COMPUTER ENCG., NAVAL ARCHITECTURE AND MARINE ENCG., MINING ENCG.
- P-3 IFCDR—MODEL STUDY
- P-4 COMPUTER CENTRE, ENERGY RESEARCH CENTRAL BLDG. & HOUSING RESEARCH CENTRE, APPROPRIATE TECHNOLOGY
- P-5 STUDENTS' HALLS
- P-6 STAFF QRS. (CLASS III & IV)
- P-7 HIGH RISE QRS. (CLASS IV)
- P-8 DIRECTORATE OF PHYSICAL EDUCATION, DIRECTORATE OF CONTINUING EDUCATION, BUREAU OF RESEARCH, TESTING & CONSULTATION, STUDENTS' BOOK-SHOP & CO-OPERATIVE, EMPLOYEES CO-OPERATIVE SOCIETY

## EXISTING BUILDING

- AC-01 ADMINISTRATIVE BLDG
- AC-01 OLD ACADEMIC BLDG
- AC-02 CIVIL ENGINEERING BLDG
- AC-03 ELECTRICAL AND MECHANICAL ENGINEERING BLDG
- AC-04 ARCHITECTURE BLDG
- AC-05 FOUNDRY SMITHY AND CARPENTRY SHOP
- AC-03 LIBRARY BUILDING
- H-01 SOHRAWARDI HALL
- H-02 SHER-E-BANGLA HALL
- H-03 TITUMIR HALL
- H-04 AHSANULLAH HALL
- H-05 SHAHID SMRITI HALL
- H-06 NAZRUL ISLAM HALL
- H-07 CAFETERIA
- H-08 LADIES HOSTEL
- RV-01 V. C'S RESIDENCE
- RT-01 TEACHERS' QUARTER BAKSHIBAZAR
- RT-02 TEACHERS' QUARTER DHAKESHARI
- RS-03 STAFF QUARTER
- RS-04 M.L.S.S. QUARTER
- X-01 AUDITORIUM COMPLEX
- X-02 GYMNASIUM
- X-03 CENTRAL MOSQUE
- X-04 MEDICAL CENTRE
- X-05 ENGINEERING UNIVERSITY SCHOOL
- X-06 SPORTS PAVILION
- X-07 ELECTRIC SUB-STATION
- X-08 AUTOMOBILE SHOP
- X-09 M.L.S.S. CLUB
- X-10 SHAHID MINAR
- X-11 UNIVERSITY CLUB

## UNDER CONSTRUCTION

- F-1 LADIES HALL
- F-2 PROVOST & ASSTT. PROVOST QRS.
- F-3 TEACHERS' & OFFICERS' HIGH RISE APARTMENTS
- F-4 BOY'S HALL

## CAMPUS GUIDE MAP

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA.

## DEANS OF FACULTIES

Faculty of Architecture & Planning  
Professor Abu Hyder Imam uddin

Faculty of Civil Engineering  
Professor Shamim-uz-Zaman Bosunia

Faculty of Electrical & Electronic Engineering  
Professor A. B. M. Siddique Hossain

Faculty of Engineering  
Professor Syed Ali Afzal

Faculty of Mechanical Engineering  
Professor Md. Abu Taher Ali

## PROVOSTS OF HALLS OF RESIDENCE

Ahsan Ullah Hall  
Dr. Monimul Huq

Nazrul Islam Hall  
Professor Md. Abdur Rouf

Sher-e-Bangla Hall  
Professor Md. Mohafizul Haque

Suhrawardi Hall  
Professor Md. Imtiaz Hossain

Titumir Hall  
Dr. Fazlul Bari

Shahid Smirity Hall  
Professor Amlesh Chandra Mandal

Dr. M. A. Rashid Hall  
Professor Md. Humayan Kabir

Chattri Hall  
Professor Khaliqur Rahman

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### SUMMARY OF COURSES OF THE DEPARTMENTS

<b>Faculty of Architecture and Planning</b>	
Department of Architecture	61
Department of Humanities	67
Department of Urban and Regional Planning	69
<b>Faculty of Civil Engineering</b>	
Department of Civil Engineering	73
Department of Water Resources Engineering	81

<b>Faculty of Electrical and Electronic Engineering</b>	
Department of Electrical and Electronic Engineering	85
Department of Computer Science and Engineering	93
<b>Faculty of Engineering</b>	
Department of Chemical Engineering	99
Department of Chemistry	107
Department of Mathematics	111
Department of Metallurgical Engineering	115
Department of Physics	121
<b>Faculty of Mechanical Engineering</b>	
Department of Industrial and Production Engineering	125
Department of Mechanical Engineering	129
Department of Naval Architecture and Marine Engineering	135

#### DETAILED COURSES OF THE DEPARTMENTS

<b>Faculty of Architecture and Planning</b>	
Department of Architecture	141
Department of Humanities	159
Department of Urban and Regional Planning	169
<b>Faculty of Civil Engineering</b>	
Department of Civil Engineering	179
Department of Water Resources Engineering	201
<b>Faculty of Electrical and Electronic Engineering</b>	
Department of computer Science and Engineering	209
Department of Electrical and Electronic Engineering	237
<b>Faculty of Engineering</b>	
Department of Chemical Engineering	265
Department of Chemistry	305
Department of Mathematics	321
Department of Metallurgical Engineering	347
Department of Physics	371
<b>Faculty of Mechanical Engineering</b>	
Department of Industrial and Production Engineering	383
Department of Mechanical Engineering	395
Department of Naval Architecture and Marine Engineering	413

## GENERAL INFORMATION OF THE UNIVERSITY

## ADMISSION AND EXAMINATION RULES AND REGULATIONS





## Historical Background :

Bangladesh University of Engineering and Technology, abbreviated as BUET, is the oldest institution for the study of Engineering and Architecture in Bangladesh. The history of this institution dates back to the days of Dhaka Survey School which was established at Nalgola in 1876 to train Surveyors for the then Government of Bengal of British India. As the years passed, the Survey School became the Ahsanullah School of Engineering offering three-year diploma courses in Civil, Electrical and Technical Engineering. In 1948, the School was upgraded to Ahsanullah Engineering College (at its present premise) as a Faculty of Engineering under the University of Dhaka, offering four-year bachelor's courses in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. This action was taken with a view to meet the increasing demand for engineers in the newly independent country and to expand the facilities for quicker advancement of engineering education, in general. In order to create facilities for postgraduate studies and research, in particular, Ahsanullah Engineering College was upgraded to the status of a University giving a new name of East Pakistan University of Engineering and Technology in the year 1962. After independence of Bangladesh in 1971, it was renamed as the Bangladesh University of Engineering and Technology.

The BUET campus is in the heart of the city of Dhaka. It has a compact campus with halls of residence within walking distances of the academic buildings. The physical expansion of the University over the last ten years has been impressive with construction of new academic buildings, auditorium complex, students' hall of residence etc.

Undergraduate courses in the faculties of Engineering, Civil Engineering, Electrical & Electronic Engineering and Mechanical Engineering extend over four years and lead to B. Sc. Engineering degrees in Civil, Electrical & Electronics, Mechanical, Chemical, Computer Science & Engg. Metallurgical and Naval Architecture & Marine Engineering. In the Faculty of



Architecture and Planning, the degree of Bachelor of Architecture is obtained in five years.

Postgraduate studies and research are, now among the primary functions. of the university. Most of the departments under the different faculties offer M Sc. Engg. and M. Engg. degrees and some departments have started Ph D. courses, Postgraduate degrees in Architecture (M. Arch.) and in Urban and Regional Planning (MURP) are offered by the Faculty of Architecture and Planning. In addition to its own research programmes, the University undertakes research programmes sponsored by outside organisations, viz. UN Organizations, Commonwealth, UGC etc. The expertise of the University teachers and the laboratory facilities of the University are also utilized to solve problems of and to provide upto-date engineering and technological knowledge to the various organisations of the country. The University is persistent in its effort to improve its research facilities, staff position and courses and curricula to meet the growing technological challenges confronting the country.

#### List of Faculties and Teaching Departments :

The University has fifteen teaching departments under five faculties. Not all of them are degree offering. Faculty-wise list of the departments with the status of the degrees offered is given below:

Faculty	Departments	Status of degree offering		
		PG only	Both UG & PG	Non degree offering
Architecture and Planning	Architecture	UG/ PG	x	
	Urban and Regional Planning Huminities	PG		Non degree offering x
Civil Engineering	Civil Engieering	Both UG/PG		
	Water Resources Engineering	PG		
Electrical and Electronic Engineering	Electrical and Electronic Engineering		x	
	Computer Science & Engineering		x	
			UG/PG	

Faculty	Departments	Status of degree offering		
		PG only	Both UG & PG	Non degree offering
Engineering	Chemical Engineering		x	
	Metallurgical Engg.		x	
	Chemistry	PG		
	Mathematics	x		
Mechanical Engineering	Physics	x		
	Industrial and Production Engineering	x		
	Mechanical Engineering	PG	x	x
	Naval Architecture and Marine Engineering		x	x

#### Admission Requirements, Academic Fees and Examination Rules & Regulations :

Admission requirements for both undergraduate and postgraduate studies (see next section of this book).

#### Academic fees for U/G Studies :

- Admission fee Tk.299/50
- A local student have to pay Tk.582/00 as tuition & other fees in each academic session the details of the fees are given below:

Admission fee	- Tk. 25/00
Tuition fees	- Tk.180/00 Tk 22/50 (per instalment)
seat rent	- Tk. 60/00 (per academic year)
Examination fees	- Tk. 140/00 "
Atheletic fees	- Tk. 20/00 "
Union fees	- Tk. 24/00 "

Medical fees	- Tk. 30/00	"
Registration fees	- Tk. 20/00	"
Caution Money	- Tk. 80/00	"

- (c) A foreign student has to pay one thousand us dollar per academic year as tuition and other fees.

**(d) Academic fees for p/G studies**

Admission fee	Tk. 50/00 (per semester)
course fees	Tk. 20/00 per credit hour with a maximum of TK. 200/- per semester
Thesis fees	Tk. 200/00
Medical fees	Tk. 15/00 per semester
seat rent	Tk. 20/00 per semester
Registration	Tk. 20/00
caution Money	Tk. 200/00
Atheletic fees	Tk. 10/00 (per semester)
Union fees	Tk. 12/00 (per semester)

**Scholarships and Awards :**

Scholarships, stipends, teaching assistantships/fellowships are given to the local students. The students enjoy scholarships from the Education Boards, also technical scholarships, scholarships from the University Grants Commission and other organizations, societies and clubs, namely, Bangladesh Chemical Industries Corporation, 61-Club, tafsils, district bodies, Bangladesh Tobacco Company, National Science & Technology, Bangladesh Sugar & Food Industries Corporation, Aligarh Old Boy's Association, Ahsanur Rahman Scholarship, Habibur Rahman Scholarship etc. Merit scholaships and University stipends are also available. Awards are also given by the University for outstanding performance. Other than awards, gold medals are awarded namely, Masud Hasan gold medal, Malik Akram Hossain gold medal and Ahsanur Rahman gold medal.

**Examination :**

An academic session, normally of one calendar year, is divided into approximately two equal parts, namely, Part A and Part B, for the purpose of examination. A formal written examination is taken at the end of each part and the promotion to next higher academic year is based on the aggregate of the marks of these two examinations and also the class tests (20 percent of the total marks for each subject) and the obtaining passing grades in the sessional subjects. The rules and regulations of examinations are given in details in the next section on 'Admission Regulations and Examination Rules and Regulations'. The academic regulations ar framed by the Academic Council on recommendations from the Boards of Studies, the Faculties and the Committee of Advanced Studies and Research (CASR).

**Teaching Staff of the University :**

The total number of teaching posts is 378 out of which 272 teachers are in active service and 106 teachers are on leave for higher studies abroad. There are four positions of teachers, namely, Lecturer, Assistant Professor, Associate Professor and Professor. The following table gives position and degree-wise breakdown of the teachers in active service including those on leave-vacancies also :

**Statistics of teachers in post with their qualifications**

Position	B.Sc. Engg., B. Arch., M. A. M.Sc., M. com.	Master in Engg., Arch. & M. Phil.	Ph.D.	Total
Professor	-	1	63	64
Associate Professor	1	12	38	51
Asstt. Professor	33	93	26	152
Lecturer	99	12	-	111
Total	133	118	127	378

Besides these teaching posts, there are Professorships and Chairs which are given below :

a) **Dr. Rashid Chair :** In memory of late Dr. M. A. Rashid, formerly Professor of Civil Engineering and the First Vice-Chancellor of BUET, a chair has been created, sponsored by the graduates of the year 1961 of BUET (61-Club). Professor A.M. Zahoorul Huq, an eminent educationist Researcher and formerly Professor of Electrical and Electronic Engineering of the University joined as Dr. Rashid Chair Professor.

**b) Professors Emeritus and Supernumerary Professors :**

In order to get the benefits from the services of eminent people of either scholastic and academic brilliance or outstanding professionals in Engineering, Architecture and Planning, the University has established provisions for appointment of such persons as Emeritus and Supernumerary Professors. Prof. M.A. Naser and Prof. Wahiduddin Ahmed, formerly Professors of Chemical Engineering and Civil Engineering of BUET respectively are now serving in their respective departments as Supernumerary Professors.

Note : The date in the Fifth column indicates the date of original appointment. Abbreviations used in the Third column are as follows : Arch.-Architecture, C.E.-Civil Engineering, Ch.E.-Chemical Engineering, Chem.-Chemistry, C.S.E.-Computer Science and Engineering, E.E.E.-Electrical & Electronic Engineering, Hum.-Humanities, I.P.E.-Industrial & Production Engineering, I.F.C.D.R.-Institute of Flood Control & Drainage Research, I.A.T.-Institute of Appropriate Technology, Math.-Mathematics, M.E.-Mechanical Engineering, Met.E.-Metalurgical Engineering, N.A.M.E.-Naval Architecture & Marine Engineering, Phy.-Physics, U.R.P.-Urban & Regional Planning, W.R.E.- Water Resources Engineering.

**List of Academic staff of the University in alphabetical order :**

Name	Educational qualification	Deptt.	Designation	Date of Joining
Abedin, Md. Zoynul	Bsc, Engg (civil) Dip in-Soil Engg Msc Engg, PhD	C.E.	Asso. Professor	23.12.80
Abedin, Kazi Sarwar	Bsc Engg (Elec)	E.E.E	Lecturer	27.8.88
Abid, Mohd. Razaul	Bsc Engg (NAME)	N.A.M.E.	Lecturer	9.12.89
Atzal, Syed Ali	Bsc (Hons), MS. Msc, Dic, PhD	Math.	Professor	24.4.78
Ahmed, Nooruddin	Bsc Engg (Chem) Msc, PhD	Ch.E.	Professor	12.2.69
Ahmed, Giasuddin	Bsc (Hons) Msc, PhD	Phy.	Professor	25.1.61
Ahmed, Dil Afroza	Bsc (Hons) Msc	Phy.	Asstt. Professor	31.3.70
Ahmed, Sohrabuddin	Bsc Engg (civil) Msc, PhD	C.E.	Professor	14.11.62
Ahmed, M. Firoze	Bsc Engg (civil) Msc Engg, PhD	C.E.	Professor	1.9.69
Ahmed, Wahiduddin	Bsc Engg (civil) M Engg, PhD	C.E.	Professor Emeritus	1.2.51
Ahmed, Syed Nooruddin	Bsc Engg (civil) Msc Engg	C.E.	Asso. Professor	1.3.64
Ahmed, Faruque	Bsc Engg (civil) Msc Engg, PhD	C.E.	Asso. Professor	23.12.80
Ahmed, Nesaruddin	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	8.6.81
Ahmed, Hasan	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	1.3.86



Name	Educational qualification	Deptt.	Designation	Date of Joining
Ahmed, Istiaque	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	29.6.82
Ahsan, Hasib Mohammed	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	29.6.87
Ahmed, Md. Zakaria	Bsc Engg (civil) Msc Engg	C.E.	Lecturer	18.9.84
Ahmed, Asif	Bsc Engg (civil)	C.E.	Lecturer	9.3.86
Ahmed, Tariq	Bsc Engg (civil)	W.R.E.	Lecturer	26.12.83
Ahmed, Belal	Bsc Engg (Mech) M Engg	M.E.	Asso. Professor	26.5.77
Ahmed, Alauddin	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	9.3.86
Ahmed, Sayeed	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	29.6.87
Ahmed, Moniruddin	Bsc Engg (Mech)	I.P.E.	Lecturer	9.12.89
Ahmed, Nasim	Bsc Engg (Mech)	I.P.E.	Lecturer	9.12.89
Ahmed, Kazi Mohiuddin	Msc Engg PhD	E.E.E.	Asso. Professor	26.7.84
Ahmed, S. Shahnawaz	Bsc Engg (Elec) Msc Engg, PhD	E.E.E.	Asstt. Professor	26.12.83
Ahmed, Kaiser	Bsc Engg (Elec)	E.E.E.	Lecturer	23.5.90
Ahmed, Syed Faisal	Bsc Engg (Elec)	E.E.E.	Lecturer	23.5.90
Ahmed, Farid	Bsc Engg (Elec) Msc Engg	C.S.E.	Asstt. Professor	27.8.88
Ahmed, Quazi Nasiruddin	Bsc Engg (Elec)	C.S.E.	Lecturer	21.10.90
Ahmed, Nizamuddin	B Arch, PhD	Arch.	Asso. Professor	15.9.80
Ahmed, Zebun Nasreen	B Arch, M Phil	Arch.	Asstt. Professor	27.8.88
Ahmed, Ajmal Hayat	Bsc Engg (civil) B Arch, M Arch, Mcp	U.R.P.	Asso. Professor	24.3.66

BUET

Name	Educational qualification	Deptt.	Designation	Date of Joining
Ahmed, Razia, S.	BA (Hons) M A (Geo.), MCP	U.R.P.	Asstt. Professor	21.3.83
Ahmed, syed Mahibuddin	Bsc Engg (civil) Msc Engg (civil) M. Engg., Ph.D	I.F.C.D.R.	Research Professor	25.10.78
Ahmed, Mustaq	Bsc Engg (W.R.E.) PhD	I.F.C.D.R.	Research Asstt. Professor	25.6.81
Ahmed, Ferdous	Bsc Engg (civil) Bsc Engg	I.F.C.D.R.	Research Lecturer	29.6.87
Ahmed, Mohiuddin	Bsc Engg (Mech)	I.A.T.	Research Asstt. Professor	24.9.86
Ahsan, Mohd. Qamrul	Bsc Engg (Elec) Msc Engg, PhD	E.E.E.	Professor	20.10.76
Ahsan, A.K.M. Quamrul	Bsc Engg (civil) Msc Engg	I.F.C.D.R.	Research Asstt. Professor	11.8.82
Akonda, Md. Abdur Razzaq	Bsc Engg (Mech) Bsc Engg, PhD	M.E.	Professor	20.11.76
Akmal, Sayeed.	Bsc Engg (Elec)	E.E.E.	Lecturer	23.5.90
Akhtar, Syed Tahera	Bsc (Hons) Msc	Chem.	Asstt. Professor	8.3.79
Alam, Md. Jobair Bin	Bsc Engg (civil)	C.E.	Lecturer	9.12.89
Alam, Md. KhorShed	Bsc Engg (civil) Msc Engg	W.R.E.	Professor	20.4.72
Alam, Md. Mahmud	Bsc Engg (civil)	W.R.E.	Lecturer	27.8.88
Alam, Md. Mahbubul	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	27.12.83
Alam, Md. Shawkatul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	18.9.84
Alam, Ahm. Zahirul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	1.4.85

Calendar

Name	Educational qualification	Deptt.	Designation	Date of Joining
Alam, Md. Shamsul	Bsc Engg (Elec) Msc Engg, PhD	C.S.E.	Asstt. Professor	16.1.74
Alam, Wahidul	B Arch, MURP	Arch.	Asstt. Professor	1.1.84
Ali, Md. Sabder	Bsc Engg (Chem) PhD	Ch.E.	Asso. Professor	12.4.70
Ali, Md. Hossain	Bsc Engg (civil) Msc Engg, PhD	C.E.	Professor	11.1.73
Ali, S.K. Sekander	Bsc Engg (civil) Msc Engg, PhD	C.E.	Asso. Professor	6.2.78
Ali, M. Abu Taher	Bsc Engg (Mech) Msc Engg, PhD	M.E.	Professor	29.1.67
Ali, Abu Rayhan Md.	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	2.1.88
Ali, G.m. Zulfikar	Bsc Engg (Mech)	M.E.	Lecturer	27.8.88
Ali, Md. Masroor	Bsc Engg (Elec)	C.S.E.	Lecturer	27.5.89
Ali, Meer Mobashsher	Bsc Engg (civil) B Arch, M Phil	Arch.	Professor	6.6.66
Ali, Zainab Faruque	B Arch	Arch.	Asstt. Professor	27.8.88
Ameen, S. Rakhrul	Bsc Engg (civil) Msc Engg, PhD	C.E.	Asso. Professor	19.2.79
Amin, A.K.M. Nurul	Bsc Engg (Mech) Msc Engg, PhD	I.P.E.	Asso. Professor	9.1.83
Ameen, Shahidul	B Arch, PhD	Arch.	Asso. Professor	5.7.79
Anwar, A.F.M	Bsc Engg (Elec)	E.E.E.	Lecturer	10.9.82
Anwar, Sohel	Bsc Engg (Mech)	M.E.	Lecturer	9.3.86
Anwar, K.M.M. Taufiqul	Msc Engg, PhD	C.E.	Asso. Professor	29.3.82
Asgar, Md. Ali	Bsc (Hons) Msc PhD	Phy.	Professor	2.12.62
Ashraf, Md. Ali	Bsc (Hons) Msc PhD	Math.	Asso. Professor	10.7.63

Name	Educational qualification	Deptt.	Designation	Date of Joining
Askar, Tahsin	Bsc Engg (Elec) Msc Engg	C.S.E.	Asstt. Professor	15.8.88
Awal, Haris M.R.	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	8.8.83
Azim, Abdul	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	11.8.82
Azim, Eng. M. Anwarul	Bsc Engg (Mech) Dipl. Ing, Dr. Ing	I.P.E.	Professor	21.10.61
Aziz, Syed Mahfuzul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	19.10.86
Badruzzaman, A.B.M.	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	18.9.84
Barée, Md. Sadiqul	Bsc Engg (NAME) PhD	N.A.M.E.	Asso. Professor	15.3.79
Bari, M. Shafiul	Bsc Engg (civil) Msc Engg, PhD	C.E.	Asstt. Professor	30.6.83
Bari, Md. Fazlul	Bsc Engg (civil) Msc Engg (WRE) PhD	W.R.E.	Asso. Professor	1.11.74
Bari, Saiful	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	18.9.84
Barkat ullah, Javed sabir	Bsc Engg (Elec)	E.E.E.	Lecturer	9.3.86
Bashir, Enamul	Msc Engg, PhD	E.E.E.	Asso. Professor	31.3.83
Begg, Md. Rezaul Karim	Bsc Engg (Elec) Msc Engg, PhD	E.E.	Asstt. Professor	18.9.84
Begum, Dil Afroz	Msc Engg, PhD	Ch.E.	Asso. Professor	1.2.82
Begum, Selina	Bsc Engg (civil) Msc Engg	W.R.E.	Asstt. Professor	16.8.82
Begum, Jasmin Ara	B Arch	Arch.	Lecturer	29.6.87

Name	Educational qualification	Deptt.	Designation	Date of Joining
Bepari, M. Moher Ali	Bsc Engg (Met) Msc Engg (Met) PhD	Met.E.	Professor	17.12.73
Bhattacharjee, Sudip Sankar	Bsc Engg (Civil)	C.E	Asstt. Professor	29.6.87
Bhuiyan, Md. Abu Hasan	Msc, Mphil, Phd	Phy.	Asstt. Professor	7.9.81
Bhuiyan, Md. Ali	Bsc Engg (Civil) Msc Engg, Phd	W.R.E.	Asstt. Professor	6.3.82
Bhuiyan, Md. Masheur Rahman	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	19.10.86
Biswas, Md. Mahmud Hossain	Bsc Engg (Mech)	I.A.T.	Research Lecturer	11.2.90
Bosunia, Md. Shamim- uz-zaman	Bsc Engg (Civil) Msc, Phd	C.E	Professor	1.9.69
Chowdhury, Zarif Ahmed	Bsc Engg (Met) Msc, Phd	Met.E.	Asso. Professor	26.12.83
Chowdhury, Al-Nokib	Bsc (Hons) Msc	Chem.	Lecturer	28.8.89
Chowdhury, Md. Mustafa Kamal	B A (Hons) M A	Math.	Asstt. Professor	24.10.75
Chowdhury, Md. Abdul Hye	Bsc (Hons) Msc	Phy.	Lecturer	28.8.88
Choudhury, Jamilur Reza	Bsc Engg (civil) Msc, Phd	C.E.	Professor	2.1.64
Chowdhury, M. Nazrul Islam	Bsc Engg (civil) Msc Engg	C.E.	Asstt. Professor	26.2.79
Chowdhury, Showkat Jahan	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Asstt. Professor	7.9.81
Chowdhury, Khabirul Huq	Bsc Engg (NAME) Phd	N.A.M.E.	Asso. Professor	1.12.77
Chowdhury, Taifur Ahmed	M S, Phd	E.E.E.	Asso. Professor	30.7.86

Name	Educational qualification	Deptt.	Designation	Date of Joining
Chowdhury, Mohammad Ali	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Asstt. Professor	4.1.80
Chowdhury, A.K.M. Dildar Hossain	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	9.3.86
Chowdhury, Ahsan Habib	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	27.8.88
Chowdhury, Golam Rasul	Bsc Engg (Elec) Msc Engg	E.E.E.	Lecturer	1.7.89
Chowdhury, Mahmood Hasan	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	29.3.88
Chowdhury, Dipak-Bin- Kashem	Bsc Egg (Elec)	E.E.E.	Lecturer	9.3.86
Chowdhury, Asiya	B Arch	Arch.	Lecturer	18.11.90
Chowdhury, A. K. M. Jahiduddin	Bsc Engg (Civil) Msc Engg, Phd	I.F.C.D.R.	Research Professor	17.4.74
Das, Dipak Kanti	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Professor	1.1.69
Das, Manoj Kanti	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	9.3.86
Dey, Swpan Kumar	Bsc Engg (NAME) Phd	N.A.M.E.	Asstt. Professor	4.2.81
Elias, Md.	Bsc (Hons), Msc	Math.	Asstt. Professor	8.4.84
Eusufzai, Shafiul A.K.	B Arch, M Arch	Arch.	Asstt. Professor	10.2.83
Faisal, Islam Md.	Bsc Engg (Civil)	W.R.E.	Lecturer	9.3.86
Farooq, M. Abdullah	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	18.9.84
Firoz, Chowdhury Md	Bsc Engg (Mech)	M.E.	Lecturer	9.12.89
Gafur, Shayer	B Arch	Arch.	Lecturer	18.11.90
Gomes, Edmond	Bsc Engg (Chem) Msc Engg	CH.E	Lecturer	9.3.86



Name	Educational qualification	Deptt.	Designation	Date of Joining
Habib, Alamgir	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Professor	1.2.68
Hafiz, Roxana	B Arch, MURP	U.R.P.	Asstt. Professor	16.1.89
Haider, Tarek Fazley	Bsc Engg (Civil)	C.E.	Lecturer	27.8.88
Haider, Ziaul	Bsc Engg (Civil)	W.R.E.	Lecturer	9.12.89
Halim, Md. Abdul	Bsc Engg (Civil) Msc Engg (WRE) Phd	W.R.E.	Professor	1.11.73
Hannan, Abdul	Bsc Engg (Civil) MS, Phd	W.R.E.	Professor	24.10.59
Haq, Saif-ul	B Arch	Arch.	Lecturer	27.8.88
Haq, Md. Manzurul	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	18.9.88
Haque, Md. Mohafizul	Bsc Engg (Met) Msc Engg, Phd	Met. E.	Research Professor	30.1.74
Haque, Md. Shamsul	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	18.9.84
Haque, Ziaul	Bsc Engg (Mech) MS	M.E.	Asstt. Professor	3.4.83
Haque, Anisul	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Asso. Professor	11.9.80
Haque, Anisul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	29.6.84
Haque, Manjurul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	29.3.88
Haque, Abu Sayeed Md. Latiful	Bsc Engg (Elec)	C.S.E.	Lecturer	24.10.90
Haque, Md. Moinul	Msc (Econ), Phd	I.A.T.	Research Asstt. Professor	26.4.87
Hasan, Altaf	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	11.8.82

Name	Educational qualification	Deptt.	Designation	Date of Joining
Hasan, Rg. Mahmud	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Asstt. Professor	8.8.83
Hasan, Mujibul	Bsc Engg (Mech)	M.E.	Lecturer	15.2.73
Hasan, M.M. Shahidul	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Asso. Professor	26.9.80
Hasan, Md. Kamrul	Bsc Engg (Elec)	E.E.E.	Lecturer	9.12.89
Hasan, Mainul	Bsc Engg (Elec)	E.E.E.	Lecturer	10.10.90
Hasan, Anwarul	Bsc Engg (Elec)	C.S.E.	Lecturer	1.11.86
Hasan, Md. Shawkat	Bsc Engg (Elec)	C.S.E.	Lecturer	9.12.89
Hasan, Shamim Ara	B Arch, M Arch	Arch.	Asso. Professor	5.7.79
Haseeb, A.S.M. Abdul	Bsc Engg (Met) Msc Engg	Met.E.	Asstt. Professor	18.9.84
Hazra, Md. A. Khaleque	Msc	Math.	Asstt. Professor	10.10.66
Helali, Maksud	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	18.9.84
Hilaly, Ahmed Kazem	Bsc Engg (Chem)	CH.E.	Lecturer	9.3.86
Hoque, Md. Mazharul	Bsc Engg (Civil) M Engg, Phd	C.E.	Asso. Professor	26.2.79
Hoque, Eqramul	Bsc Engg (Civil)	C.E.	Lecturer	9.12.89
Hoque, Md. Aynal	Bsc Engg (Elec)	E.E.E.	Lecturer	10.10.90
Hoque, Md. Mozammel	Bsc (Agri Engg) Msc Engg, Phd	I.F.C.D.R.	Research Asso. Professor	1.4.86
Hossain, Ijaz	Bsc Engg (Chem) Msc Engg, Phd	CH.E.	Asstt. Professor	10.4.80
Hossain, Nilufar Farhad	Bsc (Hons), Msc	Math.	Lecturer	20.5.90
Hossain, Tafazzal	Bsc (Hons) Msc, Phd	Phy.	Research Professor	9.4.64
Hossain, Md. Mostak	Bsc (Hons), Msc	Phy.	Lecturer	28.8.88
Hossain, Makbul	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	8.6.81

Name	Educational qualification	Deptt.	Designation	Date of Joining
Hossain, Md. Delwar	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Asstt. Professor	8.6.81
Hossain, A.S.M. Mostaque	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	25.3.84
Hossain, Md. Naser-Bin	Bsc Engg (Civil)	C.E.	Lecturer	9.12.89
Hossain, Moazzem	Bsc Engg (Civil)	C.E.	Lecturer	9.12.89
Hossain, Md. Monowar	Bsc Engg (Civil) Msc Engg (WRE) Phd	W.R.E.	Asso. Professor	30.4.76
Hossain, Md. Imtiaz	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Professor	16.11.76
Hossain, Md. Farhad	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	25.2.82
Hossain, Syed Rahmat	Bsc Engg (Mech) Msc, Phd	M.E.	Asstt. Professor	26.10.87
Hossain, Syed Ziaul	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	29.6.87
Hossain, Md. Al-Amin	Bsc Engg (Mech)	I.P.E.	Lecturer	9.3.86
Hossain, A.B.M. Siddique	Bsc Engg (Elec) Msc Engg, Phd	E.E.	Professor	1.3.73
Hossain, Md. Sajjad	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	1.4.85
Huda, Md. Durul	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	9.3.86
Hossain, Shahadat	Bsc Engg (Civil) M Engg (WRE)	I.F.C.D.R.	Research Lecturer	6.4.91
Huq, Md. Nazmul	Bsc Engg (Chem) Msc Engg, Phd	CH.E.	Asso. Professor	31.5.75
Huq, Ehsanul	Bsc Engg (Met) Phd	Met.E.	Professor	1.1.69

Name	Educational qualification	Deptt.	Designation	Date of Joining
Huq, Md. Nasrul	Bsc Engg (Met) Msc Engg, Phd	Met.E.	Asso. Professor	1.2.78
Huq, A.A. Rezaul	Bsc Engg (Met) Msc Engg	Met.E.	Asstt. Professor	31.5.75
Huq, Enamul	Bsc (Hons) Msc, Phd	Chem.	Professor	1.7.65
Huq, Monirul	Bsc (Hons), Phd	Chem.	Asso. Professor	29.3.74
Huq, Alamgir Mujibul	Bsc Engg (Civil) Msc Engg Phd	C.E.	Professor	3.3.73
Huq, Md. Monirul	Msc, Phd	Phy.	Asso. Professor	9.8.86
Huq, A.M. Aziz-ul	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Professor	8.9.65
Huq, A.F.M. Anwarul	Bsc Engg (Mech) Msc Engg, M Engg Phd	I.P.E.	Professor	7.7.65
Huq, Md. Anisul	Bsc Engg (Civil)	I.F.C.D.R.	Research Lecturer	1.2.87
Idris, A.B.M.	Bsc Engg (Mech)	M.E.	Lecturer	9.12.89
Imamuddin, Abu Hyder	B Arch, M Arch	Arch.	Professor	15.10.75
Imran, Jasmin	Bsc Engg (Civil)	W.R.E.	Lecturer	9.12.89
Imtiaz S.M. Sohel	Bsc Engg (Elec)	E.E.	Lecturer	1.7.89
Inam, Md. Khairul	B. Arch, M Arch	Arch.	Professor	15.2.72
Isa, Mohammad	Msc	Math.	Asstt. Professor	17.4.67
Islam, Kh. Ashraful	Bsc Engg (Chem) Phd	CH.E.	Asstt. Professor	20.3.79
Islam, Md. Serajul	Bsc Engg (Met) MS, Phd	Met.E.	Professor	20.3.79
Islam, Md. Fakhru	Bsc Engg (Met) Msc Engg	Met.E.	Asstt. Professor	2.5.89

Name	Educational qualification	Deptt.	Designation	Date of Joining
Islam, Md. Monowarul	Bsc (Hons) Msc, Phd	Chem.	Asso.Professor	1.4.74
Islam, Md. N	Bsc (Hons), Msc	Chem.	Asstt.Professor	21.8.67
Islam, Nazrul	Bsc (Hons) MS, Phd	Chem.	Asstt.Professor	28.9.86
Islam, A.K.M Nurul	Bsc Engg (Civil)	C.E.	Lecturer	9.12.89
Islam, Md.Rashidul	Bsc Engg (Civil)	W.R.E.	Lecturer	27.8.88
Islam, S.M. Nazrul	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Professor	1.3.70
Islam, Md. Quamrul	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Professor	20.11.76
Islam, A.K.M.Sadrul	Bsc Engg (Mech) Msc Engg, Phd	M.E.	Asso.Professor	18.8.80
Islam, A.M. Titu	Bsc Engg (Mech) Msc Engg	M.E.	Asstt.Professor	9.3.86
Islam, Abu Sayed	Bsc Engg (Mech)	M.E.	Lecturer	27.8.88
Islam, Kazi Md.Saiful	Bsc Engg (Mech) Msc Engg	I.P.E.	Asstt.Professor	29.6.87
Islam, Saiful	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Professor	31.5.75
Islam, Farhad Fuad	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt.Professor	9.3.86
Islam, Md.Shafiqui	Bsc Engg (Elec)	E.E.E.	Lecturer	1.7.89
Islam, SM. Rezaul	Bsc Engg (Elec) Msc Engg	C.S.E.	Lecturer	9.11.82
Islam, Mir Shahidul	Bsc Engg (Civil) M.P.P., Phd	U.R.P.	Professor	1.3.73
Islam, Md. Jahurul	Msc Engg, Phd	I.F.C.D.R.	Research Asstt.Professor	2.6.84
Islam, Md. Nurul	Bsc Engg (Chem) Phd	I.A.T.	Professor	1.2.68

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Islam, Md. Nazrul	Bsc Engg (Elec) M Engg, D Engg	I.A.T.	Research Asso. Professor	10.2.86
Islam, Md. Azharul	Bsc Agri Eco (Hons)	I.A.T.	Research Lecturer	1.4.87
Islam, Md. Kabirul	Bsc Engg (Civil) MSE	C.E.	Lecturer	24.12.89
Jafar, Sayeeda	BA (Hons) MA	Hum.	Asstt.Professor	17.8.81
Jahan, Mirza Mehdi	Bsc Engg (Elec)	E'E'E'	Lecturer	9.12.89
Jahan, Sarwar	BA (Hons) MA Eco,MURP MA (Reg.Plan St Ros.Dev) Phd	U.R.P.	Asso.Professor	16.8.89
Jalhil, Md. Abdul	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	9.3.86
Jasim Uzzaman	Bsc Engg (Chem) Phd	C.H.E.	Professor	8.12.63
Kabir, Md. Humayun	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Professor	17.7.73
Kabir, Ahsanul	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Asso.Porfessor	3.10.77
Kabir, M.R	Bsc Engg (Civil) Msc Engg (WRE) Pg. Dip.In.(HEIWR)	W.R.E.	Asso.Professor	18.1.87
Kabir, Humayun	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	9.3.86
Kabir, S.M. Lutful	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Asstt. Professor	30.8.82
Kabir, A.H.Ehsanul	Bsc Engg (Elec) Msc Engg	E.E.E.	Lecturer	10.9.82
Kamal, A.K.M.Mostafa	Bsc Engg (Mech)	I.P.E.	Asstt.Professor	27.8.88
Kamal, A.H.Mostafa	Msc Engg (Elec)	E.E.E.	Lecturer	27.8.88

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Kar, Dulal Chandra	Bsc Engg (Elec) Msc Engg	C.S.E.	Asstt. Porfessor	9.11.82
Kaykabad, Md.	Bsc Engg (Elec)	C.S.E.	Asstt. Professor	7.1.91
Kazi, Zunaid Hamid	Bsc Engg (Elec)	C.S.E.	Lecturer	27.8.88
Karim, A.K.M.Rezaul	Bsc Engg (Mech)	M.E.	Lecturer	9.12.89
Karim, A.N.Mustafizul	Bsc Engg (Mech) Msc Engg (IPE)	I.P.E.	Asstt. Professor	9.10.90
Kairm, Md. Ziaul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	9.3.86
Karim. Mir Nazmul	Bsc (Hons) M Com, LLB	HUM.	Asstt. Professor	21.1.69
Karim, Md. Abdul	Bsc Engg (Civil)	I.F.C.D.R.	Research Lecturer	9.12.89
Khalil, Gazi Md.	B. Tech.(Hons) Msc Engg (Mech) Phd	N.A.M.E.	Professor	5.4.73
Khan, Serajul Haque	Bsc Engg (Chem)	CH.E	Asstt. Professor	22.1.81
Khan, Md. Wahab	Bsc (Hons) Msc, M Phil	Chem.	Asstt. Professor	3.2.85
Khanam, Fahima	Bsc (Hons), Msc	Phy.	Asstt.Professor	26.12.82
Khan, Md. Firoze Alam	Bsc (Hons), Msc	Phy.	Lecturer	20.1.85
Khan, Lutful Islam	Bsc Engg (Civil) Msc Engg	C.E.	Lecturer	18.9.84
Khan, Md. Abu Jafar	Bsc Engg (Civil)	C.E.	Lecturer	27.8.88
Khan, Liakat Ali	Bsc Engg (WRE) Msc Engg	W.R.E.	Asstt. Professor	8.6.81
Khan. Md. Nasrullah	Bsc Engg (Civil) Msc Engg	W.R.E.	Lecturer	15.12.84
Khan, M.H	Bsc Engg (Mech) MS, Phd	M.E.	Professor	1.12.56

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Khan, Md. Raquibuddin	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	18.9.84
Khan, Md. Ekramul Hasan	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	1.1.84
Khan, Ahsan Ali	Msc Engg Phd	I.P.E.	Asstt. Professor	19.7.84
Khan, Shahidul Islam	Bsc Engg (Elec) Msc Engg, Phd	E.E.E.	Asso. Professor	8.4.81
Khan, Md. Rezwan	Bsc Engg (Elec) Phd	E.E.E.	Asso. Professor	10.4.80
Khan, Md. Easin	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	9.11.82
Khan, Md.Javed Iqbal	Bsc Engg (Elec)	C.S.E.	Lecturer	29.6.87
Khan, Faruq Ahmedullah	B.Arch, M.Arch	Arch.	Asso. Professor	1.1.73
Khandaker, Md. Reaz Hasan	Bsc Engg (NAME)	N.A.M.E.	Asstt. Professor	27.8.88
Khasnabish, Bhumip	Bsc Engg (Elec)	E.E.E.	Lecturer	30.8.82
Khatoon, Sufia	B A (Hons), M.A.	HUM.	Asstt.Professor	28.12.68
Khosru, Q. Deen Mohd.	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt.Professor	11.7.87
Kurny, Abu Sayed Wais	Bsc Engg (Met) Msc Engg, Phd	Met., E.	Professor	30.1.74
Mahmud, Iqbal	Bsc Engg (Chem) Msc Tech, Phd	C.H.E.	Professor	26.10.64
Maleque, Md. Abdul	Bsc (Hons), Msc	Math.	Asstt. Professor	16.4.84
Malliek, Fuad Hasan	B Arch, M Phil	Arch.	Asstt. Professor	29.3.88
Mandal, Harendra Nath	Bsc Engg (Chem)	C.H.E.	Asstt. Professor	29.6.87
Mandal, Amalesh Chowdhury	Bsc Engg (Mech) Msc Eng, Phd	M.E.	Professor	31.5.75
Matin, Abdul	Bsc Engg (Eles), M Engg, D Engg	E.E.E.	Professor	13.5.81

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Matin, Md. Abdul	Bsc Engg (Civil), Msc Engg (WRE) Phd	W.R.E.	Asstt. Professor	<del>6.9.82-</del> 25.6.81
Masum, Md. Al-	Bsc (Hons) Msc	Chem.	Lecturer	1.10.88
Majumder, Satya Prasad	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	19.9.81
Mazumder, Md. Mohiuddin	Bsc Engg (Elect)	E.E.E.	Lecturer,	9.12.89
Mazumder, Abdullah Al-Kafi	Bsc (Hons) Msc, ME, Phd	Math.	Asstt. Professor	2.12.89
Mesbahuddin, A.K.	Bsc Engg (Mech)	M. E.	Asstt. Professor	18.9.84
Mia, Abdul Quddus	Bsc (Hons), Msc	Math.	Asstt. Professor	14.11.74
Mia, Md. Abul Kashim	Bsc Engg (Elec)	C.S.E.	Lecturer	9.12.89
Miah, Mirjahan	Bsc Engg (WRE) Msc Engg, Phd	W.R.E.	Asso. Professor	8.4.77
Miah, A.K.M. Ahsan	Bsc Engg (Mech)	M.E.	Lecturer	27.8.88
Mobashwera	Bsc Engg (Civil)	W.R.E.	Lecturer	9.12.89
Modak, Sukomal	Bsc Engg (Civil)	C.E.	Lecturer	9.12.89
Mohiuddin, Md. Golam	Bsc Engg (Mech) Msc Engg	I.P.E.	Asstt. Professor	2.2.89
Mohit, Md. Abdul	M A Eco, M Phil MURP, PhD	U.R.P.	Asso. Professor	6.11.81
Mollah, Abdul Hamid	Bsc Engg (Chem) Msc Engg	Ch.E.	Lecturer	18.9.84
Mridha, Shahjahan	Bsc Engg (Met) Msc Engg, PhD	Met. E.	Professor	2.5.72
Muqem, Md. Abdul	Bsc Engg (Chem) Msc Engg	Ch.E.	Lecturer	9.3.86
Muktadir, Abdul	Bsc Engg (Civil) Msc, PhD	C.E.	Asstt. Professor	30.12.86

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Murshed, Rafiqul	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	19.9.81
Murshd, M. M. Kamrul	Bsc Engg (Elec) Msc Engg (Corp. Engg)	C.S.E.	Asstt. Professor	28.5.85
Murtaza, Md. Alea	Bsc Engg (Civil), Msc Engg, PhD	C.E.	Professor	1.8.73
Moniruzzaman, Md.	Bsc Engg (Mech), Msc Engg	M.E.	Asstt. Professor	29.6.87
Moniruzzaman, Khandaker Md.	B.Arch, MURP Msc Engg	U.R.P.	Lecturer	25.11.90
Nabi, A. S. M. Mahbub-un	Bsc Engg (Civil) M.P.P, Dip-in. Div. Planning	U.R.P.	Asso. Professor	4.5.72
Naser, M. A.	Bsc (Hons) Msc, MSE PhD	Ch.E.	Professor Emeritus	24.4.50
Naser, Jamal A.	Bsc Engg (Mech) Msc Engg, PhD	M.E.	Asstt. Professor	8.8.83
Nishat, Ainun,	Bsc Engg (Civil) Msc Engg, PhD	W.R.E.	Professor	12.6.72
Noor, Maghb-al	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	3.4.83
Omar, K. Ikhtyar	Bsc Engg (Chem) Msc Engg, PhD	Ch.E.	Professor	17.4.72
Patwari, Abdul Matin	Bsc Engg (Elec) Msc M. A, PhD	E.E.E.	Professor	17.11.56
Paul, Gopal Chandra	Bsc Engg (Chem) Msc Engg	Ch.E.	Asstt. Professor	9.3.86
Paul, Rabindra Nath	Bsc Engg (Mech)	M.E.	Lecturer	9.12.89
Paul, uttam Kumar	Bsc Engg (NAME)	N.A.M.E.	Asstt. Professor	4.1.88

Calendar

Name	Educational qualification	Deptt.	Designation	Date of Joining
Podder, Jiban	Bsc (Hons) Msc Mphil	Phy.	Lecturer	1.3.89
Quader, A. K. M. Abdul	Bsc Engg (Chem) PhD	Ch.E.	Professor	30.4.85
Quamruzzaman, Joarder	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	19.10.86
Quim, A.S.M. Abdul	Bsc Engg (civil) MURP	U.R.P.	Asstt. Professor	3.4.76
Rahim, Abdur	Bsc Engg (Name)	N.A.M.E.	Asstt. Professor	8.6.81
Rahim, Md. Azizur	B Arch	Arch.	Lecturer	14.8.86
Rahman, Khaliqur	Bsc Engg (Chem) PhD	Ch.E.	Professor	6.11.79
Rahman, A. K. M. Motiur	Bsc (Hons) Msc	Chem.	Asstt. Professor	6.2.68
Rahman, Shahidur	B.SC (Hons) Msc	Chem.	Lecturer	22.4.80
Rahman, Shakila	Bsc (Hous), Msc	Chem.	Lecturer	16.8.88
Rahman, Md. Azadur	Bsc Engg (Civil) Msc Engg, PhD	C.E.	Professor	18.4.72
Rahman, Md. Mujibur	Bsc Engg. (Civil) Msc Engg, PhD	C.E.	Asso. Professor	29.10.80
Rahman, Md. Habibur	Bsc Engg (Civil) Msc Engg, PhD	C.E.	Asstt. Professor	11.8.82
Rahman, N. M. Anisur	Bsc Engg (Meah) Msc Engg	M.E.	Asstt. Professor	31.3.89
Rahman, Md. Khalilur	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	29.6.87
Rahman, Md. Mizanur	Bsc Engg (Meah) Msc Engg Msc PhD	I.P.E.	Professor	11.1.68

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Name	Educational qualification	Deptt.	Designation	Date of Joining
Rahman, Aminur	Bsc Engg (Mech) Msc Engg	I.P.E.	Asstt. Professor	20.1.85
Rahman, Md. Khalilur	Bsc Engg (Name)	N.A.M.E.	Lecturer	9.3.86
Rahman, Syed Fazli	Bsc Engg (Elec) Msc PhD	E.E.E.	Professor	16.6.64
Rahman, Md. Mujibur	Bsc Engg (Elec) M Engg, PhD	E.E.E.	Professor	5.1.69
Rahman, Syed Anisur	Bsc Engg (Elec) MS	E.E.E.	Asstt. Professor	15.11.62
Rahman, Md. Hamidur	Bsc Engg (Elec)	E.E.E.	Asstt. Professor	16.8.69
Rahman, Md. Mashuqur	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	10.9.82
Rahman, Md. Mahmudur	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	9.3.86
Rahman, Md. Saifur	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	29.6.87
Rahman, Hafizur	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	9.4.88
Rahman, Khwaja Mustafizur	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	29.6.87
Rahman, Saifur	Bsc Engg (Elec)	E.E.E.	Lecturer	9.7.73
Rahman, Seyed Mahbubur	Msc Engg (Elec) PhD	C.S.E	Asso. Professor	3.4.82
Rahman, S. Towfiqur	Bsc Engg (Elec)	C.S.E	Lecturer	27.8.88
Rahman, Chowdhury Mofizur	Bsc Engg (Elec)	C.S.E	Lecturer	9.12.89
Rahman, Md. Saidur	Bsc Engg (Elec)	C.S.E	Lecturer	29.4.91
Rahman, Shaheda	B Arch, M Arch	Arch.	Asso. Professor	25.10.76
Rahman, Md. Mahbubur	B Arch	Arch.	Lecturer	1.4.85
Rahman, Golam	B A (Hons), M A MCPD, PhD	U.R.P.	Professor	25.8.65

Calendar



Name	Educational qualification	Deptt.	Designation	Date of Joining
Rahman, Md. Habibur	B A (Hons), M A	Hum.	Asstt. Professor	11.9.78
Rahman, Md. Razaur	Bsc Engg (Civil) Msc Engg (WRE)	I.F.C.D.R.	Research Asstt. Professor	11.8.82
Rana, Md. Yunus	Bsc Engg (Civil) M Engg	I.F.C.D.R.	Research Asstt. Professor	10.7.88
Rashed, A.K.M. Bazlur	Bsc Engg (Met) Msc Engg	Met.E.	Asstt. Professor	25.10.87
Rashid, Md. Abdur	Bsc (Hons), Msc	Chem.	Asstt. Professor	10.8.83
Rashid, Khaleda	B Arch, MURP	Arch.	Asso. Professor	15.10.75
Rashid, Mahbub	B Arch	Arch.	Lecturer	9.12.89
Raza, Syed Mostafa	Bsc Engg (Elec)	E.EE.	Lecturer	29.6.82
Refayetullah, M	Bsc Engg (NAME) PhD	N.A.M.E	Asso. Professor	31.5.75
Rouf, A.F.M.A	Bsc Engg (Civil) Msc Engg	C.E.	Asso. Professor	5.11.60
Rouf, Md. Abdur	Bsc Engg (Civil) Msc Engg, PhD	C.E.	Professor	31.5.75
Rumi, Ashraf Habib	Bsc Engg (Elec) Msc Engg	C.S.E.	Asstt. Professor	16.1.85
Safiullah, A. M. M.	Bsc Engg (Civil) Msc Engg, PhD	C.E.	Professor	31.3.73
Saha, Banshi Badan	Bsc Engg (Elec) Msc Engg	E.E.E.	Asstt. Professor	30.3.69
Saha, Tapan Kumar	Bsc Engg (Elec) M Tech	E.E.E.	Asstt. Professor	20.1.85
Saha, Pran Kani	Bsc Engg (Elec) ME	E.E.E.	Asstt. Professor	9.3.86
Saha, Mrinal Chandra	Bsc Engg (Mech)	M.E.	Lecturer	27.8.88
Saifuddin, Ahmed	Bsc Engg (Elec) Msc Engg	E.E.E.	Lecturer	27.8.88

Name	Educational qualification	Deptt.	Designation	Date of Joining
Saleh, Abul Fazai Md.	Bsc Engg (WRE) Msc Engg (WRE)	I.F.C.D.R.	Research Asstt. Professor	8.4.77
Sarker, Md. Abdur Rashid	Msc Engg (Mech)	M.E.	Asstt. Professor	17.11.85
Sarker, Ruhul Amin	Bsc Engg (Mech) M Engg (IPE)	I.P.E.	Asstt. Professor	20.9.82
Satter, Quazi Galive A.	Bsc Engg (Civil) MURP	U.R.P.	Asstt. Professor	16.1.89
Sayeed, Md. Shaheen	Bsc Engg (Elec)	C.S.E.	Lecturer	9.12.89
Syeed, Quazi Abdus	Bsc Engg (Mech)	I.P.E.	Lecturer	9.3.86
Selim, Masud. Ahmed	Bsc Engg (Mech) Msc Engg	M.E.	Asstt. Professor	31.3.87
Seraj, Salek Md.	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	18.9.84
Shahjahan, M.	Bsc Engg (Civil) MS, Phd	W.R.E.	Professor	15.10.60
Shaikh, Jamshed Ali	Msc	Math.	Asstt. Professor	16.6.70
Shome, Manash Lal	Bsc Engg (Civil)	W.R.E.	Lecturer	9.3.86
Siddiq, Abu	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Asstt. Professor	11.8.82
Siddiqui, Md. Shafiqul Islam	Bsc Engg (Civil)	C.E.	Lecturer	27.8.88
Siddiqui, M. Saiful Alam	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	9.3.86
Siddique, Abu Bakar	Bsc Engg (Civil)	I.F.C.D.R.	Research Lecturer	9.12.89
Sikdar, Ashraf Ali	Msc Engg (Mech) Phd	I.P.E.	Asstt. Professor	8.9.81
Tamim, Md.	Bsc Engg (Mech) M Tech	M.E.	Asstt. Professor	28.5.85
Tarek, Ahmed	Bsc Engg (Elec)	E.E.E.	Lecturer	9.12.89
Tareq, A.K.M.	Bsc Engg (Civil)	I.F.C.D.R.	Research Lecturer	27.3.91

Name	Educational qualification	Deptt.	Designation	Date of Joining
Ullah, Md. Rafiq	Bsc (Hons), Msc	Chem.	Asstt. Professor	16.4.80
Ullah, Md. Obayed	Bsc (Hons), Msc	Math.	Asstt. Professor	20.2.79
Ullah, Md. Ahsan	Bcom (Hons) M Com	Hum.	Asstt. Professor	1.2.84
Wahhajuddin, Md.	Bsc (Hons) Msc Engg (Mech) M Engg, Phd	M.E	Professor	1.3.83
Wares, Shamsul	B Arch	Arch.	Asso. Professor	16.2.72
Wasimi, Saheh Ahmed	Bsc Engg (WRE) Msc, Phd	I.F.C.D.R.	Research Asso. Porfessor	8.4.77
Yasin, Sarwar Jahan Md	Bsc Engg (Civil) Msc Engg	C.E.	Asstt. Professor	29.6.87
Yasin, Abdullah-Al	B Arch	Arch.	Lecturer	18.11.90
Zakaria, Md.	Bsc Engg (Civil) Msc Engg, Phd	C.E.	Asso. Professor	9.1.70
Zakerullah, Md.	Bsc (Hons) Msc, Phd	Math.	Professor	16.9.65
Zaman, Nazma	Bsc (Hons) Msc, Phd	Phy.	Asso. Professor	2.8.76

## List of Administrative Officers of the University :

### 1. Office of the Vice-Chancellor

Name	Educational Qualification	Disignation	Date of Joining
Prof. M. Shahjahan	B Sc Eng (civil) MS, PhD	Vice-Chancellor	24.4.91
Md. Joynal Abedin	B.A.	Asstt. Registrar (Co-Ordination) and Secretary to VC	28.5.85
Md. Abdul Maleque		Section Officer	2.6.87

### 2. Office of the Registrar

Abu Taher	B Sc Engg (Mech)	Registrar	28.2.81
Md. Shahjahan	B. Com (Hons.) M.Com., PG DPM	Deputy Registrar	21.11.87
Syed Ayub Ali	B.A.	Asstt. Registrar	26.1.82
Md. Nazrul Islam Ukil	M.A.	Asstt. Registrar	28.5.85
Md. Jahangir Alam	B.A.	Asstt. Registrar	28.5.85
Nurun-Nabi	B.Com	Asstt. Registrar	28.5.85
Md. Azizul Haq	M.A.	Admin. Officer	10.9.86
Md. Golam Mostafa	MSc	Admin. Officer	25.10.87
Md. Abdur Rashid	-	Section Officer	1.2.84

### 3. Office of the Comptroller

A.S.M. Ashrafu Huq	B.Com (Hons) M.Com	Deputy comptroller and Comptroller in-Charge	24.11.86
A.H.M. Morshed Alam	B. Com (Hons) M.Com	Deputy Comptroller	15.2.89
Md. Ansarul Islam	B.Com	Asstt. Director	7.7.81

Name	Educational Qualification	Disignation	Date of Joining
Md. Nurul Islam Mia	B.Com	Asstt. Director	1.12.81
Kh. Md. Aolad Ali	B.Com	Asstt. Director	5.4.86
Md. Shah Alam Bhuiyan	B.Com	Asstt. Director	30.11.86
Sadrul Imam	B.Com (Hons) M.Com	Asstt. Director	1.2.89
Md. Abdul Malek	B.Com	Accounts Officer	30.12.86
Sk. Shahjahan Ali	B.Com (Hons) M.Com, LLB	Accounts Officer	4.7.87
Md. Obaidur Rahman	B.Com	Accounts Officer	2.5.89
A.B.M. Fazlul Haq Shah		Section Officer on LPR (A/Cs)	
Md. Abul Khair	B.Com	Section Officer (cash)	18.4.90
Abdul Halim	M.Com	Asstt. Accounts Officer	16.9.86

#### 4. Office of the Controller of Examinations

Asadullah Khan	B Sc (Hons), MSc	Controller of Exams.	28.2.81
Sultan Uddin Khan	B.Com	Asstt. Controller of Exam.	28.5.85
Md. Abdul Hakim	B.A.	Asstt. Controller of Exam.	28.5.85
Md. Waizuddin	B.A.	Admin. Officer	25.4.87

#### 5. Office of the Librarian

Md. Jahirul Islam	M.A. (Lib.Science) MS	Librarian	28.2.90
K.M. Abdul Hai	M.A. (Lib.Science)	Deputy Librarian	13.8.90
S.M. Jakir Hossain	M.A. (Lib.Science)	Asstt. Librarian	14.4.76

Name	Educational Qualification	Disignation	Date of Joining
Suraiya Begum	B.A. (Hons), M.A. M.A. (Lib. Science)	Asstt. Librarian	24.11.86
Md. Abdul wahab Khan	M.A. (Lib.Science)	Sr. Cataloguer	3.6.81
Badrunnessa	M.A. (Lib.Science)	Sr. Cataloguer	30.4.84

#### 6. Office of the University Engineer

A.K.M. Fazlul Haque	BSc Engg (civil)	Executive Engineear & University Engineer-in-charge	17.6.86
Md. Abdul Aziz	M Sc Engg (Elec)	Executive Engineers	31.3.83
S.A. Mahmud Hassan	B Sc Engg. (civil) M.B.A.	Sub. Divisional Engineer (civil)	15.12.84
M.M. Abdul Alim	B Sc Engg (civil)	Sub.Divisional Engineer (civil)	24.11.86
Aftabuddin Bhuiyan	Dip-in-Engg (Civil) (civil)	Asstt. Engineer	11.5.86
Md. Nurul Momen	BSc Engg (civil) (civil)	Asstt. Engineer	28.11.88
Md. Jahangir Alam	BSc. Engg (Elect) (Elec)	Asstt. Engineer	23.11.88
Md. Majed Ali	B.A.	Admin. Officer	1.6.86
Abdul Majid Howlader		Section Officer (store)	1.2.84

#### 7. Office of the Director, Students Welfare

Prof. Dr. Ehsanul Huq	BSc Engg (Met) PhD	Director, Students Welfare-in-charge & Prof. Met. Engg.	15.9.90
Md. Monowar Hossain	BSc Engg (civil) MSc Engg, PhD	Dy. Director, Students Welfare & Asso. Prof. of W.R.E	19.6.90
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Name	Educational Qualification	Disignation	Date of Joining
Md. Nowsher Ali Mia	M.Com, M.A.	Asstt. Director	2.8.87
Md. Fazlul Haque	M.Com	Section Officer	6.6.87

#### Physical Education Office Under DSW Office

M.A. Jalil	BSc, DPE	Director, Physical Education	16.4.74
A.S.M. Lutful Karim	B.A., DPE	Physical Instructor	13.2.61
A.F.M. Obaidul Haque	M.A., BP. ED	Physical Instructor	2.6.81
Md. Ahmedur Rahman	M.S.S., BP. Ed	Physical Instructor	11.2.86
Makshudur Rahman	B.Com (Hons) BP. Ed.	Physical Instructor	2.12.89
Md. Afzalur Rahman	M.A. BP. Ed	Physical Instructor	4.12.89

#### Medical Center under DSW Office

Dr. Azizul Islam	M.B.B.S	Deputy chief Medical Officer & C.M.O.-in-charge	2.1.82
Dr. Anwarul Islam	M.B.B.S	Medical Officer	1.7.78
Dr. Golam Rahmani Ahmed	M.B.B.S	Medical Officer	15.6.81
Dr. Md. Abu Taher	M.B.B.S	Medical Officer	11.2.85
Dr. Manzur-e-Alam	M.B.B.S	Medical Officer	25.3.85
Dr. Md. Tozammul	M.B.B.S	Medical Officer	29.4.84

#### Central Mosque under DSW Office

Mowlana Abul Fatah Bhuiyan	Kamil, M.A. Pesh Imam	Senior Pesh Imam	20.5.87
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#### Mohila Hall under DSW office

Ms. Rowshan Ara Begum	M. A. in Education	Mohila warden	24.6.86
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Name	Educational Qualification	Disignation	Date of Joining
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#### 8. Office of the Director, Planning and Development

Prof. A.M.M. Safiullah	BSc Engg (civil) MSc, PhD	Director, P & D & Prof. of civil Engg	1.11.89
Md. Tahir Ahmed Chow.	B.Com, LLB	Deputy Director	28.10.78
Md. Moinuddin Chow.	B.Com	Asstt. Director	11.7.84
Sohrab Ali Mia	B.Com	Research Officer	31.3.87

#### 9. Office of the Director, Advisory, Extension and Research Services

Prof. Md. Abu Taher Ali	B Sc Engg (Mech) M Sc Engg, PhD	Director, Advisory Extn. & Res. services & Prof. of Mech. Engg	30.1.89
Fazlee Karim	B.A.	Asstt. Director (under Suspension)	28.5.85
Md. Tarekul Qader Mirza	B.A (Hons) M.A	Asstt. Director (Pub. cum-inf.)	22.4.87
Md. Khalil uddin	-	Section Officer	18.4.90

#### Machine Shop Under DAERS Office

Molla Ahmed Ali	L.M.E.	Superintendent and Chief Instructor	18.3.81
Md. Abdul Karim	Dip-in-Engg (Mech)	Foreman Instructor	29.7.84
Md. Selim Kaiser	Dip-in-Engg (Mech)	Asstt. Foreman Instructor	20.11.88

#### Foundry, Welding & Sheet Metal Shop under DAERS Office

Zulfiqar Ali Bhuiyan	Certificate in Weld. Tech.	Superintendent & Chief Instructor	18.3.81
Md. Nazimuddin	Dip-in-Engg (Mech)	Foreman Instructor	10.2.86

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Name	Educational Qualification	Disignation	Date of Joining
Md. Motaleb Hossain	Apprenticeship in Welding & Instruction Course in Marine Diesel	Foreman Instructor	19.11.88
Md. Tofayel Ahmed	Dip-in-Engg (Mech)	Asstt. Foreman Instructor	20.12.73
Md. Shahnewaz Karim	Dip-in-Engg (Mech)	Asstt. Foreman Instructor	14.9.87

#### Central Instrument Work-shop under DAERS office

A.S.M. Jahangir	MSc Instrument	Engineer (abroad)	29.6.88
Md. Rezaul Haq Akhond	BSc Engg (Elec)	Asstt. Instrument Engineer	25.10.89

#### Automobile shop Under DAERS Office

Nur Ahmed Khan	Dip-in-Engg (Auto)	Foreman Instructor	30.4.77
Md. Mohsinuzzaman	Dip-in-Engg (Power)	Asstt. foreman Instructor	15.2.87

#### Carpentry shop under DAERS Office

Md. Rafiqul Islam	Dip-in-Industrial Wood Tech.	Foreman Instructor	4.9.88
Md. Ayub Hashemi	Dip-in-Engg (civil)	Asstt. Foreman Instructor	10.10.88
Md. Kafiluddin Mahmud	Dip-in-Engg (civil)	Asstt. Foreman Instructor	19.2.90

#### 10. Office of the Director, Centre for Energy Studies

Prof. K. Ikhtyer Omar	BSc Engg (Chem) MSc Engg, PhD	Director, Centre for Energy Studies and Prof. of chemical Engg	1.3.89
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#### 11. Office of the Director, Computer centre

Name	Educational Qualification	Disignation	Date of Joining
Prof. Jamilur Reza Choudhury	BSc Engg (civil) MSc Engg, PhD	Director, Computer centre and Prof. of civil Engg	27.4.83
Sanjoy Kumar Podder	BSc. Engg (Elect) MSc Engg	Programmer	11.3.86
Md. Nazmul Huq	BSc Engg (Elect) MSc Engg	Programmer	23.6.87
S.M. Shahadat Hossain	MSc	Sr. Computer Operator	3.1.84
Khairul Alam	B.Com	Sr. Computer Operator	15.12.84
Md. Shahjahan	B.Com	Sr. Computer Operator	15.12.84
Md. Shah Alam	BSc	Sr. Computer Operator	28.8.89
Subesh Kanti Das	B.A.	Sr. Computer Operator	12.2.90
Sohrabuddin	BSc (Hons) MSc	Sr. Computer Operator	23.4.91

#### 12. Office of the Director, Institute of Flood Control and Drainage Research

Prof. Syed Mohib uddin Ahmed	BSc Engg (civil) MSc Engg, PhD	Director & Prof. IFCDR	15.1.89
Md. Nuruzzaman	B.A.	Admin. Officer	19.11.90

#### 13. Office of the Director, Institute of Appropriate Technology

Prof. Md. Nurul Islam	BSc Engg (chem) PhD	Director, IAT & Prof. of Chemical Engg	1.1.84
Mian Md. Shahjahan Calendar	M.Com	Admin. Officer	13.9.86

Name	Educational Qualification	Disignation	Date of Joining
<b>14. Deans of Faculties</b>			
Dr. Md. Syed Ali Afzal	BSc (Hons), MSc Dic, PhD	Dean, Faculty of Engineering & Prof. of Math.	28.8.90
Prof. Abu Hayder Imamuddin	B Arch, M Arch.	Dean, Faculty of Arch. and Planning & Prof. of Arch.	10.12.90
Prof. Shamim-uz- Zaman Bosunia	BSc Engg (Civil) MSc, PhD	Dean, Faculty of Civil Engg & Prof. of C.E.	1.1.90
Prof. A.M. Aziz-ul- Huq	BSc Engg (Mech) MSc Engg, PhD	Dean, Faculty of Mechanical Engg & Prof. of M.E.	30.8.89
Prof. A.B.M. Siddique	BSc Engg (Elec) MSc Engg, PhD	Dean, Faculty of Electrical & Electronic Engg & Prof. of E.E.E.	8.4.91

#### Office of different Departments

#### 15. Civil Engg. Department

M. Nashirul Haq Dhali	Dip-in-Arch.	Senior Instructor (Drafting)	7.7.81
M. Alauddin Sikder	Dip-in-Surveying Dip-in-Tech Edu.	Senior Instructor (Surveying)	4.11.81

#### 16. Metallurgical Engg. Dipartment

Md. Fazlul Haque Bhuiyan	Dip-in-Engg (Mech)	Senior Foundry Instructor	2.8.86
Md. Azaffor Ali	BSc Engg (E & E)	Asstt. Instrument Engineer	31.12.87

#### 17. Electrical & Electronic Engg. Department

Kazi Minhajuddin	Dip-in-E & E	Asstt. Instrument	19.11.88
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#### The Library System :

The four storied library building which has a floor space of 19,775 sft stands close to the academic building. It is a compact library with built-in-facilities to provide various services to students, teachers and researchers and to perform administrative and technical jobs. The university library is primarily a reference and research library for the use of staff and students of the university and visiting scholars. The administration of the library system is centralized under the University Librarian.

All acquisitions and cataloguing activities are carried out in the library, which maintain an accession register, a catalogue of holding and a shelf list. The holdings of the library as of June, 1988 is given below:

Books: 95,354

Current periodicals: 181

Back volumes \* : 12307

The library, unique in character in the country provides the following educational and research facilities to the students and teachers of this university:

#### 1. Reading Room and Refrence Library Facility:

The reading room can accommodate 200 students at a time to provide reading facilities of rare and out of print books, ready reference books and prescribed text books.

\* includes journals, conference proceedings, patent, standards, specificatgions etc.

#### 2. Periodicals and Research Library Facility:

It provides services to the post-graduate students, researchers and teachers. The library procures photocopies and reprints of articles, papers and other published materials on request from the researchers and teachers through agencies such as the British Lending Library.



### 3. Reprographic Facility:

To meet the research and educational needs of both the students & teachers, the library provides reproduction facilities of articles, part of rare and out of print text books and other published materials at a very nominal charge.

### 4. Rental Library Facility:

The Rental Library issues text books to students for one academic session on rental basis through payment of nominal fees.

5. Borrowing facilities : are extended to all members of the university including students of both graduate and post-graduate levels.

### 6. Computer Facility :

The library has a plan to use the modern computer technology and telecommunication facilities in near future to upgrade its information retrieval services. The library has at present, a microcomputer which is now being used for house keeping works.

### 7. Library hours :

a) General library (Saturday-Wednesday): 9 am till 5 pm

b) Reading Room and Reference Library (Saturday-Wednesday): 9 am till 10 pm

Thursday: 9 am till 9 pm.

### Student Health Service :

A students health centre provides primary and basic health care facilities to students (residential and non-residential) free of charge. A hospital and an out-patient dispensary are maintained for the students. The out-patient department is staffed with six full-time general practitioners who also attend residential student-patients on call. For specialized consultation on complicated diseases, the centre refers the patients to specialist-consultants. The University bears all hospital expenses, in case a student needs hospitalization.

### Research & Extension Services and Workshop Facilities :

To provide engineering and workshop services as backup facilities to research (instrumentation, equipment maintenance, construction of rigs for experimentations etc.), the University is formidably equipped with few workshops. Under a separate Directorate of Advisory, Extension and Research Services, these workshops are administered and managed.

These workshops also function as teaching workshops to impart practical knowledge in workshop technology and metal cutting technology and on job training to the first year students, in general and to the second year students and also to the third year and fourth year students of Mechanical Engineering who take sessional works on Machine Tools and Production Engineering. Machine Shop, Foundry & Pattern Shop, Sheet Metal & Welding Shop, Carpentry Shop and Automobile Shop are the major teaching cum-service workshops, while the Central Instrument Workshop provides services in repairing and maintaining equipments of all engineering and science departments. This workshop also provides photocopying services and other modern reproduction facilities for academic and official purposes.

### Computer Centre :

The Computer Centre plays an important role in the teaching and research of the students of the different faculties and provides useful services in data processing facilities required in various sectors of national development.

The Computer Centre has two main frame computers, IBM 370 Model 115 HO2 system and an IBM 4331-KO2 system. In addition microcomputers with hard disc and plotting facilities are available. The on-line peripherals are eight 3340 DASD devices each having a capacity of seventy megabytes, three magnetic tape units, one card reader, one diskette I/O unit and two line printers. Interactive facilities are available through four VDU terminals in addition to a matrix printer connected to the 370/115 and ten VDU terminals connected to the 4331 consultation on complicated diseases, the centre refers the patients to specialist-consultants. The University bears all hospital expenses, in cases a student needs hospitalization.

### Directorate of Students Welfare :

(Students Union, Athletic Club and games & sports facilities)

The Directorate of Students Welfare is responsible for the various activities related to the physical, psychological, social and other aspects of welfare of the students. These include arrangement of supervision for halls of residence, programmes for physical education, games and sports, supervision of the programmes for extra-curricula activities of students through the Central Students Union and through the students unions of the various halls of residence. It is also responsible for providing health services through the Students Health Centre (See page 15), to direct student's consulting and guidance programmes, to aid in arranging employments for students and to organise and maintain contact with the alumni of the University etc.. The Central Students Union, the members of which are elected by the students, oversees the socio-cultural activities of the students. It aids new students in their introduction to the University as well as in looking after the problems of students already at the University.

The students unions of the various halls of residence also arrange their individual socio-cultural activities, literary competitions and help the hall managements in the day-to-day running of the halls.

### Games and Sports :

The athletic club of the University provides excellent facilities to students to acquire physical fitness indispensable for a healthy mind and body. The University maintains a beautiful playground, a squash court, tennis lawns, cricket-pitch volley ball and basketball courts. A well-equipped modern gymnasium provides ample facilities for various types of physical activities to a large number of students at a time. The athletic club arranges a colourful athletic competition every year in the form of annual sports meet.

For improvement of the standard of games and sports, regular coaching by experts are arranged. The University arranges inter-hall football, hockey, basketball, tennis, swimming competitions, Inter-Faculty cricket competition etc. It also participates in Inter-University and national competitions in which the University teams and participants have won medals on different occasions. Inter-hall indoor games competition are held and teacher-student friendly games are also arranged at times.

### Students Halls of Residence :

The University has eight halls of residence (one of these is exclusively for female students) The total capacity of these halls is around 2800 (including 390 female students). Following are the halls with their respective residential capacities. The halls are named after the national heroes, stalwarts, poets and eminent personalities of the country.

Name of Hall	Residential Capacity
Ahsan Ullah Hall	452
Dr. M. A. Rashid Hall	400
Nazrul Islam Hall	281
Shahid Smrity Hall	293
Sher-e-Bangla Hall	317
Sohrawardy Hall	316
Titumir Hall	403
Chhatri Hall	300
Total 2762	

The existing capacity is around 80% of the total number of students of the University. Non-residential students are to be attached to a hall, so that administrative control on students becomes hall-based.

All of the eight halls are set in gardens and frontal green plantations and lawns and are within easy walking distances of the University, almost at the centre of the city, near shopping centres and on bus routes to the city and suburb. The students live in these halls on community-basis, while a single room, depending on its size, is shared by 3 to 4 students. Each hall has a common-room/ television lounge, library, dining hall, prayer room and room laundry service and other service facilities.

### University Institutes :

Two research institutes, namely, (i) institute of Flood Control and Drainage Research, and (ii) institute of Appropriate Technology have been established in the University with clear objectives and purposes. These institutes are basically of non-teaching character; the main purpose to be served by these institutes is to carryout basic and applied research in the two relevant vital areas and develop useful and important softwares.

### **Institute of Flood Control and Drainage Research :**

In recognition of the importance of research in flood control, irrigation and drainage in the country, Institute of Flood Control and Drainage Research was established in July 1974.

#### **The specific aims and objectives of the Institute are :**

- a. to undertake research relating to behavior of Bangladesh rivers with emphasis on flood control, river training, bank protection and related problems;
- b. to study problems relating to flood, irrigation, drainage, groundwater, water distribution and management and agriculture;
- c. to carry out basic research as applied to hydrology, hydraulics, river mechanics, fluid mechanics and in other relevant fields;
- d. to study the long term effects of embankments, barrages, dams and other stabilizing works on the regime of rivers as well as on the morphology and environment of the flood plains;
- e. to study harbour, land reclamation, and coastal engineering problems with special emphasis on tides, sediment movement, and salinity;
- f. to provide extension courses, training, and research facilities in the above fields;
- g. to provide teaching, training, and research facilities at the postgraduate level (Diploma and Certificate) in the relevant fields;
- h. to provide advisory and consulting services to Government, Semi Government and other agencies and to undertake studies and investigations sponsored by them as per University rules;
- i. to establish and maintain contact with similar organization both within and outside Bangladesh ; and
- j. to do such other functions as may be prescribed by the Board of Governors.

In view of the national importance of flood control and the pressing urgencies for the development of efficient irrigation and drainage systems to agricultural lands for the increased production of food, emphasis in research will include studies in the following areas :

1. Studies on characteristics of rivers of Bangladesh.
2. Flood and flood control study series.
3. Studies on water management and irrigation problem of Bangladesh.
4. Mathematical modelling study series.

The Institute has already taken up a number of research projects. Some of them are mentioned below:

1. Regional flood frequency analysis of Bangladesh.
2. A review and analysis of hydrological gauging networks of Bangladesh.
3. Laboratory study of distribution pattern of sediment load.
4. Mathematical model study of storm drainage problem in Dhaka City.
5. A review of flood and road embankment construction practice in Bangladesh.
6. Study on flood depth of the north-east region of Bangladesh.
7. Study on river banks shifting characteristics of Bangladesh.
8. Study of groundwater quality and its effects upon physical properties of irrigated soils in the southern region of Chalan Beel.
9. Numerical simulation of tides and saline water intrusion in the Ganges Delta.
10. Computer modelling of river channel changes in alluvial condition.
11. Numerical modelling of sediment transport process by finite element technique.

### **Institute of Appropriate Technology :**

The Institute of Appropriate Technology (IAT) has been established in the Bangladesh University of Engineering and Technology (BUET) to cater the need for an institution to develop national indigenous capability in selection, generation and dissemination of technologies appropriate to the national development objectives of Bangladesh.

**The objectives of IAT are :**

- (i) to initiate, promote and conduct research on technology policies, technology assessment, technology transfer, technology development and technology dissemination,
- (ii) to develop training programmes related to technology assessment, transfer, development and dissemination,
- (iii) to establish collaborative linkage with institution engaged in similar objectives,
- (iv) to disseminate information for the effective use of technology for national development;
- (v) to provide advisory services on matters related to technology and development.

**The functions of the Institute include :**

- (a) Research and Development Function.
- (b) Training Function.
- (c) Network Function.
- (d) Documentation and Information Dissemination Function.
- (e) Advisory Function.

**(a) Research and Development Function**

**Policy Research :** Identification of policies for appropriate choice, generation and dissemination of technologies in relevant sectors. This type of research would generate necessary information for selecting appropriate policies.

**Technology Assessment:** Assessment of effectiveness of existing technologies and technology based development programmes with a view to identify strategies to improve their performance and to identify criteria for selection of similar technologies in future development programmes. This type of research would help in optimum use of technology for national development.

**Resource Assessment and Technology Development:** Assessment of available resources and identify technology for the effective use of resources.

On the basis of assessment of resources, users need and existing technologies; wherever necessary initiate research for development of technology; involving design, fabrication, testing and demonstration in field condition.

**Technology Transfer and Dissemination:** Identification of appropriate mechanism for transfer and dissemination of technologies.

**(b) Training Function**

Organize and/or develop short courses, seminars, workshops etc. (i) specific to different areas such as, Technology Assessment, Technology Adaptation and Developments, Technology Diffusion and Dissemination; (ii) specific to different issues, technologies or technological process, such as, Rural Energy planning, Post harvest processing or rice/sugarcane gur (iii) specific to the need of different groups such as, banks, research institutions, non-governmental organization.

In addition, social scientists, scientists and technologists from other national organizations will be welcomed to undertake short term research projects in association with Institutes professional staffs.

It is envisaged that these training programmes will be able to meet part of the training need of the country in the field of technology and development.

**(c) Network Function**

Establish contact and exchange programmes with national and international institutions of similar nature.

**(d) Documentation and Information Dissemination Function**

Exchange of documents and information; It is envisaged that information dissemination activities will be able to create an awareness about the appropriate choice, generation and dissemination of technology for national development.

**(e) Advisory Function**

Professional staffs will offer advice on matters related to technology policy, technology assessment, resources assessment, technology development and technology diffusion. These activities will reduce dependence on external technical assistance for such services and also will help in effective use of technology for development.

**Auditorium Complex and Seminar Hall :**

The University has its own Auditorium Complex with modern facilities which houses one auditorium with a seating capacity of 1500. Within this complex, a modern and hygienically sound canteen caters for food to the students and

teachers. There is also one seminar hall, with a seating capacity of 250, capable of holding conferences and seminars. Besides this seminar hall, a similar one with modern electronic gadgets having a seating capacity of around 200 is located on the first floor of the Civil Engineering Building.

#### List of Committees :

The University has the following eight statutory committees :

- 1) Syndicate
- 2) Academic Council
- 3) Finance Committee
- 4) Planning and Development Committee
- 5) Committee for Advanced Studies and Research (CASR)
- 6) Boards of Undergraduate Studies (BUGS)
- 7) Boards of Post graduate Studies (BPGS)
- 8) Faculties

The Syndicate is the supreme authority in major policy-making matter and in approving recommendations. The Finance Committee, the Planning and Development Committee and other committees assist the Syndicate in matters important for proper functioning of the University. The Academic Council is the supreme body in formulating academic rules and regulations to which the CASR, Boards of Undergraduate and Postgraduates Studies, and Faculties recommend.

#### University Publications :

The University publishes the following items at various times :

- (i) Calendar and Diary : About 7000 copies of Calendar and 2000 copies of diary annually.
- (ii) Annual Report : Annually about 650 copies
- (iii) Research Abstract : Biannually about 550 copies
- (iv) Research Bulletins : Mechanical Engineering,  
Chemical Engineering,  
Water Resources Engineering,  
Electrical & Electronic Engineering  
(Published annually)

- (v) Ordinance, Statutes, Rules and Regulations : Published occasionally.
- (vi) University Calendar : 400 copies published biannually. (Syllabus)
- (vii) BUET Studies : Half yearly about 500 copies
- (viii) Technical Journal : Annually about 4000 copies



### **Admission Requirements for Undergraduate and Postgraduate Courses:**

Students get their admission into the four-year B. Sc. Engineering degree course in the various engineering departments and in the five-year architecture course through an open admission test. Candidates for admission into the B. Sc. Engg. and the B. Arch, courses must have passed the Higher Secondary Certificate (HSC) examination (Science group) after twelve years of schooling or its equivalent. Students are generally selected on the basis of the result of the admission test. The number of fresh entrants in the engineering faculty is usually 510 and that for Architecture is 50. Moreover, a maximum of 26 seats are reserved for foreign students and 21 seats for the members of the Bangladesh armed forces. Students would give option for any of the branches of engineering viz. Chemical, Civil, Electrical and electronics, Computer Science & Engg., Mechanical, Metallurgical and Naval Architecture & Marine Engineering during admission.

The qualifying requirements for the admission test for subsequent entry in the undergraduate courses are as follows :

- (i) Minimum of 50% of marks in Secondary School Certificate (10 years of schooling equivalent to Matriculation) examination.
- (ii) Minimum of 65% of marks in aggregate in the subjects of Physics, Chemistry and Mathematics and not less than 50% marks in each of these subject separately in the Higher Secondary Certificate examination.

The detailed rules of admission for each academic session are framed by the Academic Council of the University. Usually, the notice for admission is advertised in the local news papers soon after the results of the HSC examinations are announced. Application forms and any other information may be obtained from the Academic Section of the Registrar's Office. Overseas students may contact the Registrar of the University for details about the admission procedure.

### **Registration/Admission :**

Students qualified in the admission test, have to undergo a medical check-up. The medical check-up is conducted at the Students Health Centre of the University. Medical Examination is preceded by verification of previous academic documents at the academic section of the Registrar's office before the students can get their admissions into the first year classes. The right of admission to the University is subject to the requirement that the student will comply with the admission procedure and will obey the existing statutes, ordinances, rules and regulations of the University and those framed from time to time.

### **Discipline and Conduct :**

As member of the university community a student is expected to behave in a seemly fashion. It is obligatory for him to abide by the rules and regulations of the University. In case of violation of some rules or in case of misconduct or an act of indiscipline a student may be penalised by the concerned authorities of the university, or his case may be referred to the Board of Residence and Discipline for appropriate action. Student may be informed of the relevant rules at different times by the offices of the Registrar, the Comptroller, the Controller of Examinations, the Librarian, the Director of Students Welfare and the Provosts of residential halls. Students should keep themselves aware of the the different notifications issued by these offices. In case a student is interested to know about any regulation of the university he may contact the office of the Registrar of the university.

### **Postgraduate Admission and Course Qualifying Requirements and Academic Regulations :**

- (i) M. Sc. Engg./M. Engg. and M. Arch.-A student must have a bachelor's degree or its equivalent from a recognized university or institution with a good academic record.
- (ii) Master of Urban & Regional Planning-A student must have a bachelor's degree or its equivalent in Engineering/ Architecture/Planning/ Agricultural Economics or a Master's degree in Sociology/Social

Welfare/Social Work/ Geography/ Economics from a recognized university or institution with a good academic record.

- (iii) M. Phil in Physics and Chemistry-A student must have a bachelor's degree or its equivalent in relevant Engineering or a Master's degree in relevant subjects from a recognized university or institution with a good academic record.
- (iv) Ph.D.-A student must have a Master's degree or M. Phil from a recognized university or institution a student; in the Master's programme may be transferred to the Ph. D. programme if he shows excellent progress in his Master's thesis after completion of courses.

#### Academic Duration :

- (i) Master's courses in Engineering and Architecture are of three semesters with a minimum duration of one year and a half.
- (ii) M. Phil, MURP and Ph. D. are of four semesters with a minimum duration of two years.

A candidate for the Master's degree must complete all requirements within five calendar years and Ph. D. within six calendar years from his first enrolment in respective programmes.

#### Academic regulations :

The academic year for postgraduate studies is divided into two semesters. Academic progress is measured in terms of credit hours earned by a student. One credit hour subject should require one hour of class attendance per week for one semester. A student needs credit hours for respective degrees as follows:

Degrees	Course Cr. hr.	Thesis/Project Cr. hr.
M. Sc. Engg/M. Arch	18	18
M. Engg.	30	6
M. URP	30	18
M. Phil	18	30
Ph. D.	9	45

## Examinations Rules and Regulations For Undergraduate and Postgraduate Students

### A. Undergraduate

Rules relating to conduct of examinations for undergraduate engineering and architecture courses applicable to the students admitted to this university in session 1983-84 onwards and repeaters along with them:

#### System & conduct of Examination

The B. Sc. Engineering and Architecture degrees courses shall be divided for the purposes of the examination and promotion as follows :

For 1st Year, 2nd Year, 3rd Year and 4th year (for Engineering) and 1st Year, 2nd Year, 3rd Year, 4th Year and 5th Year (for Architecture) each will extend over one academic session. For the purpose of examination, a course will be divided into two parts, Part 'A' and Part 'B'. Part 'A' Examination will be held in the middle of the session and will carry 40% of the total marks allotted for the courses/subjects and part 'B' examination will be held at the end of the session and will carry 40% of the total marks allotted for the courses/subjects.

#### Class test

There shall be continuous assessment of performance of students through class tests in all theory courses and 20% of total marks of that course (10% of total marks in each of part-A and part-B) shall be allotted for these class tests. In each part of the session, the teacher(s) concerned shall take at least two, but not more than three class tests and shall prepare marksheets which he shall submit separately at the end of each part of the session.

#### Date of Examination

The dates of various examination shall be announced by the Dean at the beginning of each session. The dates of examinations shall not be



changed except by a specific decision of the Academic Council on the recommendation of the Faculty concerned.

Preparatory leave

A preparatory leave of two weeks will be allowed before part 'A' examination and two to three weeks before part 'B' examination.

Minimum pass/qualifying marks

40% is the minimum pass marks in each theory/sessional subject. Where a subject is taken as more than one distinctly different subjects mentioned in the curricula, the paper shall be divided into requisite number of parts and it shall be obligatory to pass the parts separately. Marks obtained in the part 'A' and 'B' examinations and the class test will be added to calculate the total marks obtained by a student in that subject. Absence in any paper will be considered equivalent to securing zero in that paper.

A student will be promoted to the higher class when he passes in all the subjects.

Distribution of marks of different courses will be as follows :

Distribution of marks (for engineering)

		1st year	2nd year	3rd year	4th year	
1	period per week	50		100	100	Theory subjects
2	" " "	150	150	200	200	
3	" " "	200	250	300	300	
4	" " "	300	300	400	400	

For session/practical, for all years for a course of 3 hours per week, marks will be 100 and/ or of a course of 3 hours per alternate week, marks will be 50.

Eligibility of examinee

A candidate may not be admitted to any university examination unless :

: Submits and application for appearing in the examination in the prescribed form to the Controller of Examinations.

: Paid the prescribed examination fees and all outstanding University and Hall dues.

Merit position & award of Class

Class of a student shall be decided on the marks he obtained in the regular examinations and class tests. The classes will be determined on the basis of the aggregate of marks obtained by a candidate in all the eight theory/sessional examinations of the four year courses for engineering and in all the ten theory/sessional examinations of the five year courses for architecture.

A candidate securing 75% or above in the aggregate of marks in all the papers for all the four year classes for engineering and for all the five year classes for architecture, shall be placed in the First Class with honours. If the aggregate is below 75% but 60% or higher he/she shall be declared to have obtained First Class. If the aggregate is below 60% but 50% or higher, he/she shall be declared to have obtained Second Class (Upper). Other successful candidates shall be placed in the Second Class.

Referred Examination

A student who fails in not more than two theory subjects, provided that he has already obtained at least 40% marks in aggregate (i.e. total of all theory and sessional courses for that year), will be allowed to sit for a referred examination to clear those subjects to be held normally in the 2nd week from the beginning of the classes of the next academic session. A student taking referred examination will be provisionally allowed to attend the higher class until the result of the referred examination is published. A student who will pass in the referred subjects shall be declared to have passed in the relevant examination.

## Attendance

The rules for attendance report of students are as follows : Student's attendance reports for each subject in one academic session shall be notified in four instalments as given below:

- |  |   |
|--|---|
| i) First quarterly report :                | Six weeks after the resumption of classes of the part-A   |
| ii) Second quarterly report (Cumulative)   | A cumulative attendance of a student during part-A at the end of part-A classes   |
| iii) Third quarterly report : (Cumulative) | A cumulative attendance of a student during part-A and the current quarter of six weeks after the resumption of classes of part-B |
| v) Final overall cumulative report :       | At the end of classes of the part-B, total cumulative attendance of a student during the session.                                 |

A student shall not be admitted to part-B examination if his cumulative attendance so recorded above falls short of 60% of the total classes held in every subject during part-A and part-B classes of the session.

A list of the students whose attendance is less than 60% will be prepared by the Registrar within 2 working days after obtaining a report and the respective guardians of these defaulting students would be informed.

If after the third report a student's attendance falls below 60% and is such that even if the student attends all the classes after the announcement of this third report and still could not achieve 60% attendance, he shall not be allowed to continue attending the remaining classes of part-B.

## Private

A student who fails as per rules and who has passed in all sessional/practical subjects may appear in the examination in which he failed. as a private candidate on payment of examination fees. He shall be required to pass all theory subjects for promotion to the higher class.

## Exemption

Repeater students may be exempted in the theory course (s) in which he secured 60% or more marks. Head of the relevant department concerned may, however, disallow such exemption. For exemption in sessional/ practical subjects following rules will apply:

- 40% shall not be exempted
- above 40% and below 45%, Head of the Department concerned may allow exemption.
- 45% and above, shall be exempted directly on the basis of application (provided the student has applied for such exemption within the specified time).

## B. Postgraduate

Rules relating to conduct of examinations for postgraduate courses in M. Sc. Engg. M. Engg. M. Arch., M. URP, M. Phil. and Ph.D.

## Conduct of Examination

i) For all postgraduate degrees in Engineering, Architecture, Urban & Regional Planning and Physics and Chemistry, in addition to test, assignments and/or examinations during the semester as may be given by the teacher (s) concerned, there shall be a written examination and/or other test for each of the subjects offered in a semester at the end of that semester. The dates of which shall be announced by the Deen of the respective faculties at least two weeks before the commencement of the examination. The final grade in a subject shall be based on the performance in all tests, assignments and/or examinations.

Final grades for courses shall be recorded as follows :

## Grading System

Grade	Merit description	Grade points	Numerical markings
A +	Excellent	4.0	90% and above
A	Very good	3.5	80% to below 90%
B +	Good	3.0	70% to below 80%
B	Average	2.5	60% to below 70%
C	pass	2.0	50% to below 60%
F*	Failure	-	below 50%
I**	Incomplete	-	
S or U	Satisfactory or Unsatisfactory (for non-credit course)		

W Withdrawn from course

\* Subject in which the student gets F grades shall not be counted towards credit hour requirements and for the calculation of Grade Point Average (GPA).

## Qualifying Requirements

\*\* Given only a student is unable to complete the course because of circumstances beyond his control, it must be made up by the close of next two semesters or the incomplete grade becomes a failure. He may, however, be allowed to register without further payment of tuition fees for that course.

The qualifying requirement for graduation is that a student must earn the minimum grade point of 2.65 based on the weighted averaged in his course work.

The C grades, upto a maximum of two subjects may be ignored for calculation of grade point average (GPA) at the written request of the student, provided the student has completed the total credit hour requirement with a minimum weighted GPA of 2.65 in the remaining subjects. No subject shall be repeated unless it is a compulsory requirement for the degree as determined by the Board of Postgraduate Studies. Performance in all the subjects shall be reflected in the transcript.

If the cumulative number of F grades obtained by the student is three or more he shall not be allowed to continue in the programme.

If at the end of the second or any subsequent semesters, the cumulative GPA falls below 2.5 (considering all grades including F grades), he shall not be allowed to continue in the programme.

## Thesis/Project

In addition to successful completion of course works every student shall submit a thesis/project on his research work, fulfilling the requirements as detailed below.

Every candidate submitting a thesis/project in partial fulfilment of the requirements of a degree, shall be

## Calendar

required to appear at an oral examination, on a date or dates fixed by the Head of the department and must satisfy the examiners that he is capable of intelligently applying the results of this research to the solution of problems, of undertaking independent work, and also afford evidence of satisfactory knowledge related to the theory and technique used in his research work.

(ii) For Ph. D. degree :

As in (i) above for Masters and M.Phil degrees.

Conduct of  
Examination

Qualifying  
Requirements

To qualify for the degree a student must earn a minimum grade of 2.65 based on the weighted average in his course work.

Comprehensive  
Examination

The date and time of the comprehensive examination shall be fixed by the Doctoral Committee on the request of the supervisor. Comprehensive Examination shall ordinarily be held after the completion of the course work by the student.

The comprehensive examination shall comprise a written examination and/or an oral examination to test the knowledge of the student in his field of study. The Doctoral Committee shall conduct the comprehensive examination. If a student fails to qualify in a comprehensive examination he shall be given one more chance to appear in the examination as scheduled by the Doctoral Committee.

Research work for a thesis shall be carried out in this University or at a place(s) approved by the Doctoral Committee in consultation with the supervisor.

## Thesis

At the end of the student's research work the student shall submit a thesis which must be an original contribution to engineering/ sciences and worthy of publication. At least five type written copies of the thesis in the final form must be submitted to the Head of the department through the supervisor in the approved format.

In case a student fails to satisfy the Board of Examiners in thesis and/or oral examination, the student shall be given one ore chance to resubmit the thesis and/or appear in oral examination as recommended by the Board.

A student who has been transferred to the Ph. D. programme from the M. Sc. Engg/M. Phil. programme may be awarded an M. Sc. Engg./M. Phil. degree on recommendation of the supervisor, if the student fails to qualify for the award of the Ph.D. Degree.

SUMMARY OF COURSES OF  
THE DEPARTMENTS

## Faculty of Architecture and Planning

### Department of Architecture

Teaching staff :

#### Professors :

Meer Mobashsher Ali, B. Sc. Engg. (CE) B. Arch., M. Phil

Khairul Inam, B. Arch., M. Arch. \*

Abu Hyder Imamuddin, B. Arch., M. Arch.

#### Associate Professors :

Feruque A. U. Khan, B. Arch., M. Arch.

Khaleda Rashid, B. Arch. MURP

Nizamuddin Ahmed, B.Arch., Ph. D.

Shahidul Ameen, B.Arch., Ph. D.

Shaheda Rahman Imam, B. Arch., M. Arch.

Shamsul Wares, B. Arch.

Shamim Ara Hassan, B. Arch., M.Arch.

#### Assistant Professors :

Shafiul. A. K. Yousufzai, B. Arch. M. Arch.

Wahidul Alam, B. Arch, MUD.

Fuad Hassan Mallick, B. Arch. M. Phil.

Zabun Nasreen Ahmed, B. Arch. M. Phil.

Zainab Faruqi Ali, B. Arch.

#### Lecturers :

Jasmin Ara Begum, B. Arch.

Azizur Rahim, B. Arch,

Saif-ul-Haq, B. Arch.

Mahbub Rashid, B. Arch.

Shayer Ghafur, B. Arch.

Asiya Chowdhury, B. Arch.

Abdullah-Al-Yasin, B. Arch.

\* *Head of the department*

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Farida Nilufar, B. Arch.  
 Adnan Zullur Morshed, B. Arch.  
 Khandakar Sabbir Ahmed, B. Arch.

### Introduction and Architecture Programme :

The Department of Architecture, is the only teaching department in Bangladesh, imparting formal education and training in architecture. In 1961, the introduction of architectural education, side by side with engineering education, was a significant step forward in the history of this institution. The department of Architecture was started with only one foreign teacher and six students. By 1966, six local teachers joined the department after obtaining architecture degrees from U.S.A. Presently the \* *Head of the department* department has 22 teachers, 14 of them with postgraduate degrees, specializing in Housing, Environment, Urban Design, Landscape, Health and Educational Facilities. Intake of students were initially 25. This was later increased to 35 and presently 50 students are admitted in the 1st year course.

The curriculum is comprehensive with emphasis on design. It also included Humanities, Physical Sciences, Arts, construction, Architectural History, Environment, and Engineering. The understanding of human being as social creature, his perception of environment, goals, hopes and aspirations, capabilities and limitations, all these are accepted as principal guiding factors for creation of the built environment. Accordingly present day architectural education is mostly concerned with studies and investigation of the determinants of architecture and objective analysis of all other factors.

The graduates of the department are employed by the government, semi-government agencies, corporations and private consulting firms. Many of the graduates are self-employed running design offices.

The department of architecture offers a five-year undergraduate programme leading to the Degree of Bachelor of Architecture (B. Arch.). Students are given a series of courses and design exercises aimed at developing a thorough understanding of the fundamentals of architecture and acquiring progressively complex design skills through these exercises. In the fifth year during first half of the course, students accomplish a complete project including preliminary design, development, working drawings and specifications; in the final part of the fifth year, each student chooses a project of significance which is about to be taken

up by some government or private agency. In each case the project consists of the development of concept and criteria for design through investigation of the physical and socio-economic aspects of the problems and preparation of a design solution.

With time, design of environment for projects such as housing, health facilities, educational facilities etc. have become complex and deserve more investigation and research. Architects also have a significant role to play in the policy making process of physical development of the country. The undergraduate programme does not provide adequate scope for specialization and research. Current research includes, an approach to the formulation of design criteria and space standards for community secondary schools and designing a prototype in Bangladesh, the sharing problems of multiownership flats and investigation of noise and study of the relevant architectural aspects in some selected industries in Bangladesh.

### SUMMARY OF COURSES

#### Undergraduate

##### First year

Course No.	Subject Title	Hours/week	Marks
Hum 111	Sociology and Psychology	2-0	200
Arch 121	Climate and Design 1	2-0	200
Math 122	Mathematics	2-0	200
Phy 123	Physics	2-0	200
Arch 131	Design 1	1-0	100
Arch 132	Art and Architecture 1	2-0	200
Arch 141	Construction Details 1	1-0	100
Shop 142	Carpentry and Metal Works	0-3	100
Arch 191	Design 1	0-9	450
Arch 192	Architectural Graphics	0-6	300

##### Second Year

Arch 211	Basic Planning	1-0	100
Arch 221	Climate and Design II	1-0	100
Arch 232	Art and Architecture II	2-0	200
Arch 241	Construction Details II	1-0	100
Arch 243	Building and Finish Materials	2-0	200
CE 229	Structure II	2-0	200



Course No.	Subject Title	Hours/week	Marks
CE 231	Plumbing	1-0	100
Arch 291	Design II	0-12	600
Arch 292	Photography and Graphic Reproduction	0-3	100
Arch 293	Graphic Art and Sculpture	0-6	200
<b>Third Year</b>			
Arch 311	Advanced Theories of Planning	1-0	100
Arch 312	Urban Design	1-0	100
ME 321	Mechanical Equipments	1-0	100
EE 323	Electrical Equipments	1-0	100
Arch 322	Architectural Acoustics	1-0	100
Arch 332	Art and Architecture III	2-0	200
CE 329	Structure III	2-0	200
Arch 342	Specifications and Cost Estimating	1-0	100
Arch 391	Design III	0-18	900
Arch 392	Working Drawings	0-3	100
<b>Fourth Year</b>			
Hum 411	Logic and Philosophy	2-0	200
Arch 412	Housing	2-0	200
Arch 413	Rural Planning	1-0	100
Arch 414	Landscape Design	1-0	100
Arch 421	Surveying Techniques and Analytic Methods 1 to	2 weeks	100
CE 429	Structure IV	2-0	200
Arch 491	Design IV	0-18	900
Arch 492	Landscape Design	0-3	100
<b>Fifth Year</b>			
Arch 511	Health Facilities Planning	2-0	200
Arch 513	Seminar (Thesis, Design Arch)	1-0	100
Arch 541	Professional Practice	1-0	100
Arch 543	Construction Management	1-0	100
Hum 516	Accounting	1-0	100
CE 529	Structure V	2-0	200
Arch 515	Design V	0-2110	50

<b>Postgraduate</b>			
Course No	Subject Title	Credit	Hours
Arch 6101	Housing Problems and Policies in the Developing Countries	3 + 1	
Arch 6102	Thermal Environment in Built-form	2 + 1	
Arch 6103	Theories of Urban Design	1 + 1	
Arch 6104	Health Problems in the Contemporary Societies	1	
Arch 6105	Analytic Methods	1	
Arch 6202	Urban Housing	2 + 1	
Arch 6203	Sonic Environment in Built-form	2 + 1	
Arch 6204	Urban System	1 + 1	
Arch 6205	Health Facilities, Planning and design	1	
Arch 6206	Research Methodology in Architecture	1	
Arch 6207	Regional Architecture of Bengal	2 + 1	
Arch 6208	Safety and Security in Buildings	2 + 1	
Arch 6303	Domestic Architecture	2 + 1	
Arch 6304	Luminous Environment in Built-forms	2 + 1	
Arch 6309	Thesis		

## Department of Humanities

Teaching Staff :

### Assistant Professors :

Sufia Khatoon, B.A. (Hons.), M.A.

Mir Nazmul Karim, B.Com. (Hons.), M.Com., LLB

Md. Habibur Rahman, B.A. (Hons.), M.A. \*

Md. Ahsan Ullah, B.Com. (Hons.), M.Com.

Sayeeda Jafar, B.A. (Hons.), M.A.

### Introduction :

The department is basically non-degree offering. It offers courses in English Economics, Sociology, Government, Accountancy. Industrial Management, Industrial law, Philosophy and Pyschology in the undergraduate classes in Architecture, Civil, Electrical & Electronic, Engineering and Mechanical Faculties. The British council has provided the department with necessary teaching training facilities and materials under a programme entitled "English for Specific Purpose." This programme will immensely benefit the students of the University in their engineering studies.

### SUMMARY OF COURSES :

Couse No.	Subject Title	Hours/Week	Marks
Hum 101	English and Economics	2-0	150
Hum 103	English	2-0	200
Hum 111	Sociology & Psychology	2-0	200
Hum 201	Government & Sociology	2-0	150
Hum 203	Accountancy & Industrial Management	3-0	250
Hum 207	Accounts and Sociology	2-0	150
Hum 303	Development Economics and Accounts	2-0	200
Hum 305	Industrial law, Sociology and Accounts	3-0	300
Hum 309	Economics and development Economics	2-0	200
Hum 313	Industrial law, Sociology and Accounts	3-0	300
Hum 411	Logic and Philosophy	2-0	200
Hum 516	Accounting	1-0	100
Arch 543	Construction Management	1-0	100

\* Head of the department

## Department of Urban & Regional Planning

### Teaching Staff :

#### Professors :

Golam Rahman, B. A. (Hons.), M.A., MCRP, Ph. D.  
Mir Shahidul Islam, B.Sc. Engg. (Civil), M. P. P., Ph.D. \*

#### Associate Professors :

A. S. M. Mahbub-ub-Nabi, B. Sc. Engg. (CE), M.P.P. Dipl. in Dev. Planning  
Ajmal Hayat Ahmad, B. Sc. Engg. (Civil), B. Arch., M. Arch., M. C. P.  
A. S. M. Abdul Quium, B. Sc Engg. (Civil), M. U.R. P.  
Md. Abdul Mohit, M. A. (Econ.), M. Phil M. U. R. P. Ph.D.  
Sarwar Jahan, B. A. (Hons.), M. A. (Econ.), MURP, M.A. (Reg. Plan. & Ros, Dev.), Ph. D

#### Assistant Professors :

Rezia S. Ahmad, B. A. (Hons.), M. A. (Geog.), M. C. P.  
Roxana Hafiz, B. Arch., MURP.

#### Lecturers :

Quazi Galive A Sattar, B. Sc. Engg. (Civil), MURP  
Khandoker Md. Moniruzzaman, B. Arch. MURP

#### Introduction :

The concept of planning has changed significantly in the recent years. Emphasis has been expanded from a focus only on such cases as, physical, environment, land-use, circulation system, community facilities etc. to a broader and more explicit concern for environmental policy, social, economic policy, urban and rural systems.

The planning and urban, regional & rural studies currently focus on specialized areas, such as' (i) City Services Analysis, (ii) Metropolitan Region, (iii) Income distribution (iv) Rural development, (vii) Institutional aspects of development, (viii) National Policy for rural and village level development,(ix) poverty and (x) Food distribution.

The Master's Degree in the department, a two-year programme, is designed to provide a set of widely applicable skills and experience and their application to urban and regional problems.

\* *Head of the department*

Moreover, under the broad subject of urban and regional & rural planning wide spectrum of spatial and social context are covered namely, city, metropolis, region, rural area, village etc. Within this context the education is focused to the following areas, such as:

- i) a general understanding of the interaction between the social Economic spatial and institutional aspects of the society,
- ii) techniques for analyzing the urban, regional and rural communities—their social, economic characteristics and the process of change, and
- iii) skill in the synthesis of urban and rural policies including the planning process and the institutional relationships affecting the policies.

#### SUMMARY OF COURSES :

The three numbers in the last column are (a) lecture hour per week (b) studio or sessional hours per week and (c) number of credits respectively.

Course No.	Subject Title	Hours per week & credit
Plan 6000	Thesis	18 credits
Plan 6001	Human Settlement and Land Economics	2-0-2
Plan 6002	Economics for Planners	2-0-2
Plan 6003	Planning Process and Theories	2-0-2
Plan 6004	Urban Planning I	2-0-2
Plan 6005	Rural Development Planning I	2-0-2
Plan 6006	Regional Planning	2-0-2
Plan 6007	Quantitative Techniques in Planning analysis 1	1-3-2
Plan 6008	Transportation Planning	2-0-2
Plan 6009	Housing and Community Development	2-0-2
Plan 6010	Planning Administration Implementation and Management Process I	2-0-2
Plan 6011	Project Evaluation and Management Techniques	1-3-2
Plan 6012	Seminar on Special Problems in Planning and Development I	2 credits
Plan 6020	project (6 credits)	

Individual student will select a problem on particular aspect of urban and regional planning

Course No.	Subject Title	Hours per Week & credit
Plan 6101	Urban Planning II	2-0-2
Plan 6102	Urban Design	2-0-2
Plan 6103	Housing and Site Planning	2-0-2
Plan 6104	Physical Infrastructure Planning (Urban & Rural)	2-0-2
Plan 6105	Planning Administration implementation and Management Process II	2-0-2
Plan 6106	Low-Income Housing and Settlement	2-0-2
Plan 6108	System Analysis in Urban and Regional Planning	2-0-2
Plan 6109	Quantitative Technique in Planning Analysis II	0-6-2
Plan 6110	Special Studies	2-0-2
Plan 6113	Studio : Urban Planning Technique	0-6-2
Plan 6114	Studio: Housing and Area Planning	0-6-2

#### Division-II Regional and Rural Planning :

Plan 6120	Regional Development Planning and Resource Use	2-0-2
Plan 6121	Rural Development Planning II	2-0-2
Plan 6122	Economics of Population Growth	2-0-2
Plan 6123	Studio: Regional Planning Technique	0-6-2
Plan 6124	Studio: Rural Planning Techniqu	0-6-2

#### Division-III Development Planning :

Plan 6130	Urban and Regional Economics	2-0-2
Plan 6131	Public Finance In Underdeveloped Countries	2-0-2
Plan 6132	Rural/Agricultural Development	2-0-2
Plan 6133	Agriculture in Economic Development	2-0-2
Plan 6134	Economic Development	2-0-2

## Faculty of Civil Engineering

### Department of Civil Engineering

#### Teaching Staff :

##### Professors :

Sohrabuddin Ahmed, B.Sc. Engg. (Civil), M.Sc., Ph. D.  
Jamilur Reza Choudhury , B.Sc. Engg. (Civil), M.Sc., Ph. D.  
Alamgir Habib, B.Sc. Engg. (Civil), M.Engg., Ph. D.  
Shamin-uz-Zaman Bosunia, B.Sc. Engg. (Civil), M.Sc., Ph. D.  
Md. Alee Murtaza, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
Alamgir Mujibul Huq, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
M. Feroze Ahmed, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D. \*  
A. M. M. Safiullah, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
Md. Azadur rahman, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
Md. Hossain Ali, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
Md. Humayun Kabir, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.  
Md. Abdur Rouf, B.Sc. Engg. (Civil), M.Sc.Engg., Ph. D.

##### Professor Emeritus :

Wahiduddin Ahmed, B.Sc. Engg. (Civil), M.Engg., Ph. D.

##### Associate Professors :

A. F. M. A. Rouf, B.Sc.Engg. (Civil), M.Engg.  
Syed Nuruddin Ahmed, B.Sc.Engg. (Civil), M.Sc.Engg.  
A. M. M. Taufiqul Anwar, M.Sc.Engg., Ph.D.  
Md. Zakaria, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
Ahsanul Kabir, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
Md. Zoynul Abedin, B.Sc.Engg. (Civil), Dipl. in Soil Engg., M.Sc.Engg., Ph.D.  
Faruque Ahmed, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
Md. Mazharul Hoque, B.Sc.Engg. (Civil), M.Engg., Ph.D.  
Sk. Sekander Ali, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
Md. Mujibur Rahman, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
Hassan Ahmed, Bsc. Engg. (Civil), M.Sc., Ph. D.

\* Head of the department



**Assistant Professors :**

S. Fakhru Ameen, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
 M. Shafiul Bari, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
 Md. Habibur Rahman, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
 Md. Delwar Hossain, B.Sc.Engg. (Civil), M.Sc.Engg.,  
 Abu Siddiq, B.Sc.Engg. (Civil), M.Sc.Engg.,  
 Haris M. R. Awal, B.Sc.Engg. (Civil), M.Sc.Engg.,  
 A. S. M. Mustaque Hossain, B.Sc.Engg. (Civil), M.Sc.Engg.,  
 Abdul Muqtadir, B.Sc.Engg. (Civil), M.Sc.Engg., Ph.D.  
 Salek Md. Seraj, B.Sc.Engg. (Civil), M.Sc.Engg.  
 A. B. M. Badruzzaman, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Md. Shamsul Haque, B.Sc.Engg. (Civil), M.Sc.Engg.  
 M. Saiful Alam Siddiqui, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Md. Abdul Jalil, B.Sc.Engg. (Civil), M.Sc.Engg.  
 M. Nazrul Islam Chowdhury, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Sudip Sankar Battacharjee, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Ishtiaque Ahmed, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Manoj Kanti Das, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Sarwar Jahan Md. Yasin, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Hasib Mohammad Ahsan, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Md. Kabirul Islam, B.Sc.Engg. (Civil), M.Sc.E

**Lecturers :**

A. K. M. Reazul Zamil, B.Sc.Engg. (Civil)  
 Md. Zakaria Ahmed, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Lutful Islam Khan, B.Sc.Engg. (Civil), M.Sc.Engg.  
 Asif Ahmed, B.Sc.Engg. (Civil)  
 Md. Shafiqul Islam Siddiqui, B.Sc.Engg. (Civil)  
 Tarek Fazley Haider, B.Sc.Engg. (Civil)  
 Md. Abu Jafar Khan, B.Sc.Engg. (Civil)  
 Sukomal Modak, B.Sc.Engg. (Civil)  
 Md. Naser Bin Hossain, B.Sc.Engg. (Civil)  
 Eqramul Hoque, B.Sc.Engg. (Civil)  
 A. K. M. Nurul Islam, B.Sc.Engg. (Civil)  
 Md. Jobair Bin Alam, B.Sc.Engg. (Civil)  
 Moazzem Hossain, B.Sc.Engg. (Civil)  
 Bashir Ahmed, B.Sc.Engg. (Civil)

Khan Mahamud Amanat, B.Sc.Engg. (Civil)  
 Mehedi Ahmed Ansary, B.Sc.Engg. (Civil)  
 Tahsin Reza Hossain, B.Sc.Engg. (Civil)  
 Mahnaz Hasan, B.Sc.Engg. (Civil)  
 Rowsan Mamtaz, B.Sc.Engg. (Civil)  
 Kazi Iftekar Ahmed, B.Sc.Engg. (Civil)  
 Tanwer Hasan, B.Sc.Engg. (Civil)

**Introduction :**

The department of Civil Engineering comprises four major divisions, viz, Structural Engineering and Concrete Technology, Environmental Engineering, Geotechnical engineering and Transportation Engineering. Researches on the above fields are highly important in the national context. These include areas, such as, behaviour of available building and road materials with emphasis on indigenous materials, engineering soil properties of various regions of the country, low-cost cyclone resistant housing, seismic zoning of Bangladesh, water pollution and its control, traffic safety studies in urban areas etc. The results of some of these researches have been incorporated in the Code of Practice for Building, prepared by the department,

Besides, work is in progress on research projects which are of more fundamental in nature, viz, dynamic analysis of multi-storey buildings, structure soil interaction, behaviour of brick masonry, non-linear finite element analysis of structures, design of transmission towers, creep of concrete, clay mineralogy, settlement analysis of foundation and chemical and mechanical properties of concrete.

**SUMMARY OF COURSES****Undergraduate****First Year**

Course No.	Subject Title	Hours/week	Marks
CE 100	Civil Engg. Drawing	0 - 3	100
CE 101	Engineering Mechanics	3 - 0	200
Chem 101	Chemistry	3 - 0	200
Chem 102	Chemistry Sessional	0 - 3/2	50

Calendar

Course No.	Subject Title	Hours/week	Marks
EEE 103	Basic Electrical Engineering	3 - 0	200
EEE 104	Electrical Engg. Sessional	0 - 3/2	50
Hum 101	English and Economics	2 - 0	150
Math 103	Mathematics		
	Paper I	2 - 0	150
	Paper II	2 - 0	150
ME 104	Mechanical Engg. Drawing	0 - 3/2	50
Phy 101	Physics	3 - 0	200
Phy 102	Physics Sessional	0 - 3/2	50

#### Workshop

Shop 108	Machine shop	0 - 3/2	50
Shop 110	Welding shop	0 - 3/4	25
Shop 112	Carpentry shop	0 - 3/4	25

#### Second year

CE 200	Details of Construction and Estimating	0 - 3	100
CE 201	Surveying	3 - 0	250
CE 202	Practical Surveying	Three weeks field work	100
CE 203	Engineering Materials	3 - 0	250
CE 205	Computer Programming and Numerical Methods in Civil Engineering	2 - 0	150
CE 206	Computer Programming Sessional	0 - 3/2	50
CE 207	Geology and Geomorphology	2 - 0	150
CE 211	Mechanics of Materials	3 - 0 - 1*	250
CE 212	Structural Mechanics and materials Sessional	0 - 3/2	50
CE 214	Concrete Sessional	0 - 3/2	50
Hum 203	Accounts and Sociology	2 - 0	150
Math 203	Mathematics	3 - 0	250
WRE 211	Fluid Mechanics	3 - 0 - 1*	250
WRE 212	Fluid Mechanics Sessional	0 - 3/2	50

#### Third year

CE 311	Structural Analysis and Design I	3 - 0	300
CE 312	Structural Analysis and Design I		

Course No.	Subject Title	Hours/week	Marks
	Sessional	0 - 3/2	50
CE 313	Reinforced Concrete	3 - 0	300
CE 314	Reinforced Concrete Sessional	0 - 3/2	50
CE 331	Environmental Engineering I	3 - 0	300
CE 332	Environmental Engg. Sessional	0 - 3/2	50
CE 341	Geotechnical Engineering I	3 - 0	300
CE 342	Geotechnical Engg. Sessional	0 - 3/2	50
CE 351	Transportation Engineering I	3 - 0	300
CE 352	Transportation Engg. I Sessional	0 - 3/2	50

\* Tutorial 1 hour pr week

Math 305	Mathematics	3 - 0	300
WRE 311	Open Channel Flow and Hydraulic Machinery	3 - 0	300
WRE 321	Open Channel Flow and Sessional	0 - 3/2	50
WRE 313	Hydrology	2 - 0	200

#### Fourth Year

##### Compulsory Subjects

CE 400			
or	Project and Thesis	0 - 6	200
WRE 400			
CE 401	Project Planing and Management	2 - 0	200
CE 411	Structural Analysis and Design II	3 - 0	300
CE 412	Structural analysis and Design Sessional	0 - 3/2	50
WRE 411	Water Resources Engineering I	3 - 0	300
WRE 412	Hydraulic Machinery Sessional	0 - 3/2	50

##### Optional Subject

Any two groups out of Group A, Group B, Group (C or E), and Group D, (Subject to the approval of Dean of the Faculty)

##### Group A

WRE 413	Water Resources Engg. II	3 - 0	300
WRE 415	Water Resources Engg. III	2 - 0	200
WRE 416	Water Resources Engg. Sessional	0 - 3/2	50

Course No.	Subject Title	Hours/week	Marks
<b>Group B</b>			
CE 413	Structural Analysis and Design III	3 - 0	300
CE 415	Structural Analysis and Design IV	2 - 0	200
CE 416	Structural Analysis and Design Sessional	0 - 3/2	50

<b>Group C</b>			
CE 431	Environmental Engineering II	3 - 0	300
CE 433	Environmental Engineering III	2 - 0	200
CE 434	Environmental Engg. Sessional	0 - 3/2	50

<b>Group D</b>			
CE 441	Geotechnical Engineering II	3 - 0	300
CE 443	Geotechnical Engineering III	2 - 0	200
CE 444	Geotechnical Engineering Sessional	0 - 3/2	50

<b>Group E</b>			
CE 451	Transportation Engineering II	3 - 0	300
CE 453	Transportation Engineering III	2 - 0	200
CE 454	Transportation Engineering Sessional	0 - 3/2	50

#### Postgraduate

Course No.	Subject Title	Credit hours
CE 6000	Thesis	18
CE 6001	Project	6
CE 6101	Theory of Elasticity	3
CE 6103	Theory of Plates	3
CE 6105	plastic Design of Structures	3
CE 6106	Elastic Stability of Structures	3
CE 6108	Analysis and Design of Shells	3
CE 6109	Finite Element Methods I	3
CE 6110	Computer Methods in Civil Engineering	3
CE 6111	Advanced Design of Concrete Structures	3
CE 6114	Analysis and Design of Tall Building	3
CE 6115	Bridge Engineering	3
CE 6116	Finite Element Methods II	3
CE 6117	Structural Dynamics Seismic Design of Structures	3
CE 6118	Structural Brick Work	3

Course No.	Subject Title	Credit hours
CE 6201	Advanced Concrete Technology	3
CE 6301	Theory of Water Treatment	3
CE 6304	Theory of Sewage Treatment	3
CE 6305	Biology of Sewage and polluted Waters	3
CE 6309	Environmental Sanitation	3
CE 6310	Industrial Water and Waste Treatment	5
CE 6311	Municipal and Rural Sanitation	3
CE 6312	Water Pollution and its Control	3
CE 6315	Water Supply Engineering Design	3
CE 6316	Sewerage and Drainage Engineering Design	3
CE 6401	Soil Mechanics I	3
CE 6402	Soil Mechanics II	3
CE 6403	Foundation Analysis Methods	3
CE 6404	Earth Pressure and Retaining Structures	3
CE 6405	Earth Dams and Stability of Slopes	3
CE 6406	Rock Mechanics	
CE 6407	Soil Dynamics	3
CE 6408	Advanced Engineering Geology	3
CE 6409	Reinforced Earth	3
CE 6501	Transportation Engineering	3
CE 6502	Geometric Design of Highways	3
CE 6503	Highway Materials	3
CE 6504	Advanced Surveying	3
CE 6505	Structural Design of Pavements	3
CE 6507	Traffic Engineering	3
CE 6508	Railway Engineering	3
CE 6509	Waterways	3
CE 6510	Planning and Design of Airports	3
CE 6511	Transportation Planning	3
CE 6512	Transportation Engineering Economics	3

## Department of Water Resources Engineering

### Teaching Staff :

#### Professors :

Abdul Hannan, B.Sc. Engg. (Civil), M.S. Ph.D.  
M. Shahjahan, B.Sc. Engg. (Civil), M.S. Ph.D.  
Ainun Nishat, B.Sc. Engg. (Civil), M.Sc. Engg., Ph.D.  
Md. Abdul Halim, B.Sc. Engg. (Civil), M.Sc. Engg., (WRE), Ph.D.  
Md. Khorshed Alam, B.Sc. Engg. (Civil), M.Sc. Engg., Ph.D. \*

#### Associate Professors :

Md. Fazlul Bari, B.Sc. Engg. (Civil), M.Sc. Engg.(WRE), Ph.D.  
Md. Monowar Hossain, B.Sc. Engg. (Civil), M.Sc. Engg.(WRE), Ph.D.  
Mirjahan Miah, B.Sc. Engg. (WRE), M.Sc. Engg. Ph.D.

#### Assistant Professors :

Liaquat Ali Khan, B.Sc. Engg. (WRE), M.Sc. Engg.  
Md. Abdul Matin, B.Sc. Engg. (Civil), M.Sc. Engg.(WRE), Ph.D.  
Salina Begum, B.Sc. Engg. (WRE), M.Sc.Engg.  
M. R. Kabir, B.E.(Civil), M.Sc. Engg. (WRE), P.G.Diploma (H & WR)  
Mohammad Ali Bhuiyan, B.Sc. Engg. (Civil), M.Sc. Engg., Ph.D.

#### Lecturers :

Tariq Ahmed, B.Sc. Engg. (Civil)  
Md. Nasrullah Khan, B.Sc. Engg. (Civil), M. Sc. Engg.  
Islam Md. Faisal, B.Sc. Engg. (Civil)  
Manash Lal Shome, B.Sc. Engg. (Civil)  
Md. Rashidul Islam, B.Sc. Engg. (Civil)  
Md. Mahmud Alam, B.Sc. Engg. (Civil)  
Jasim Imran, B.Sc. Engg. (Civil)  
Ziaul haider, B.Sc. Engg. (Civil)  
Mobashwera, B.Sc. Engg. (Civil)

#### Introduction :

With the repid growth of world economy and civilization, the need for the development of water resources has become more urgent than ever before.

\* *Head of the department*

The importance and the need for planned development of the water resources of riverine Bangladesh can hardly be overemphasized. The heavy dependence on the economy and living conditions of people on the river behaviour and the rainfall pattern demand specially trained people in the field of water resources engineering.

To meet this national demand, the department of Water Resources Engineering is continuously engaged in producing engineers specially trained in hydrology, hydraulics, river morphology, salinity intrusion, irrigation, drainage, flood control, land reclamation, bank protection, river stabilization, ground, sedimentation problems and coastal engineering.

Areas of current research in the postgraduate programme include the following : soil/water conservation, fluid mechanics, hydrodynamics, hydraulic engineering, fluvial hydraulics, deterministic and stochastic hydrology, salt water intrusion, coastal engineering, flood control, river morphology, sediment transportation and drainage engineering and physical and mathematical modelling.

## SUMMARY OF COURSES

### Postgraduate

Course No.	Subject Title	Credit Hours
WRE 6000	Thesis	18
WRE 6001	Project	6
WRE 6101	Fluid Mechanics 1	3
WRE 6102	Fluid Mechanics 11	3
WRE 6103	Open Channel Flow	3
WRE 6201	Hydrology	3
WRE 6202	Statistical Methods in Hydrology	3
WRE 6203	Ground Water Hydraulics	3
WRE 6204	Flow through Porous Media	3
WRE 6205	Irrigation and Drainage Engineering	3
WRE 6301	River Engineering	3
WRE 6302	Sediment Transport	3
WRE 6303	Waterpower Engineering	3
WRE 6304	Hydraulic Structures	3
WRE 6305	Photogrammetry in water Resources	3

Course No.	Subject Title	Credit Hours
WRE 6401	Development of Water Resources Projects	3
WRE 6402	Planning of Water Resources System	3
WRE 6403	Physical Modelling and Hydraulic Similitudes	3
WRE 6404	Mathematical Modelling	3
WRE 6501	Coastal Engineering	3
WRE 6502	Estuarine Hydraulics	3
WRE 6600	Special Studies in Water Resources Engineering	1-3

## SUMMARY OF COURSES

### Undergraduate

#### Second Year

Course No.	Subject Title	Hours/Week	Marks
WRE 211	Fluid Mechanics	3-0	250
WRE 212	Fluid Mechanics Sessional	0-2/3	50

#### Third Year

WRE 311	Open Channel flow and Hydraulic Machinery	3-0	300
WRE 312	Open Channel flow Sessional	0-2/3	50
WRE 313	Hydrology	2-0	200

#### Fourth Year

WRE 400	Project and thesis	0-6	200
WRE 411	Water Resources Engineering I	3-0	300
WRE 412	Hydraulic Machinery Sessional	0-2/3	50
WRE 413	Water Resources Engineering II	3-0	300
WRE 415	Water Resources Engineering III	2-0	200
WRE 416	Water Resources Engineering Sessional	0-2/3	50



## Faculty of Electrical and Electronic Engineering

### Department of Electrical and Electronic Engineering

Teaching Staff :

#### Professors :

Abdul Matin Patwari, B. Sc. Engg. (Elect.), M. Sc. M. A., Ph. D.  
Syed Fazl-i-Rahman, B. Sc. Engg. (Elect.), M. S., Ph. D.  
Md. Mujibur Rahman, B. Sc. Engg. (Elect.), M. Engg., Ph. D.  
A. B. M. Siddique Hossain, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
Abdul Matin, B. Sc. Engg. (Elect.), M. Engg., D. Engg.  
Saiful Islam, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D. \*  
Mohd. Qamrul Ahsan, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.

#### Associate Professors :

Enamul Basher, M. Sc. Engg. Ph. D.  
Kazi Mohiuddin Ahmed, M. Sc. Engg., Ph. D.  
Aminul Haque, B. Sc. Engg. (Elect.), M. Sc. Engg. Ph. D.  
Shahidul Islam Khan, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
Md. Rezwan Khan, B. Sc. Engg. (Elect.), Ph. D.  
M. M. Shahidul Hasan, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
Taifur Ahmed Chowdhury, M. S., Ph. D.

#### Assistant Professors :

Syed Anisur Rahman, B. Sc. Engg. (Elect.), M. S.  
Banshi Badan Saha, B. Sc. Engg. (Elect.), M. Sc. Engg.  
Mohd. Hamidur Rahman, B. Sc. Engg. (Elect.)  
Mohammad Ali Chowdhury, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
S. M. Lutful kabir, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
Md. Easin Khan, B. Sc. Engg. (Elect.), M. Sc. Engg.  
Satya Prased Majumder, B. Sc. Engg. (Elect.), M. Sc. Engg.  
Md. Mashuqur Rahman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
Rafuqul Murshed, B. Sc. Engg. (Elect.), M. Sc. Engg.  
Tapan Kumar Saha, B. Sc. Engg. (Elect.), M. Sc. Engg.

\* Head of the department

Md. Showkatul Alam, B. Sc. Engg. (Elect.), M. Tech.  
 Md. Rezaul Karim Begg, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Pran Kanai Saha, B. Sc. Engg. (Elect.), M. E.  
 Narayan Ch. Debnath, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Md. Sajjad Hossain, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Syed Mahfuzul Aziz, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 A. H. M. Zahirul Alam, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 S. Shahnawaz Ahmed, B. Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.  
 Farhad Frad Islam, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 A. K. M. Dildar Hossain Chowdhury, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Md. Ziaul Karim, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Md. Mahmudur Rahman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Joarder Quamruzzaman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Mashiur Rahman Bhuiyan, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Md. Saifur Rahman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Anisul Haque, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Q. Deen Mohd. Khosru, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Hafizur Rahman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Manjurul Haque, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Khwaja Mustafizur Rahman, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Ahsan Habib Chowdhury, B. Sc. Engg. (Elect.)

#### Lecturers :

Saifur Rahman, B. Sc. Engg. (Elect.)  
 Bhumip Khasnabish, B. Sc. Engg. (Elect.)  
 A. H. Ehsanul Kabir, B. Sc. Engg. (Elect.) M. Sc. Engg.  
 Syed Mostafa Mahmud Raza, B. Sc. Engg. (Elect.)  
 Kazi Sarwar Abedin, B. Sc. Engg. (Elect.)  
 Ahmed Saifuddin, B. Sc. Engg. (Elect.)  
 A. H. Mostafa kamal, B. Sc. Engg. (Elect.)  
 Golam Rasul Chowdhury, B. Sc. Engg. (Elect.), M. Sc. Engg.  
 Md. Shafiqul Islam, B. Sc. Engg. (Elect.)  
 S. M. Sohel Imtiaz, B. Sc. Engg. (Elect.)  
 Md. Mohiuddin Mazumder, B. Sc. Engg. (Elect.)  
 Mirza Mehdi Jahan, B. Sc. Engg. (Elect.)  
 Md. Kamrul Hasan, B. Sc. Engg. (Elect.)  
 Sayeed Akmal, B. Sc. Engg. (Elect.)

Kaiser Ahmed, B. Sc. Engg. (Elect.)  
 Syed Faisal Ahmed, B. Sc. Engg. (Elect.)  
 Md. Aynal Haque, B. Sc. Engg. (Elect.)  
 Mainul Hasan, B. Sc. Engg. (Elect.)  
 Ashish Kumar Kirtania, B. Sc. Engg. (Elect.)  
 Md. Mahbub Bis Rashed, B. Sc. Engg. (Elect.)  
 Md. Mosaddeq-ur-Rahman, B. Sc. Engg. (Elect.)  
 Md. Quamrul Huda, B. Sc. Engg. (Elect.)  
 Rubeena Shahnaz, B. Sc. Engg. (Elect.)  
 Md. Rabiul Islam, B. Sc. Engg. (Elect.)  
 Syed Moshir Rahman, B. Sc. Engg. (Elect.)  
 Md. Tanvir Quddus, B. Sc. Engg. (Elect.)  
 Md. Faizul Alam, B. Sc. Engg. (Elect.)

#### Intorduction :

Electrical & Electronic Engineering play an important and indispensable role in establishing and maintaining instant communication across the country and beyond with high ranged fidelity and functional frugality, among many other functions.

The department is thus, committed to a large and varied programme of research in its effort to solve the national level problems in the field of electrical and electronic engineering.

The department is currently engaged in research in such fields as : power system stability, comparative study of new and conventional methods of measuring synchronous machine quantities. optimum load scheduling, AC transmission system stabilization by DC link, determination of radio data for Bangladesh terrain at microwave frequencies, properties of dielectrics made of indigenus materials, microwave filters, analysis, design and synthesis of electronic circuits, fabrication of solid state diodes and transistors, energy conversion, Bio-Engineering Etc.

Moreover, The department is now also working in the fields of energy research, Projects on various aspects of Electric, Electronic, Communication including Material Science. The postgraduate programme of the department leading to M.Sc. (Engg), M. Engg. and Ph.D. is Designed to include such areas of

research as : circuits, communications, control, electronics, material science, microwave, fields, machines, high voltage engineering and power systems.

## SUMMARY OF COURSES

### Undergraduate

Course No.	Subject Title	Hours/week	Marks
<b>First year</b>			
CE 104	Civil Engineering Drawing	0 - 3/2	50
CE 108	Survey Practical	0 - 2	50
Chem 101	Chemistry	3 - 0	200
Chem 102	Chemistry Sessional	0 - 3	100
CSE 101	Computer Techniques	2 - 0	150
CSE 102	Computer Techniques Sessional	0 - 3/2	50
EEE 101	Basic Electrical Engineering	3 - 0	200
EEE 102	Basic Electrical Engineering Sessional	0 - 3/2	50
Hum 101	English and Economics	2 - 0	150
Math 105	Mathematics		
	Paper I	2 - 0	150
	Paper II	2 - 0	150
ME 103	Basic Mechanical Engineering	2 - 0	150
ME 104	Basic Mechanical Engineering Sessional	0 - 3/2	50
ME 112	Mechanical Engineering Drawing	0 - 3/2	50
Phy 101	Physics	3 - 0	200
Phy 102	Physics Sessional	0 - 3	50
Shop 104	Foundry Shop	0 - 3/2	

Course No.	Subject Title	Hours/week	Marks
ME 104	Basic Mechanical Engineering Sessional	0-3/2	50
ME 112	Mechanical Engineering Drawing	0-3/2	50
Phy 101	Physics	3-0	200
Phy 102	Physics Sessional	0-3	100
Shop 104	Foundry Shop	0-3/2	50
Shop 106	Metal and welding shop	0-3/2	50
Shop 108	Machine Shop	0-3/2	50

Course No.	Subject Title	Hours/week	Marks
<b>Second Year</b>			
CE 225	Mechanics of Materials	2-0	150
CE 226	Mechanics of materials Sessional	0-3/2	50
EEE 200	Electrical Design and Drafting	0-3/2	50
EEE 203	Electrical Circuits I	3-0	250
EEE 204	Electrical Circuits I Sessional	0-3/2	50
EEE 205	Electrical Machines I	3-0	250
EEE 206	Electrical Machines I Sessional	0-3/2	50
EEE 207	Electronics I	3-0	250
EEE 208	Electronics I Sessional	0-3/2	50
Hum 203	Accountancy and Industrial Management : Accountancy	1-0	100
	Industrial Management	2-0	150
Math 205	Mathematics		
	Paper I	2-0	150
	Paper II	2-0	150
ME 207	Thermodynamics and Fluid Mechanics	3-0	250
ME 208	Fuel Testing and Fluid Mechanics Sessional	0-3/2	50
<b>Third year</b>			
CSE 301	Digital Techniques	2-0	200
CSE 302	Digital Techniques Sessional	0-3/2	50
EEE 300	Electronics Shop Sessional	0-3/2	50
EEE 301	Electronics II	3-0	300
EEE 302	Electronics II Sessional	0-3	100
EEE 303	Electrical Circuits II	3-0	300
EEE 305	Electrical Machines II	3-0	300
EEE 306	Electrical Machines II Sessional	0-3	100
EEE 307	Measurements and Instrumentation	2-0	200
EEE 308	Measurements and Instrumentation Sessional	0 - 3/2	50
EEE 309	Electromagnetic Fields and waves	2 - 0	200
EEE 311	Transmission and Distribution of Electrical power	3 - 0	300
EEE 314	Electrical Design Sessional	0 - 3/2	50
Math 309	Mathematics	2 - 0	200

Course No.	Subject Title	Hours/week	Marks
<b>Fourth Year</b>			
CSE 401	Microprocessors & Digital Computers*	2 - 0	200
CSE 402	Microprocessors Digital Electronics	0 - 3/2	50
EEE 400	Project and Thesis	0 - 6	200
EEE 401	Control Systems	2 - 0	200
EEE 402	Control Systems Sessional	0 - 3/2	50
EEE 403	Power Systems Analysis	2 - 0	200
EEE 404	Power Systems Analysis Sessional	0 - 3/2	50
EEE 405	Power Stations	2 - 0	200
EEE 407	Integrated Circuits and Industrial Electronics	3 - 0	300
EEE 408	Integrated Circuits and Industrial Electronics Sessional	0 - 3/2	50
EEE 409	Telecommunication Engineering	2 - 0	200
EEE 410	Telecommunication Engineering Sessional	0 - 3/2	50
EEE 411	Science of Materials	2 - 0	200
EEE 413	Switchgear and Protective Relays	2 - 0	200
EEE 414	Switchgear and Protective Sessional	0 - 3/2	50
EEE 415	Microwave Engineering*	2 - 0	200
EEE 416	Microwave Engineering Sessional	0 - 3/2	50
EEE 417	Electronics III *	2 - 0	200
EEE 418	Electronics III Sessional	0 - 3/2	50
EEE 419	High Voltage Engineering*	2 - 0	200
EEE 420	High Voltage engineering Sessional	0 - 3/2	50
EEE 423	Electrical Circuits III *	2 - 0	200
EEE 424	Electrical Circuits III Sessional	0 - 3/2	50

\* Indicates optional courses. A student has to take two of these courses, in the combination suggested by the department and from amongst those offered, including appropriate laboratories.

#### Postgraduate

Course No.	Subject Title	Credit hours
EEE 6000	Thesis	18
EEE 6000	Project	6
EEE 6001	Seminar	0

Course No.	Subject Title	Credit hours
<b>Compulsory Subjects</b>		
EEE 6011	Engineering Analysis	3
EEE 6012	Energy Conversion Processes	3

#### Optional Subjects

EEE 6101	Linear System Analysis	3
EEE 6102	Network Synthesis I	3
EEE 6103	Network Synthesis II	3
EEE 6104	Non-Linear Circuits	3
EEE 6105	Advanced Topics in Network Theory	3
EEE 6201	Statistical Communications Theory	3
EEE 6202	Information Theory	3
EEE 6203	Telephone Traffic Theory	3
EEE 6204	Advanced Telecommunication Engineering	3
EEE 6301	Power Semiconductor Circuits	3
EEE 6302	Design of Power Electronic Circuits	3
EEE 6401	Advanced Electronics	3
EEE 6402	Quantum Electronics	3
EEE 6403	Solid Stats Devices	3
EEE 6404	Active Circuit Design	3
EEE 6501	Electric and Magnetic Properties of Material	3
EEE 6502	Electronics of Solids	3
EEE 6503	Laser Theory	3
EEE 6601	Applied EM Theory	3
EEE 6602	Microwave Theory and Techniques	3
EEE 6603	Microwave Tubes and Circuits	3
EEE 6604	Antennas and Propagation	3
EEE 6701	Non-linear Control	3
EEE 6702	Sampled-data Control	3
EEE 6703	Modern Control Theory	3
EEE 6704	Optimal Control Systms	3
EEE 6705	Statistical Models for Engineering systems	3
EEE 6801	Generalized Machine Theory	3
EEE 6802	Special Machines	3
EEE 6803	Advanced Machine Design	3
EEE 6901	Optimization of power System Operation	3

Course No.	Subject Title	Credit hours
EEE 6902	Computer-aided Power System Design	3
EEE 6903	Protective Relays	3
EEE 6904	Power System Stability	3
EEE 6905	Transients in Power Systems	3
EEE 6906	Reliability of Power System	3
EEE 6907	Power System planning	3
EEE 6908	Advanced Power System Control	3

## Department of Computer Science & Engineering

Teaching Staff :

### Associate Professor :

Syed Mahbubur Rahman, M.Sc. Engg. (Elect.), Ph. D. \*

Md. Shamsul Alam, B.Sc. Engg. (Elect.), M. Sc. Engg., Ph. D.

### Assistant Professors :

Dulal Ch. kar, B. Sc. Engg. (Elect.), M. Sc. Engg.

Ashraf Habib Rumi, B. Sc. Engg. (Elect.), M. Sc. Engg.

M. M. Kamrul Murshed, B. Sc. Engg. (Elect.), M. Sc. Engg. (Comp. Engg.)

Md. Hasan Chowdhury, B. Sc. Engg. (Elect.), M. Sc. Engg.

Tahsin Askar, B. Sc. Engg. (Elect.), M. Sc. Engg.

Farid Ahmed, B. Sc. Engg. (Elect.)

Mahammad Kaykabad, M. Sc. Engg. Ph. D. M. Engg.

### Lecturers :

S. M. Rezaul Islam, B. Sc. Engg. (Elect.), M. Sc. Engg.

Javed Sabir Barkatullah, B. Sc. Engg (Elect.)

Dipak Bin Kashem Chowdhury, B. Sc. Engg (Elect.)

Anwarul Hasan, B. Sc. Engg (Elect.)

Md. Javed Iqbal Khan, B. Sc. Engg (Elect.)

S. Towfiqur Rahman, B. Sc. Engg (Elect.)

Zunaid Hamid Kazi, B. Sc. Engg (Elect.)

Md. Masroor Ali, B. Sc. Engg (Elect.)

Md. Shaheen Sayeed, B. Sc. Engg (Elect.)

Md. Shawkat Hasan, B. Sc. Engg (Elect.)

Ahmed Tarek, B. Sc. Engg (Elect.)

Md. Abul Kashem Mia, B. Sc. Engg (Elect.)

Chowdhury Mofizur Rahman, B. Sc. Engg (Elect.)

Quazi Nasir Uddin Ahmed, B. Sc. Engg (Elect.)

Abu Sayed Md. Latiful Hoque, B. Sc. Engg (Elect.)

Md. Saidur Rahman, B. Sc. Engg (Elect.)

Md. Hasanuzzaman, B. Sc. Engg (Elect.)

\* Head of the department



Md. Shahadatullah Khan, B. Sc. Engg (Elect.)  
Kazi Muhammad Hassan, B. Sc. Engg (Elect.)

### Introduction :

A rapid proliferation of computers and computer usage during the last few years has called for a large number of computer personnels in the country. Graduate and undergraduate programme is thus, primarily designed to meet this need. Computer Science and Engineering has been emphasized in the name to indicate that the department provides a balanced view of computer software and hardware. The curriculum readily accomodates diverse career interest : entrance into the practice as computer professional upon the Completion of the four year undergraduate program; preparation for graduate study in any of the various Computer fields. The graduate resarch program, conducted by faculty members, graduate students and interested undergraduate students, contribute to an environment in which the students can develop their interests and abilities.

The department offers degrees leading to B.Sc. Engg. M. Sc. Engg. and M. Engg. in hardware and software aspects of computers and is also prepared to offer Ph.D. program.

Graduates of the department should be able take up work in, (i) planning and management of computer installation, (ii) develop systems for all computer environments, (iii) design and development of microprocrrsor based control systems, (iv) computer-based management and data processing systems, and (v) research in specialized branch of computers and microprocessors.

## SUMMARY OF COURSES

### undergraduate

#### First year

Course No.	Subject	Hourse/week	Marks
Phy 101	Physics	3-0	200
Phy 102	Physics Laboratory	0-3	100
Chem 101	Chemistry	3-0	200
Chem 102	Chemistry Laboratory	0-3	
100			
Math 105	Mathematics		

Course No.	Subject	Hourse/week	Marks
	Paper - I	2-0	150
	Paper - II	2-0	150
Hum 101	English and Economics English	1-0	75
	Economics	1-0	75
CSE 103	Programming Languages	3-0	200
CSE 104	Programming Languages Laboratory	0-3	100
ME 103	Basic Mechanical Engineering	2-0	150
ME 104	Basic Mechanical Engineering Laboratory	0-3/2	50
ME 112	Machanical Engineering Drawing	0-3/2	50
EEE 109	Basic Electrical Engineering	3-0	200
EEE 110	Basic Electrical Engineering Laboratory	0-3/2	50
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			20 -13.5

### Second Year

CSE 200	Software Development - I	0-3	100
CSE 201	Discrete Mathematics & Numerical Analysis	2-0	150
CSE 203	Data Structures and Algorithms	2-0	150
CSE 204	Data Structures and Algorithms Laboratory	0-3	100
CSE 205	Machine and Assembly Language Programming	2-0	150
CSE 206	Assembly Language Program Development	0-3	100
CSE 207	Switching Theory and Logical Design	2-0	150
CSE 208	Switching Theory and Logical Design Laboratory	0-3/2	50
EEE 209	Electronic Devices & Circuits	2-0	150
EEE 210	Electronic Devices & Circuits Laboratory	0-3/2	50
EEE 213	Electrical Technology	2-0	150
EEE 214	Electrical Technology Laboratory	0-3/2	50
HUM 203	Accounting and Industrial Management	3-0	250
Math 215	Mathematics Matrices, differential equation and Fourier Series Vector	3-0	250
	Analysis and Complex Variables	3-0	250
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			18-13.5

Third Year				
Course No.	Subject	Hours/week	Marks	
CSE 300	Software Development -II	0-3	100	
CSE 303	Database and Management Information Systems	2-0	200	
CSE 304	Database and Management Information Systems Laboratory	0-3	100	
CSE 305	Data Communication	2-0	200	
CSE 307	Computer Architecture and Operating Systems	2-0	200	
CSE 309	Microprocessors and Interfacing	2-0	200	
CSE 310	Microprocessors and Interfacing Laboratory	0-3/2	50	
CSE 313	Digital Electronics & Pulse Techniques	2-0	200	
CSE 314	Digital Electronics & Pulse Techniques Laboratory	0-3	100	
CSE 320	Digital Circuit Design	0-6	200	
EEE 315	Electrical Circuit Theory	2-0	200	
EEE 317	Measurement and Instrumentation	2-0	200	
EEE 318	Measurement and Instrumentation Laboratory	0-3/2	50	
Math 315	Statistics, Laplaces Transform, Boundary Value Problems and Queueing Theory	2-0	200	
		16-18		

#### Fourth Year

CSE 400	Project and Thesis	0-6	200	
CSE 403	Computer Networks	2-0	200	
CSE 405	Computer System Analysis	2-0	200	
CSE 407	Computer Graphics and Pattern Recognition	2-0	200	
CSE 408	Computer Graphics and Pattern Recognition Laboratory	0-3/2	50	
CSE 409	Artificial Intelligence and Expert Systems	2-0	200	

Course No.	Subject	Hours/week	Marks
CSE 410	Expert Systems Design	0-3	100
CSE 411	Computers and Societal Problems	2-0	200
CSE 413	Computer Peripherals and applications	2-0	200
CSE 416	Microprocessor Based Design	0-3	100

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12-13.5

To select any two subjects from the following on prior permission from the department.

CSE 421	Systems Programming and Software Engineering Methods	2-0	200
CSE 422	Systems Programming and Software Engineering Methods Laboratory	2-0	50
CSE 423	Fault Tolerant Systems	2-0	200
CSE 424	Fault Tolerant Systems Laboratory	0-3/2	50
CSE 425	Compiler Design	2-0	200
CSE 426	Compiler Design Laboratory	0-3/2	50
CSE 427	Computer Simulation	2-0	200
CSE 428	Computer Simulation Laboratory	0-3/2	50
CSE 429	Computer Vision and Robotics	2-0	200
CSE 430	Computer Vision & Robotics Laboratory	0-3/2	50
CSE 431	VLSI Design and Applications	2-0	200
CSE 432	VLSI Design & Application Laboratory	0-3/2	50

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4-3

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16-16.5

#### Post Graduate

Course No.	Subject Title	Credit Hours
CSE 6000	Project (for M. Engg. only)	6
	Thesis (for M.Sc. Engg. only)	18
CSE 6101	Microprocessors and Microcomputers	3
6011	Engineering Analysis	3

Course No.	Subject Title	Credit Hours
CSE 6201	Digital Computer Theory and Design	3
CSE 6202	Computer Organization	3
CSE 6203	Advanced topics in Microcomputer	3
CSE 6204	Data Communication and Computer Network	3
CSE 6301	Computer Science	3
CSE 6302	Machine and Assembly Language Programming	3
CSE 6303	Operating Systems I	3
CSE 6304	Operating Systems II	3
CSE 6305	Data Base Management	3
CSE 6306	Compiler Construction	3
CSE 6307	System Analysis and design	3

## Faculty of Engineering

### Department of Chemical Engineering

Teaching Staff :

#### Professors :

Iqbal Mahmud, B. Sc. Engg. (Chem), M. Sc. Tech. Ph. D. \*  
 Nooruddin Ahmed, B. Sc. Engg. (Chem), M. Sc. Ph. D.  
 Jasim uz zaman, B. Sc. Engg. (Chem), Ph. D.  
 Khaliqur Rahman, B. Sc. Engg. (Chem), Ph. D.  
 K. Ikhtyar Omar, B. Sc. Engg. (Chem), M. Sc. Engg. Ph. D.  
 A. K. M. Abdul Quader, B. Sc. Engg. (Chem), Ph. D.

#### Professor Emeritus :

M. A. Naser, B. Sc. (Hons), M. Sc., M. S. E., Ph. D.

#### Associate Professors :

Dil Afroza Begum, M. Sc. Engg. Ph. D.  
 Md. Sabder Ali, B. Sc. Engg. (Chem), Ph. D.  
 Md. Nazmul Huq, B. Sc. Engg. (Chem), M. Sc. Engg. Ph. D.

#### Assistant Professors :

Sirajul Haque Khan, B. Sc. Engg. (Chem)  
 Ijaz Hossain, B. Sc. Engg. (Chem), M. Sc. Engg. Ph. D.  
 Kh. Ashraful Islam, B. Sc. Engg. (Chem), Ph. D.  
 Gopal Chandra Paul, B. Sc. Engg. (Chem), M. Sc. Engg.

#### Lecturers :

Abdul Hamid Mollah, B. Sc. Engg. (Chem), M. Sc. Engg.  
 Ahmed Kazem Hilaly, B. Sc. Engg. (Chem)  
 Edmond Gomes, B. Sc. Engg. (Chem), M. Sc. Engg.  
 Md. Abdul Muqeem, B. Sc. Engg. (Chem), M. Sc. Engg.  
 Harendra Nath Mondol, B. Sc. Engg. (Chem)  
 Ananda Mohan Mondal, B. Sc. Engg. (Chem)  
 Rauha Tazeen Rahman, B. Sc. Engg. (Chem)

\* Head of the department

### Introduction :

The Chemical Engineering Department is striven toward deliberate studing of detailed principles and practices of chemical dynamics, transport and biomass phenomena and their application to the synthesis and analysis of complex chemical systems.

The Chemical Engineering programme has been designed for instruction and research leading to the degrees of M. Sc. Engg./M. Engg. and Ph. D. in the discipline apart from undergraduate course. The postgraduate programme is, however, in such a way that it could accommodate the greatest possible range of academic freedom and flexibility. Areas of current research interest at the postgraduate level of the department include the following : heat and mass transfer, modelling and optimization, ion exchange kinetics, combustion, fluidization, corrosion studies, producer and bio-gas generation, heterogeneous kinetics and catalysis.

### SUMMARY OF COURSES

#### Undergraduate

##### First year

Course No.	Subject Title	Hours/week	Marks
CE 104	Civil Engg. Drawing	0-3/2	50
ChE 101	Elements of Chemical Engineering	2-0	150
Chem 103	Physical, Inorganic and Organic Chemistry	3-0	200
Chem 104	Chemistry Sessional	0-3	100
EE 105	Basic Electrical Engineering	2-0	150
EE 106	Electrical Engg. Sessional	0-3/2	50
Hum 103	English	2-0	150
Math 107	Mathematics	4-1	300
ME 105	Engineering Mechanics	3-0	200
ME 112	Mechanical Engg. Drawing	0-3/2	50
Phy 103	Physics	3-0	200
Phy 102	Physics Sessional	0-3	100
Shop 104	Foundry shop	0-3/4	25
Shop 106	Welding Shop	0-3/4	25
Shop 108	Machine and Fitting Shop	0-3/2	50

##### Second year

Course No.	Subject Title	Hours/week	Marks
ChE 201	Material and Energy Balance	3-0	250
ChE 203	Fluid Mechanics	3-0	250
ChE 205	Chemical Engineering Thermody-namics I	2-0	150
ChE 202	Material and Energy Balance Sessional	0-3/2	50
ChE 204	Fluid Mechanics Sessional	0-3	100
ChE 208	Computer Programming and Applications	0-2	100
Chem 201	Organic and Inorganic Chemistry	3-0	250
Chem 202	Organic and Inorganic Chemistry Sessional	0-3	100
Chem 203	Physical Chemistry	3-0	250
Chem 204	Physical Chemistry Sessional	0-3/2	50
Hum 201	Government and Sociology	2-0	150
Math 209	Vectors, Matrices and Differential Equations	3-0	250
ME 209	Mechanics of Materials	3-0	250

##### Third year

ChE 301	Heat Transfer	2-0	200
ChE 303	Mass Transfer	3-0	300
ChE 305	Chemical Engineering Thermody- namics II	2-0	200
ChE 307	Particle Technology	2-0	200
ChE 309	Principles of Food Preservation and Processing	2-0	200
Or			
ChE 311	Polymers and Petrochemicals	2-0	200
Or			
ChE 313	Technology of Glass, Ceramics and Cement	2-0	200
ChE 302	Heat Transfer Sessional	0-4/2	50
ChE 304	Mass Transfer Sessional	0-4/2	50
ChE 308	Particle Technology Sessional	0-3/2	50
ChE 314	Chemical Process Analysis	0-3	100
ChE 316	Computational Techniques in Chemical Engineering	0-2	100
Chem 302	Instrumental Methods of Analysis	0-3/2	50
EEE 231	Electrical Technology	3-0	300
EEE 232	Electrical Technology Laboratory	0-3/2	50
Hum 309	Development Economics	2-0	200

Course No.	Subject Title	Hours/week	Marks
Math 301	Mathematics	2-0	200
Math 303	Numerical Analysis and Statistics	2-0	200

#### Fourth year

ChE 401	Chemical Reaction Engineering	2-0	200
ChE 403	Process Control	2-0	200
ChE 405	Material Science and Corrosion Engineering	3-0	300
ChE 407	Process Design	2-0	200
ChE 409	Economics and Management for Chemical Process Industries	3-0	300
Elective I			
Elective II			
Elective III			

(Elective I should be chosen from Group I and Electives II and III may be chosen from any of the 3 Groups, a maximum of 2 electives is allowable from any group.)

#### Group I

✓ ChE 411	Energy and Environment	2-0	200
✓ ChE 413	Industrial Pollution Control	2-0	200
ChE 415	Fuels and Combustion	2-0	200
ChE 417	Natural Gas and Petroleum Engineering	2-0	200

#### Group II

ChE 419	Transport Phenomena	2-0	200
ChE 421	Mathematical Models in Chemical Engineering	2-0	200
ChE 423	Bio-Chemical Kinetics and Reactor Design	2-0	200
ChE 425	Nuclear Chemical Engineering	2-0	200

#### Group III

ChE 427	Petrochemicals and Refinery Engineering	2-0	200
ChE 429	Polymer Processing Principles	2-0	200
ChE 431	Fertilizer, Pulp and Paper Technology	2-0	200

ChE 433	Food and Sugar Technology	2-0	200
ChE 400	Project/Thesis	0-8	300
ChE 404	Reaction Engineering and Process Control Sessional	0-3/2	50
ChE 408	Process Design Sessional	0-5	200
ChE 412	Energy and Environment Sessional	0-3/2	50
Or			
ChE 414	Pollution Control Sessional	0-3/2	50
Or			
ChE 416	Fuel Testing Sessional	0-3/2	50
Or			
ChE 434	Food Engineering Sessional	0-3/2	50

#### POSTGRADUATE COURSES :

Postgraduate courses of Chemical Engineering are offered under six broad areas such as :

- (i) Transport Process and Reaction Engineering
- (ii) Process Engineering and Technology
- (iii) Computer Application and Process Control
- (iv) Energy and Environmental Engineering
- (v) Food and Biochemical Engineering
- (vi) Petroleum and Natural Gas Engineering

#### SUMMARY OF COURSES

##### Postgraduate

Course No.	Subject Title	Credit Hours
ChE 6000	Thesis	18
ChE 6000	Project	6
ChE 6001	Advanced Topics in Chemical Engineering and Related Fields (Only one such course may be taken)	3

##### Transport Process and Reaction Engineering

ChE 6101	Transport phenomena	3
ChE 6102	Advanced Thermodynamics	3

Course No.	Subject Title	Credit Hours
ChE 6103	Fluid Mechanics	3
ChE 6104	Heat Transfer	3
ChE 6105	Mass Transfer	3
ChE 6106	Kinetics and Catalysis	3
ChE 6107	Advanced Chemical Reactor Design	3
ChE 6108	Equilibrium Stage Processes	3
ChE 6109	Non-Newtonian Fluid Flow and Heat Transfer	3

#### Process Engineering and Technology

ChE 6201	Advanced Plant Design	3
ChE 6202	Polymer Science for Chemical Engineers	3
ChE 6203	Nuclear Chemical Engineering	3
ChE 6204	Electrochemical Engineering	3
ChE 6205	Corrosion Science and Engineering	3
ChE 6206	Corrosion Protection System	3
ChE 6207	Ion-Exchange	3
ChE 6208	Adsorption and Diffusion in Porous Media	3
ChE 6209	Fluidization and its Application	3
ChE 6210	Industrial Safety	3

#### Computer Application and Process Control

ChE 6301	Advanced Numerical Methods in Chemical Engineering	3
ChE 6302	Process Dynamics	3
ChE 6303	Process Control	3
ChE 6304	Computer Aided Process Design	3
ChE 6305	Optimization Techniques in Chemical Engineering	3

#### Energy and Environmental Engineering

ChE 6401	Fuels and Combustion Science	3
ChE 6402	Combustion Engineering and Technology	3
ChE 6403	Energy Management and Modeling	3
ChE 6404	Industrial Furnaces	3
✓ ChE 6405	Water Pollution and Control	3
✓ ChE 6406	Air Pollution and Control	3

Course No.	Subject Title	Credit Hours
<b>Food and Biochemical Engineering</b>		
ChE 6501	Chemistry and Microbiology of Food	3
ChE 6502	Food Processing and Preservation	3
ChE 6503	Food Technology	3
ChE 6504	Fermentation Technology	3
ChE 6505	Biochemical Engineering	3
ChE 6506	Quality Control in Food and Biochemical Industries	3

#### Petroleum and Natural Gas Engineering

ChE 6601	Introduction to Petroleum Engineering	3
ChE 6602	Petroleum Reservoir Fluids	3
ChE 6603	Oil Well Drilling and Completion	3
ChE 6604	Petroleum Production Technology	3
ChE 6605	Well Logging and Formation Evaluation	3
ChE 6606	Reservoir Engineering	3
ChE 6607	Natural Gas Engineering	3
ChE 6608	Transmission and Distribution of Natural Gas	3



## Department of Chemistry

Teaching Staff :

### Professor :

Enamul Huq, B. Sc. (Hons.), M. Sc. Ph. D. \*

### Associate Professors :

Md. Monwarul Islam, B. Sc. (Hons.), M. Sc. Ph. D.

Monimul Huq, B. Sc. (Hons.), M. Sc. Ph. D.

### Assistant Professors :

Md. N. Islam, B. Sc. (Hons.), M. Sc.

A. K. M. Motiur Rahman, B. Sc. (Hons.), M. Sc.

Md. Rafiq Ullah, B. Sc. (Hons.), M. Sc.

Syeda Tahera Akhter, B. Sc. (Hons.), M. Sc.

Md. Nazrul Islam, M. Sc. (Hons.), M. Sc., Ph. D.

Md. Abdur Rashid, B. Sc. (Hons.), M. Sc.

Md. Wahab Khan, B. Sc. (Hons.), M. Sc. M. Phil.

### Lecturers :

Shahidur Rahman, B. Sc. (Hons.), M. Sc.

Shakila Rahman, B. Sc. (Hons.), M. Sc.

Md. Al-Masum, B. Sc. (Hons.), M. Sc.

Al-Nakib Chowdhury, B. Sc. (Hons.), M. Sc.

### Introduction :

This Department came into existence as a separate department detached from Chemical Engineering Department of the erstwhile Ahsanullah Engineering College, when the college was upgraded to the status of the present University in 1962. The department offers courses in Chemistry to the first year Engineering students, second year Chemical, Mechanical and Metallurgical students and 3rd year Chemical Engineering students.

The topics of the first year Chemistry course have been so selected that the graduate engineers can appreciate the significance of the properties of the materials in his professional life and hence, can employ the various materials efficiently and economically. Such courses will also enable him to get his

\* *Head of the department*

curiosity, regarding anomalies in the properties of matter, satisfied. The second year course of Chemistry for Mechanical and Metallurgical Engineering students comprises corrosion and properties of engineering materials.

The department has recently introduced the M.Phil. programme. The on-going research projects of the department of Chemistry include both basic and applied research. Basic research is mainly in the sphere of Physical Chemistry, while applied research is primarily concerned with Organic Chemistry. The current research topics include Isolation and Characterization of the active ingredients of natural products, such as, Aegle Marmelos, A. Integrifolia (Heterophyllum), Sida Cordifolia Linn and isolation and Characterization of essential oils from different seeds. The Physical Chemistry researches include Metal-Gas reaction, studies of complexes of metal ions, studies on mixed ligand complexes of  $\text{CO}_2$  (II),  $\text{Ni}^{++}$  (II) ion, Physico-Chemical studies on aqueous solutions of Electrolytes and Non-electrolytes.

#### SUMMARY OF COURSES

##### Undergraduate

Course No.	Subject Title	Hours/Week	Marks
Chem 101	Chemistry	3-0	200
Chem 102	Chemistry Sessional	0-3	100
Chem 102	Chemistry Sessional (For C.E Department)	0-3/2	50
Chem 103	Physical, Inorganic and Organic Chemistry	3-0	200
Chem 104	Chemistry Sessional	0-3	100
Chem 201	Inorganic and Organic Chemistry	3-0	250
Chem 202	Inorganic and Organic Chemistry Sessional	0-3	100
Chem 203	Physical Chemistry	3-0	250
Chem 204	Physical Chemistry Sessional	0-3/2	50
Chem 205	Corrosion and Chemistry of Non-metallic Engineering materials	2-0	150
Chem 207	Physical Chemistry	2-0	150
Chem 302	Instrumental Methods of Analysis	0-3/2	50

##### Postgraduate

Course No.	Subject Title	Credit hours
Chem 6001	Chemistry of Natural Products	3
Chem 6002	Chemistry of Biomolecules	3

Course No.	Subject Title	Credit hours
Chem 6003	Organic Reagents in Synthesis	3
Chem 6004	Carbohydrate Chemistry	3
Chem 6005	Spectroscopy and structure of Molecules	3
Chem 6006	Advanced Organic Reactions Mechanism	3
Chem 6007	Advanced Stereo Chemistry	3
Chem 6008	Kinetics and Energetics of Organic Reactions	3
Chem 6009	Organo-Metallic Chemistry	3
Chem 6010	Chemistry of Heterocyclic Compounds	3
Chem 6011	Biogenesis and Biosynthesis of Natural Product	3
Chem 6012	Spectra of Organic Compounds	3
Chem 6013	Organic Synthesis	3
Chem 6014	Stereo Chemistry and Reactivity of Organic Compounds	3
Chem 6015	Chromatography Principle and Application	3
Chem 6016	Advanced Topics in Chemistry	3
Chem 6101	Chemistry of Coordination Compounds	3
Chem 6102	Modern Methods of Chemical Analysis	3
Chem 6103	Corrosion Science	3
Chem 6104	Studies on crystal and Molecular Structure by Diffraction Method	3
Chem 6105	Advanced Electrochemistry	3
Chem 6106	Chemistry of Polymer	3
Chem 6107	Chemical Kinetics and Solution Thermodynamics	3
Chem 6108	Chemistry of Pollution	3

## Department of Mathematics

Teachign Staff:

### Professors :

Syed Ali Afzal, B. Sc. (Hons.) M. Sc. M.Sc. DIC, Ph. D. \*

Md. Zakerullah, B. Sc. (Hons.), M. Sc. Ph. D.

### Associate Professor :

Md. Ali Ashraf, B. Sc. (Hons.), M. Sc. M. Phil.

### Assistant Professors :

Md. A. Khaleque Hazra, M. Sc.

Mohammed Isa, M. Sc.

Jamshed Ali Sheikh, M.Sc.

Abdul Quddus Mia, B. Sc. (Hons.), M. Sc.

Md. Mustafa Kamal Chowdhury, B. A. (Hons.), M. A.

Md. Obayed Ullah, B. Sc. (Hons.), M. Sc.

Abdullah Al-Kafi Mazumder, B. Sc. (Hons.), M. Sc. M. E., Ph. D.

Md. Elias, B. Sc. (Hons.), M. Sc.

Md. Abdul Maleque, B. Sc. (Hons.), M. Sc.

### Lecturer :

Nilufar Farhat Hossain, B. Sc. (Hons.), M. Sc.

### Introduction :

The department offers basic and advanced courses in Mathemiatics to the undergraduate and postgraduate students in different faculties of the University. The standard of the courses offered to the undergraduate students are comparable to that of other universities. The postgraduate students of the faculties of Civil and Mechanical Engineering are offered advanced courses in mathematics related to their own fields of interest.

The academic council of the University has entrusted this department to introduce M.Phil course in Mathematics. This department would take necessary steps to introduce M.Phil course within a short period.

\* *Head of the department*

# SUMMARY OF COURSES :

Course No.	Subject Title	Hours/week	Marks
Math 101	Differential and integral calculus	4-1	300
103	Co-ordinate geometry	4-1	300
105	and	4-1	300
107	Ordinary differential equations	4-1	300
Math 122	Differential and integral calculus and solid Geometry	2-0	200
Math 201	Vector calculus, Matrices, Laplace's transforms, Differential equations	3-0	250
Math 203	Matrices, Differential equations, Vector calculus, Bessel's and Legendre's equations, Laplace's transforms and Spherical Trigonometry	3-0	250
Math 205	Matrices, Differential equations, Fourier series, Bessel's and Legendre's differential equations and Partial differential equations	4-0	300
Math 209	Sets, Groups, Rings, Fields, Infinite Series, Laplace's transforms, Vectors. Matrices and Differential equations	4-0	300
Math 211	Matrices, Solid geometry, Vector calculus, Differential equations, Laplace's transforms and Fourier series	3-0	250
Math 213	Vector calculus, Statistics, Matrices, Laplace's transforms and Differential equations	4-0	300
Math 215	Statistics, Complex variable, Matrices, Vector Calculus	3-0	250
Math 301	Fourier series, Harmonic analysis, Partial differential equations and complex variables	2-0	200
Math 302	Computer programming and Numerical analysis	0-3/2	50
Math 303	Numerical analysis and statistics	2-0	200
Math 305	Solid geometry, Statistics, Fourier series and Harmonic analysis	3-0	300
Math 307	Fourier series, Partial differential	3-0	300

Course No.	Subject Title	Hours/week	Marks
	equations, Harmonic analysis, Numerical analysis and Complex variables		
Math 309	Laplace's transforms, Partial differential equations, Fourier series, Harmonic analysis and Statistics.	2-0	200
Math 315	Statistics, Laplace's Transforms, Fourier Series, Harmonic Analysis	2-0	200

M. Phil Courses in Applied Mathematics.  
Math 6000 Thesis

Course No.	Subject Title	Credit	hours
Math 6101	Special functions and Integral Transforms I		3
Math 6102	Special functions and Integral Transforms II		3
Math 6201	Fluid Dynamics I		3
Math 6202	Fluid Dynamics II		3
Math 6301	Similarity Analysis		3
Math 6302	Perturbation and Approximation Theory		3
Math 6401	Optimization Techniques I		3
Math 6402	Optimization Techniques II		3
Math 6501	Advanced Quantum Mechanics I		3
Math 6502	Advanced Quantum Mechanics II		3

## Department of Metallurgical Engineering

Teaching Staff :

### Professors :

Md. Serajul Islam, B. Sc. Engg. (Met), M. Engg. (Mech), Ph. D.  
Ehsanul Haque, B. Sc. Engg. (Met), M. Met., Ph. D.  
Shahjahan Mridha, B. Sc. Engg. (Met), M. Sc. Engg. (Met), Ph D.  
Md. Mohar Ali Bepari , B. Sc. Engg. (Met), M. Sc. Engg. (Met), M. Met., Ph.D. \*  
Abu Syed Wais Kurny, B. Sc. Engg. (Met), M. Sc. Engg. (Met), Ph. D.  
Md. Mohafizul Haque, B. Sc. Engg. (Met), M. Sc. Engg. Ph.D.

### Associate Professors :

Zariff Ahmed Chaudhury, B. Sc. Engg. (Met), M. Sc. Engg. (Met), Ph.D.  
Md. Nasrul Haque, B. Sc. Engg. (Met), M. Sc. Engg. (Met), Ph.D.

### Assistant Professors :

A. A. Md. Rezaul Haque, B. Sc. Engg. (Met), M.Sc. Engg. (Met), M. Met.  
A. S. M. Abdul Haseeb, B. Sc. Engg. (Met), M. Sc. Engg. (Met).  
A. K. M. Bazlur Rashid, B. Sc. Engg. (Met), M. Sc. Engg. (Met).  
Md. Fakhrul Islam, B. Sc. Engg. (Met), M. Sc. Engg. (Met).

### Lecturers :

A K M Matiur Rahman, B.Sc. Engg. (Met)  
Qumrul Ahsan, B.Sc. Engg. (Met), M.Sc. Engg. (Met)

### Introduction :

The department is the only place in the country where Metallurgical Engineering education is offered and as such, for sometime to come, the entire demand for Metallurgical Engineers will have to be met by this department. The department produces about fifteen graduates every year and also offers M.Sc Engineering courses specialising in major areas of Metallurgical Engineering and Materials Science. The research objective of the department is to develop the optimum properties of metals and alloys for bringing about economy in their use and to satisfy the specific needs for industrial applications. The development and adoption of techniques for reducing the use of imported raw materials, metals and alloys and thereby increasing the use of indigenous raw

\* Head of the department

materials, has been one of the objectives while carrying out research activities in the department. Thus the research topics are selected considering the country's technological base, national need and priority.

The areas of current research interest includes: the use of natural gas for melting metals and alloys, manufacture of refractory materials from local deposits, case-carburisation by natural gas instead of traditional pack carburising by solid carbonaceous mixtures, recovery of metals and alloys from scraps and wastes, heat treatment of metals and alloys, nitriding of steels, study of centrifugal casting process, development of low alloy high strength steels, strontium-modification of aluminium-silicon alloys, production of metallic glasses by rapid solidification techniques etc.

## SUMMARY OF COURSES

### UNDERGRADUATE

#### First year

Course No.	Subject Title	Hours/week	Marks
CE 108	Survey Practical	2 weeks	50
Chem 101	Chemistry	3-0	200
Chem 102	Chemistry	0-3	100
EE 105	Basic Electrical Engineering	2-0	150
EE 106	Basic Electrical Engineering Sessional	0-3/2	50
Hum 101	English and Economics	2-0	150
Math 107	Paper I	2-0	150
	Paper II	2-0	150
ME 107	Basic Thermal Engineering and Engineering Mechanics	3-0	200
ME 108	Basic Thermal Engineering and Engineering Mechanics Sessional	0-3/2	50
ME 112	Mechanical Engineering Drawing	0-3/2	50
Met E 101	Fundamental Metallurgy	2-0	150
Phy 102	Physics Sessional	0-3	100
Phy 103	Physics	3-0	200
Shop 102	Carpentry Shop	0-3/4	25
Shop 106	Welding Shop	0-3/4	25
Shop 108	Machine and Fitting	0-3/2	50

#### Second year

Course No.	Subject Title	Hours/week	Marks
Chem 207	Physical Chemistry	2-0	150
Math 211	Mathematics	3-0	200
ME 205	Mechanics of Solids	3-0	200
ME 212	Mechanical Engineering Drawing	0-3/2	50
ME 217	Elements of Fluid Mechanics and Machinery	2-0	150
Met E 201	Materials Science	2-0	150
Met E 203	Geology and Mineralogy	2-0	150
Met E 204	Metallurgical Analysis and Assaying	0-3	100
Met E 207	Fuels and Refractories	3-0	250
Met E 208	Fuels and Refractories Sessional	0-3/2	50
Met E 212	Engineering Drawing	0-3/2	50
Met E 213	Engineering Materials	3-0	250
Met E 216	Materials Testing Sessional	0-3/2	50
Met E 218	Fundamental Metallurgy Sessional	0-3	100

#### Third year

EEE 231	Electrical Technology	3-0	300
EEE 232	Electrical Technology Sessional	0-3/2	50
Hum 313	Industrial Law, Sociology and Accounts	3-0	300
IPE 307	Metal Cutting Processes	2-0	200
IPE 308	Metal Cutting Processes Sessional	0-3/2	50
Math 302	Computer Programming and Numerical Analysis	0-2	100
Met E 301	Elements of Mining Engineering	2-0	200
Met E 303	Metallurgical Operations and Control	3-0	300
Met E 305	Metallurgical Thermodynamics	2-0	200
Met E 307	Ore-dressing and Extractive Metallurgy	3-0	300
Met E 309	Foundry Technology	3-0	300
Met E 310	Foundry Technology Sessional	0-3	100
Met E 312	Chemical Analysis of Metals and Minerals	0-3	100

#### Fourth Year

##### Compulsory Subjects

IPE 403	Industrial Management	3-0	300
Met E 400	Project and Thesis	0-6	200



Course No.	Subject Title	Hours/week	Marks
Met E 401	Ferrous Production Metallurgy	2-0	200
Met E 403	Metallic Alloys		
	Paper I	2-0	200
	Paper II	2-0	200
Met E 405	Metal Technology	3-0	300
Met E 407	Physical Metallurgy	3-0	300
Met E 408	Metallography and Heat Treatment -Sessional	0-4 $\frac{1}{2}$	150
Met E 410	Metallurgical Problems Sessional	0-3/2	50

Optional Subjects : (Any two from the following)

IPE 411	Production Planning and Control	2-0	200
Met E 431	Foundry Engineering	2-0	200
Met E 433	Corrosion for Metallurgical Engineers	2-0	200
Met E 435	Welding Technology	2-0	200
Met E 437	Powder Metallurgy	2-0	200
Met E 439	Metal Finishing	2-0	200
Met E 441	Non-ferrous Production Metallurgy	2-0	200
Met E 443	Refractory Materials and Ceramics	2-0	200

SUMMARY OF POST-GRADUATE COURSES (AS APPROVED IN GROUPS BY THE ACADEMIC COUNCIL ON 04/5/88).

Course NO.	Subject Title	Credit Hrs.
Met. E. 6000	Thesis	18
Met. E. 6001	Project	6
Met. E. 6002	Recent Advances in Metallurgy	3
Met. E. 6003	Electron Microscopy	3
Met. E. 6004	X-Ray Metallography	3
Met. E. 6005	Experimental Techniques in Metallurgy	3
Met. E. 6101	Advanced Metal Physics	3
Met. E. 6102	Machine Tool Materials and Heat Treatment	3
Met. E. 6103	Advanced Physical Metallurgy	3
Met. E. 6104	Theory of Dislocation	3
Met. E. 6105	Crystallography	3
Met. E. 6106	Diffusion in Solids	3

Course NO.	Subject Title	Credit Hrs.
Met. E. 6107	Failure Mechanism and Analysis	3
Met. E. 6108	Physical Metallurgy of Steels	3
Met. E. 6201	Advanced Metal Technology	3
Met. E. 6202	Surface Treatments	3
Met. E. 6203	Advanced Foundry Engineering	3
Met. E. 6204	Metallurgy of Welding	3
Met. E. 6205	Furnace Technology	3
Met. E. 6206	Fuel Technology	3
Met. E. 6207	Metal Technology	2
Met. E. 6301	Advanced Extractive Metallurgy	3
Met. E. 6302	Metallurgical Thermodynamics	3
Met. E. 6303	Theory of Metallurgical Processes	3
Met. E. 6304	Advanced Production Metallurgy	3
Met. E. 6401	Industrial Alloys	3
Met. E. 6402	Composite Materials	3
Met. E. 6403	Refractory Materials	3
Met. E. 6404	High Temperature Oxidation of Metals and Alloys	3
Met. E. 6405	Nuclear Materials	3

## Department of Physics

### Teaching Staff :

#### Professors :

Giasuddin Ahmad, B. Sc. (Hons.), M. Sc. Ph. D.

Md. Ali.Asgar, B. Sc. (Hons.), M. Sc. Ph. D. \*

#### Research Professor :

Tofazzal Hossain, B. Sc. (Hons.), M. Sc. Ph. D.

#### Associate Professors :

Nazma Zaman, B. Sc. (Hons.), M. Sc. Ph. D.

Md. Mominul Huq, M. Sc. Ph. D.

#### Assistant Professors :

Dil Afroze Ahmed, B. Sc. (Hons.), M. Sc.

Md. Abu Hashan Bhuiyan, M. Sc. M. Phil. Ph. D.

Fahima Khanam, B. Sc. (Hons.), M. Sc.

#### Lecturers :

Md. Feroze Alam Khan, B. Sc. (Hons.), M. Sc.

Md. Ábdul Hye Chowdhury, B. Sc. (Hons.), M. Sc.

Md. Mostak Hossain, B. Sc. (Hons.), M. Sc.

Jiban Podder, B. Sc. (Hons.), M. Sc. M. Phil.

### Introduction :

A considerable exposure to the basic knowledge in physics is deemed necessary for students undertaking undergraduates courses in the different faculties. With this objective in view, extensive theoretical courses in physics, covering the needs of various departments, are offered to the undergraduate students. Adequate laboratory facilities are available to supplement the theoretical knowledge and provide experimental basis.

The department also offers M.Phil. and Ph.D degree courses. The major areas in which a postgraduate students can carry out research and course work are the following : Solid State Physics. Material Science, X-ray and Optical

\* Head of the department

Crystallography, Magnetism, Nuclear Physics, Bio and Medical Physics, Meteorology. Current research projects are given as follows :

(i) The development of magnetic materials, (ii) The study of the precursor states for carbonising and graphitizing materials, (iii) Prediction of track of Cyclones in Bangladesh, (iv) Analysis of low Z elements by Alpha induced Gamma ray spectroscopy and (v) Development of low level whole body radioactive monitor. The above research projects have been undertaken mostly by the M.Phil. and Ph.D. students for their theses requirement. There is a special collaboration in the fields of Solid State Physics, Material Science, Medical Physics and Meteorology between the department, the Atomic Energy Commission and Space Research and Remote Sensing Organisation.

The department has two well-equipped laboratories for the undergraduate students. At present three postgraduate research laboratories in the process of being set up, one in the field of Nuclear Physics, one in the field of Solid State Physics and one in Material Science.

#### SUMMARY OF COURSES

##### Undergraduate

Course No.	Subject Title	Hours/week	Marks
Phy 101	physics	3 - 0	200
Phy 102	Physics Sessional	0 - 3/2	50
Phy 103	Physics	3 - 0	200
Phy 123	Physics	2 - 0	150

##### Postgraduate

Course No.	Subject Title	Credit Hours
MetE 6301	Met 7-Metal Technology	2
Phy 6001	Quantum Mechanics	2
Phy 6002	Low Temperature, Physics and Vacuum Techniques	2
Phy 6003	Radiation Bio-Physics	4
Phy 6004	Medical Physics	4
Phy 6005	Solid State Physics (General)	4
Phy 6006	X-ray	4
Phy 6007	Optical Crystallography	4
Phy 6008	Magnetism I (General)	4
Phy 6009	Magnetism II (Special)	4

Course No.	Subject Title	Credit Hours
Phy 6010	physics of deformed solids	2
Phy 6011	Thermodynamics of solids	2
Phy 6012	Nuclear physics	4
Phy 6013	Nuclear reaction I	3
Phy 6014	Nuclear reaction II	3
Phy 6015	Nuclear Model I	3
Phy 6016	Nuclear Model II	3
Phy 6017	Basic Atmospheric physics	3
Phy 6018	Dynamical and Tropical Meteorology	3
Phy 6019	Monsoon Meteorology and Modelling	4
Phy 6020	Reactor physics	4
Phy 6021	Radiation Protection	2
Phy 6022	Experimental Techniques in Solid State physics	4

**Faculty of Mechanical Engineering**  
**Department of Industrial and Production**  
**Engineering**

Teaching Staff :

**Professors :**

M. Anwarul Azim, B. Sc. Engg. (Mech), Dipl-Ing, Dr. Ing.  
A. F. M. Anwarul Haque, B. Sc. Engg (Mech), M.Sc. Engg. M. Engg. Ph. D.  
Md. Mizanur Rahman , B.Sc. Engg. (Mech) M.Sc. Engg. M.Sc. Ph. D.

**Associate Professors :**

A. K. M. Nurul Amin, M. Sc. Engg. (Mech), Ph. D.  
Ahsan Ali Khan, M. Sc. Engg. (Mech), Ph. D.

**Assistant Professors :**

Ruhul Amin Sarker, B. Sc. Engg. (Mech), M. Engg.  
Aminur Rahman, B. Sc. (Mech), M. Engg.  
Md. Golam Mohiuddin, B. Sc. Engg. (Mech), M. Sc. Engg. (Mech).  
Kazi Md. Saiful Islam, B. Sc. Engg. (Mech).  
Ashraf Ali Sikder, M. Sc. Engg. (Mech), Ph. D  
A. K. M. Mostafa Kamal, B. Sc. Engg. (Mech.)  
A. N. Mustafizul Karim B. Sc. Engg. (Mech), M. Engg. (IPE)

**Lecturers :**

Md. Al-Amin Hossain, B. Sc. Engg. (Mech). M. Sc. Engg.  
Kazi Abdus Sayeed, B. Sc. Engg. (Mech).  
Muniruddin Ahmed, B.Sc. Engg. (Mech.)  
Naim Ahmad, B.Sc. Engg. (Mech.)  
Md. Mahmudul Gani, B.Sc. Engg. (Mech.)  
G.M. Salam Azad, B.Sc. Engg. (Mech.)

**Introduction :**

Industrial and Production Engineering is an important area for development of almost every of the country's industry. Manufacture of products of everyday use in the one hand and manufacture of sophisticated products, design, quality

\* *Head of the department*

control, operation and maintenance of the industries and the management on the other hand are the areas of concern of industrial and production engineers. The industrial and production Engineers are, therefore, the important manpower resources for any technological development, endeavour and their operation.

The department has been carrying out research projects through the postgraduate programme and has opened up Research Out-stations at different industries. The research projects are basically applied to different problems of the industries in the field of industrial and production engineering.

Courses are offered at the postgraduate level leading to M. Engg./M. Sc. Engg. and Ph. D Some courses are also being offered at the undergraduate levels in the departments of Mechanical Engg. Naval Architecture and Marine Engg. and Metallurgical Engg.

\* Head of the Department.

## SUMMARY OF COURSES

### Undergraduate

#### Second Year

Course No.	Subject Title	Hours/Week	Marks
IPE 205	Production Processes	2-0	150
IPE 206	Production Processes Sessional	0-3/2	50

#### Third Year

IPE 305	Production Processes	2-0	200
IPE 306	Production Processes Sessional	0-3/2	50
IPE 307	Metal Cutting Processes	2-0	200
IPE 308	Metal Cutting Processes Sessional	0-3/2	200
IPE 313	Measurement and Quality Control	3-0	300
IPE 314	Measurement and Quality Control Sessional	0-3/2	50

#### Fourth Year

IPE 400	Project	0-9	300
IPE 403	Industrial Management	3-0	300

Course No.	Subject Title	Hours/Week	Marks
IPE 409	Machine Tools	3-0	300
IPE 410	Machine Tools Sessional	0-3/2	50
IPE 411	Production Planning and Control	3-0	300
IPE 413	Production Planning and Control	3-0	300
IPE 445	operation Research	2-0	200

### Postgraduate

#### Compulsory Subjects for M. Engg. (IPE)

Course No	Title	Course Hours
IPE 6000	Project	6
IPE 6003	Advanced Machine Tools	3
IPE 6006	Designing for Production	3
IPE 6007	Production System Analysis	3
IPE 6008	Advanced Manufacturing Processes	3
IPE 6009	Advanced Quality control	3
IPE 6209	Quantitative Techniques	3

#### Compulsory subjects for M. Sc. Engg. (IPE)

IPE 6000	Thesis	18
IPE 6006	Designing for Production	3
IPE 6007	Production System Analysis	3
IPE 6008	Advanced Manufacturing Processes	3
IPE 6009	Advanced Quality Control	3

#### Optional Subjects (Any three)

IPE 6001	Metal Fabrication	3
IPE 6002	Principles of Metal Cutting	3
IPE 6004	Production Materials	3
IPE 6005	Statistical Quality Control	3
IPE 6101	Tool Engineering	3
IPE 6102	Managerial Economics	3
IPE 6103	Introduction to Control Engineering	3
IPE 6104	Principles of Industrial Management	3
IPE 6105	Modern Marketing Management	3
IPE 6106	Plastic Process Engineering	3

Course No	Title	Course Hours
IPE 6107	Special Studies (Not more than two)	3
IPE 6201	Quantitative Analysis I	3
IPE 6202	Control Engineering	3
IPE 6203	Applied Plasticity	3
IPE 6204	Linear Programming	3
IPE 6205	Quantitative Analysis II (Preq.IPE-6201)	3
IPE 6206	Computer Methods in Industrial Engg	3
IPE 6207	Growth and Management of Technology	3
IPE 6208	Organizational Behaviour	3
EEE	Electrical Machines and Electronics	3

#### Non-Departmental Courses (one only)

## Department of Mechanical Engineering

Teaching Staff:

### Professors :

M. H. Khan, B.Sc. Engg. (Mech.), M. S; Ph. D.  
A. M. Aziz-ul-Huq, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
Dipak Kanti Das, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
M. Abu Taher Ali, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
S. M. Nazrul Islam, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
Md. Wahhajuddin, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D. \*  
Amalesh Ch. Mandal, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
Md. Quamrul Islam, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.  
Md. Abdur Razzaq Akhanda, B.Sc. Engg. (Mech.), M.Sc. Engg., Ph.D.  
Md. Imtiaz Hossain, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph.D.

### Associate Professors :

Belal Ahmed, B.Sc. Engg. (Mech.), M. Engg.  
A. K. M. Sadrul Islam, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph. D.  
Md. Abdur Rashid Sarker, M. Sc. Engg. (Mech.), Ph. D.

### Assistant Professors :

Md. Farhad Hossain, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Ziaul Haque, B.Sc. Engg. (Mech.), M. S.  
Maglub-al-Noor, B.Sc. Engg. (Mech.), M. Engg.  
Altaf Hasan, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Abdul Azim, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Md. Raquib Uddin Khan, B.Sc. Engg. (Mech.), M. Sc. Engg.  
R.G. Mahmud Hasan, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Jamal A. Naser, B.Sc. Engg. (Mech.), M. Tech.  
Md. Tamim, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Md. Manzurul Haq, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Saiful Bari, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Maksud Helali, B.Sc. Engg. (Mech.), M. Sc. Engg.  
A. K. Mesbahuddin, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Md. Ekramul Hasan Khan, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Md. Mahbulul Alam, B.Sc. Engg. (Mech.), M. Sc. Engg.  
Syed Rahmat Hossain, B.Sc. Engg. (Mech.), M. Sc., Ph.D.

\* Head of the department



Md. Durul Huda, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Masud Ahmed Selim, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Alauddin Ahmed, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Humayun Kabir, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 A. M. Titu Islam, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 N. M. Anisur Rahman, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Abu Rayhan Md. Ali, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Sayeed Ahmed, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Md. Khalilur Rahman, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Md. Maniruzzaman, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Syed Ziaul Hossain, B.Sc. Engg. (Mech.), M. Sc. Engg.  
 Showkat Jahan Chowdhury, B.Sc. Engg. (Mech.), M. Sc. Engg., Ph. D.

#### Lecturers :

Mujibul Hasan, B.Sc. Engg. (Mech.)  
 Sohel Anwar, B.Sc. Engg. (Mech.)  
 Abu Saeed Islam, B.Sc. Engg. (Mech.)  
 G. M. Zulfikar Ali, B.Sc. Engg. (Mech.)  
 A. K. M. Ahsan Mian, B.Sc. Engg. (Mech.)  
 Mrinal Ch. Saha, B.Sc. Engg. (Mech.)  
 Rabindra Nath Paul, B.Sc. Engg. (Mech.)  
 Chowdhury Md. Feroz, B.Sc. Engg. (Mech.)  
 A. B. M. Idris, B.Sc. Engg. (Mech.)  
 A. K. M. Reazul Karim, B.Sc. Engg. (Mech.)  
 Md. Ehsan, B.Sc. Engg. (Mech.)  
 Md. Mahbubur Razzaque, B.Sc. Engg. (Mech.)  
 A. K. M. Azizu Haque, B.Sc. Engg. (Mech.)  
 Shaik Reaz Ahmed, B.Sc. Engg. (Mech.)

#### Introduction :

The department is continuously engaged in updating and enhancing the knowledge in the field of mechanical engineering education in the context of the present day world. It is committed to a varied programme of research with a view to solving problems in the national level. The research projects carried out through the undergraduate and postgraduate programmes are both applied and fundamental in nature, covering the areas like, thermodynamics, fluid mechanics, turbulence, heat transfer, applied mechanics, wind and solar energy etc.

Construction of low cost manually operated pumps, design and fabrication of wind turbines for lifting water for irrigation, improved design of country cycle rickshaws, solar energy utilization, use of natural gas in IC engine, study of jets, wakes and separation-reattachment-recovery of flow are some of the important research projects now being carried out in the department.

### SUMMARY OF COURSES

#### Undergraduate

##### First year

Course No.	Subject Title	Hours/week	Marks
CE 102	Surveying	Two week	50
CE 104	Civil Engineering Drawing	0-3/2	50
Chem 101	Chemistry	3-0	200
Chem 102	Chemistry Sessional	0-3/2	50
EEE 101	Basic Electrical Engineering	3-0	200
EEE 102	Basic Electrical Engineering Sessional	0-3/2	50
Hum 101	English and Economics	2-0	150
Math 101	Mathematics	4+1	300
	Paper I		
	Paper II		
ME 101	Thermal Engineering	3-0	200
ME 102	Thermal Engineering Sessional	0-3/2	50
ME 112	Basic Mechanical Engineering Drawing	0-3/2	50
Phy 101	Physics	3-0	200
Phy 102	Physics Sessional	0-3/2	50
Shop 104	Foundry shop	0-3/2	50
Shop 106	Welding shop	0-3/2	50
Shop 108	Machine shop	0-3/2	50

##### Second Year

Chem 205	Chemistry of Non-metallic Engineering Materials	2-0	150
EEE 211	Electrical Technology	3-0	250
IPE 205	Production Processes	2-0	150
Math 201	Vector Calculus, Matrices, Laplace's Transforms, Differential equations	3-0	250

Course No.	Subject Title	Hours/week	Marks
ME 201	Basic Thermodynamics	3-0	250
ME 202	Basic Thermodynamics Sessional	0-3/2	50
ME 203	Engineering Mechanics	3-0	250
ME 205	Mechanics of Solids	3-0	250
ME 206	Mechanics of Solids Sessional	0-3/2	50
ME 212	Mechanical Engineering Drawing	0-3/2	50
MetE 205	Metallic Materials	2-0	150
MetE 206	Metallic Materials Sessional	0-3/2	50

### Third Year

Hum 305	Industrial law, Sociology and Accounts	3-0	300
IPE 305	Production Processes	2-0	200
IPE 306	Production Processes Sessional	0-3/2	50
IPE 313	Measurement and Quality Control	3-0	300
IPE 314	Measurement and Quality Control Sessional	0-3/2	50
Math 307	Fourier series, Partial Differential Equations and Harmonic Analysis, Numerical Analysis and Complex Variables	3-0	300
ME 300	Computer programming	0-3/2	50
ME 301	Heat and Mass Transfer	3-0	300
ME 302	Heat Transfer Sessional	0-3/2	50
ME 303	Mechanics of Machinery	3-0	300
ME 304	Mechanics of Machinery Sessional	0-3/2	50
ME 307	Fluid Mechanics	3-0	300
ME 308	Fluid Mechanics Sessional	0-3/2	50
ME 309	Machine Design	3-0	300
ME 310	Machine Design Sessional	0-3/2	50

### Fourth Year

IPE 403	Industrial Management	3-0	300
IPE 409	Machine Tools	3-0	300
IPE 410	Machine Tools Sessional	0-3/2	50
IPE 413	Production Planning and Control	3-0	300
ME 400	Project and Thesis	0-9	300
ME 401	Applied Thermodynamics	3-0	300
ME 402	Applied Thermodynamics Sessional	0-3/2	50

Course No.	Subject Title	Hours/week	Marks
ME 407	Fluid Mechanics and Machinery	3-0	300
ME 408	Fluid Mechanics and Machinery Sessional	0-3/2	50

### Optional Subjects (Any Two)

ME 421	Aerodynamics	2-0	200
ME 425	Automobile Engineering	2-0	200
ME 429	Control Engineering	2-0	200
ME 431	Plastics Process Technology	2-0	200
ME 441	Introduction to Petroleum Engineering	2-0	200
ME 451	Refrigeration and Airconditioning	2-0	200

### Postgraduate

Course No.	Subject Title	Credit Hours
ME 6000	Thesis	18
	Project	6
ME 6003	Problem	3
ME 6101	Classical Thermodynamics	3
ME 6103	Statistical Thermodynamics	3
ME 6111	Solar Energy	3
ME 6121	Survey of Fluid Mechanics	3
ME 6123	Mechanics of Inviscid Incompressible Fluid	3
ME 6125	Mechanics of Viscous Fluid	3
ME 6127	Mechanics of Inviscid Compressible Flow	3
ME 6129	Turbulence	3
ME 6131	Wind Power	3
ME 6133	Wind Turbines	3
ME 6135	Advanced Aerodynamics	3
ME 6141	Advanced Heat Transfer	3
ME 6143	Advanced Conduction and Radiation Heat Transfer	3
ME 6145	Advanced Convection Heat Transfer	3
ME 6147	Design of Heat Transfer Equipments	3
ME 6149	Heat Transfer Seminar	3
ME 6151	Boiling and Condensation Heat Transfer	3
ME 6161	Thermal Environmental Engineering	3
ME 6171	Advanced Dynamics	3
ME 6173	Mechanical Vibrations	3

Course No.	Subject Title	Credit Hours
ME 6175	Applied Elasticity	3
ME 6177	Theory of Plates and Shells	3
ME 6179	Elastic Stability of Structures	3
ME 6181	Experimental Stress Analysis	3
ME 6183	Finite Element Methods	3
ME 6185	Advanced Numerical Analysis	3
ME 6187	Computer and Programming	3
ME 6201	Mechanical Behaviour of Engineering Materials	3
ME 6203	Structure and Properties of Engineering Materials	3
ME 6205	Theory of Plasticity	3
ME 6207	Dislocation Theory	3

## Department of Naval Architecture and Marine Engineering

Teaching Staff:

### Professor :

Gazi Md. Khalil, B. Tech. (Hons.), M. Sc. Engg. (Mech.), Ph.D. \*

### Associate Professors :

Md. Sadiqul Baree, B.Sc. Engg. (NAME), Ph. D.

Khabirul Huq Chowdhury, B. Sc. Engg. (NAME), M. Sc. Engg.

M. Refayetullah, B. Sc. Engg. (NAME), Ph. D.

Swpan Kumar Dey, B. Sc. Engg. (NAME), Ph. D.

### Assistant Professors :

Abdur Rahim, B.Sc. Engg. (NAME)

Md. Khalilur Rahman, B.Sc. Engg. (NAME)

Uttam Kumar Paul, B.Sc. Engg. (NAME)

Md. Reaz Hasan Khondoker, B.Sc. Engg. (NAME)

### Lecturers :

Md. Rezaul Abid, B.Sc. Engg. (NAME)

Mir Tareque Ali, B.Sc. Engg. (NAME)

### Intorduction :

The department of Naval Architecture and Marine Engineering was established in 1971. The department was set up with the aim of producing local expertise in the broader field of maritime activities which include naval architecture, shipbuilding, marine transport, offshore structures, marine engineering etc. These include design of mining and drilling rig structures, piping layout, machineries and equipment installations, ensuring stability of structures in rough weather, fabrication of structures at shipyards, inspection and testing, transportation and installation at site etc.

This deparment is mainly concentrating on education in design, construction, repair, maintenance, inspection and testing of inland and coastal vessels. The Marine Hydrodynamics laboratory and Ship Design Laboratory are about to be completed. Efforts are also being made to procure experimental setups for a

\* Head of the department

Calendar

Marine Engineering Laboratory. The department is now offering under graduate and as well as postgraduate courses. Enrolment in the first year is now 13 of which 3 seats are reserved for the Bangladesh Navy.

## SUMMARY OF COURSES

### Undergraduate

Course No	Subject Title	Hours/weeks	Marks
<b>First Year</b>			
CE 102	Surveying	2 weeks	50
Chem 101	Chemistry	3-0	200
Chem 102	Chemistry Sessional	0-3/2	50
EEE 107	Electrical Engineering principles	2-0	150
EEE 108	Electrical Engg. principles sessional	0-3/2	50
Hum 101	English and Economics	2-0	150
Math 101	Mathematics Paper -I	4 + 1	300
	Paper - II		
ME 101	Thermal Engineering	3-0	200
ME 102	Thermal Engineering sessional	0-3/2	50
ME 112	Basic Mechanical Engg. Drawing	0-3/2	50
NAME 107	Basic Naval Architecture	2-0	150
NAME 108	Ship drawing and calculations Sessional	0-3/2	50
Phy 101	Physics	3-0	200
Phy 102	Physics Sessional	0-3/2	50
Shop 104	Foundry Shop	0-3/2	50
Shop 106	Welding shop	0-3/2	50
Shop 108	Machine shop	0-3/2	50

$$19-14\frac{1}{2}=33\frac{1}{2} \quad 1850$$

### Second Year

EEE 211	Electrical Technology	3-0	250
EEE 212	Electrical Technology Sessional	0-3/2	50
Math 213	Mathematics	3-0	250
ME 201	Basic Thermodynamics	3-0	250

Course No	Subject Title	Hours/weeks	Marks
ME 202	Basic Thermodynamics Sessional	0-3/2	50
NAME 201	Strength of Materials I	2-0	150
NAME 202	Strength of Materials I Sessional	0-3/2	50
NAME 203	Fluid Mechanics	2-0	150
NAME 204	Fluid Mechanics Sessional	0-3/2	50
NAME 205	Shipbuilding Technology I	2-0	150
NAME 207	Ship Design I	2-0	150
NAME 208	Ship Design I Sessional	0-3	100
MetE 209	Shipbuilding Materials	3-0	250
MetE 210	Shipbuilding Materials Sessional	0-3/2	50

$$20-10\frac{1}{2}=30\frac{1}{2} \quad 1950$$

### Third Year

Hum 305	Industrial Law, Accountancy and Sociology	3-0	300
Math 307	Applied Mathematics	3-0	300
NAME 300	Computer Program and its applications	0-3/2	50
NAME 301	Strength of Materials II	2-0	200
NAME 302	Strength of Materials II Sessional	0-3/2	50
NAME 303	Marine Hydrodynamics	2-0	200
NAME 304	Marine Hydrodynamics Sessional	0-3/2	50
NAME 305	Shipbuilding Technology II	3-0	300
NAME 307	Ship Design II	2-0	200
NAME 308	Ship Design II Sessional	0-3	100
NAME 311	Marine Engineering I	2-0	200
NAME 313	Analysis and Design of Machine Elements	3-0	300
NAME 314	Analysis and Design of Machine elements Sessional	0-3/2	50
NAME 316	Shipyards Practice I (Practical)	3 weeks	50

$$20-9 = 29 \quad 2350$$

#### Fourth Year

Course No.	Subject Title	Hours/Wk.	Marks
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#### Compulsory Subjects

IPE	403	Industrial Management	3-0	300
NAME	400	Project and Thesis	0-6	200
NAME	401	Ship Structures	2-0	200
NAME	402	Ship Structures (Sessional)	0-3/2	50
NAME	403	Resistance and Propulsion of ships	2-0	200
NAME	404	Resistance and propulsion of ships (Sessional).	0-3/2	50
NAME	407	Ship Design III	2-0	200
NAME	408	Ship Design III Sessional	0-3	100
NAME	409	Marine Dynamics	3-0	300
NAME	411	Marine Engineering II	3-0	300
NAME	412	Marine Engineering II Sessional	0-3/2	50
NAME	416	Shipyard Practice II (Practical)	3 weeks	50

#### Optional Subjects (any two)

IPE	445	Operations Research		
NAME	431	Matrix Structural Design		
NAME	433	Optimum Structural Design		
NAME	435	Design of Inland Waterway Transportation system	2-0	200
NAME	437	Propulsion Engineering	2-0	200
NAME	439	Ship Hull Vibration		
NAME	441	Ship Performance		
NAME	443	Ship Environment		
NAME	445	Control Engineering		

$$19-13\frac{1}{2}=32\frac{1}{2} \quad 2400$$

#### Post graduate

Course No.	Subject Title	Credit Hours
Math 1101	Applied Mathematics - I	3
Math 1201	Applied Mathematics - II	3
NAME 6000	Thesis	18
NAME 6002	Project	6
NAME 6101	Ship Structures - I	3

Course No.	Subject Title	Credit Hours
NAME 6102	Ship Structures - II	3
NAME 6103	Finite Element Methods	3
NAME 6201	Ship Propulsion	3
NAME 6202	Theory of Wave Making Resistance	3
NAME 6203	Seakeeping Performance	3
NAME 6204	Weather Routing of Ships	3
NAME 6205	Boundary Layer Theory	3
NAME 6301	Analysis and Design of Welded Structures	3
NAME 6302	Ship Production Technology	3
NAME 6401	Marine Transportation System	3
NAME 6402	Design of Cargo Access Equipments	3
NAME 6403	Computer Simulation.	3
NAME 6501	Advanced Marine Engineering	3
NAME 6502	Marine Transmission Systems	3
NAME 6503	Control Theory in Marine System Design	3
NAME 6601	Mechanics of Water Waves	3
NAME 6602	Harbour Engineering	3
NAME 6700	Seminar	0

One non-Departmental Course other than Math-1101 and Math - 1201 may be offered.

**DETAILED COURSES OF  
THE DEPARTMENTS**



## **Faculty of Architecture and Planning**

### **Department of Architecture**

#### **UNDERGRADUATE COURSES**

##### **ARCHITECTURAL SCIENCE I**

###### **Arch 121 Climate and Design I**

2 hours per week 200 marks

Introduction, global climatic factors, elements of climate, measuring the elements and recording the data; Classification of climates, tropical climate, site climate.

##### **THEORY AND HISTORY OF ARCHITECTURE I**

###### **Arch 131 Design I**

1 hour per week 100 marks

Architecture, design, elements of design, principles of design, philosophies of architecture, design methods.

###### **Arch 132 Art and Architecture I**

2 hours per week 200 marks

A general survey of world art and architecture; Study of the various Arts and their relationships to architecture through the ages.

##### **CONSTRUCTION AND STRUCTURE I**

###### **Arch 141 Construction Details I**

1 hour per week 100 marks

Simple constructions, Foundations, floors, walls, doors and Windows.

##### **STUDIO WORK I**

###### **Arch 191 Design I**

9 hours per week 450 marks

Freehand drawing in various media, basic design problems, room arrangements, single-cell building design.

### **Arch 192 Architectural Graphics**

6 hours per week 300 marks

Relationship of mechanical and free hand drawing, study of scale, composition, drafting, lettering, execution of mechanical and free hand perspective shadows and reflections in perspectives both mechanical and freehand.

### **HUM 111 Sociology and Psychology**

2 hours per week 200 marks

For First year Architecture

Sociology: Introduction to sociology. Principles of human relations, contribution of biology, geography, group life and culture to development personality, living habits in Bangladesh, working habits in Bangladesh, social evolution.

Psychology: Principles of human behaviour, motivations of behaviour and mechanisms of adjustment to conflicts.

### **MATH 122 Mathematics**

2 hours per week 200 marks

For First year Arch

#### **PART A**

Section A: Differential Calculus

Limit. Continuity Differentiation. Successive and partial differentiations with allied theorems. Rolle's theorem. Mean value theorems for one variable Expansion of functions by Taylor's series and Maclaurin's series. Tangents and normals. Maxima and minima for functions of one variable.

Section B: Integral Calculus

Integration by various methods. Definite integrals. Area bounded by plane curve Trapezoidal rule. Simpson's rule and Wedle's rule.

#### **PART B**

Section A: Ordinary differential Equation

Formation of differential equations. Solution of equations of first order by various methods. Solution of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equations. Applications.

### **Section B: Solid Geometry**

System of co-ordinates. Distance between two points. Section formulae. Direction cosines. Equations of planes and straight lines. Shortest distance between two given straight lines. Standard equations of sphere and ellipsoid. Tangent planes.

### **PHY 123 Physics**

2 hours per week 150 marks

For First year Arch

#### **PART A**

##### **Heat**

Conductivity: introduction. Definition of thermal conductivity, thermal diffusivity, Ingen Hausz's method for comparing the conductivities of different metals, determination of thermal conductivity of bad conductors by Lees Method, Underground temperature-age of the earth.

Convection: Definition. Newton's law of cooling. Domestic and industrial application ventilation, domestic hot water supply and central heating.

Radiation: Introduction, blackbody. instruments for detecting and measuring thermal radiation-Leslie's differential air thermometer, thermopile. Emission and absorption of radiation, Prevost theory of exchange. Humidity: Definition. Absolute humidity. Relative humidity. Dew point, the control of humidity.

##### **Sound**

Wave motion: Periodic motion, Vibratory motion, Simple harmonic motion, meaning of (a) amplitude (b) Frequency (c) Frequency (d) Phase (e) Phase difference and Epoch, Equation of simple harmonic motion, Velocity, acceleration. Kinetic and potential energies of a particle executing simple harmonic motion.

Sound Waves: Progressive and Stationary Waves, interference and beats. Doppler's principle, reflection, refraction, absorption and diffraction of sound. Sound insulation in building. Decibel and other units Musical scale.

Architectural acoustic: Analytical treatment of reverberation-Growth of intensity and decay of intensity.

## PART B

### Light

Nature of Light: Theories regarding the nature of light. Corpuscular theory and wave theory, Huygen's principle.

Interference of Light: Meaning of the term and the condition of interference, Width of fringes produced by two coherent sources formation of interference fringes by Fresnel Biprism and determination of the wavelength of monochromatic light, explanation of the formation of Newton's ring and their application.

Diffraction: Meaning and its difference with interference, Fraunhofer and Fresnel diffraction.

Polarization of Light: Meaning of polarization, Double refraction and Nicol's prism, specific rotation, the polarimeter.

Illumination and Photometry: Luminous intensity, illumination and practical illumination, their units and measurement, phosphorescence, fluorescence, electrical and discharge lamps, reflecting powers of different sources, principles of lighting, illumination of home, street, factory etc., architectural lighting systems, flood lighting.

### Electricity

Current and Resistance: Electric current and e. m. f., ohm's law, Kirchhoff's law, analysis of simple circuits. Magnetic field and Ampere's law: Ampere's law for magnetic field of a current, Force on a current due to magnetic field, magnetic fields of simple circuits. Faraday's law and inductance. Alternating current: Alternating current circuits, electronic instruments.

### Modern physics

Atomic structure: Bohr's model of hydrogen atom, atomic spectra. Radioactivity: Radioactivity, law of exponential decay, half life, mean life. Law of successive disintegration, Relativity: Theory of special relativity postulates, variation of mass with velocity, mass-energy relation. The Nucleus: Binding energy, Fission and Fusion processes, Atomic Reactor. Gravity: Laws of gravity, escape velocity.

### SH 142 Carpentry and metal Works

3 Hours per week 100 Marks

Use of hand tools and machines for basic wood framing and simple cabinets of wood and other materials, making of simple furniture.

## ENVIRONMENTAL STUDIES 11

### Arch 211 Basic Planning

1 hour per week 100 marks

History of settlements; Basic planning theories, introduction to community, city and regional planning, Problems of planning in Bangladesh.

### ARCHITECTURAL SCIENCE 11

#### Arch 221 Climate and Design 11

1 hour per week 100 marks

Sun-built form relationships, wind-built form relationships, precipitation built form relationships; design applications.

### THEORY AND HISTORY OF ARCHITECTURE 11

#### Arch 232 Art and Architecture 11

2 hours per week 200 marks

Art and Architecture in the Indo-Pak-Bangladesh subcontinent-ancient to modern.

### CONSTRUCTION AND STRUCTURE 11

#### Arch 241 Construction Details 11

1 hour per week 100 marks

Stair cases, bath rooms and toilets; Introduction to large span roofs and framed buildings, economic and technical feasibility of different common structural systems, problems of water proofing.

#### Arch 243 Building and Finish Material

2 hours per week 200 marks

Concrete, steel, brick and wood-nature and use; Terrazzo, plaster, roofing glass, paint, insulation and plastic-nature and use; Detail sketches.

### STUDIO WORK 11

#### Arch 291 Design 11

12 hours per week 600 marks

Simple buildings with simple functions, layouts of housing, markets etc. with emphasis on circulation.

#### Arch 292 Photography and Graphic Reproduction

3 hours per week 100 marks

Fundamentals of photography, art of taking good photograph, developing and printing of films, principles of composing good photographs of buildings and interiors.

**Arch 293 Graphic Art and Sculpture**

6 hours per week 200 marks

Drawing and painting, relationship to architectural presentation; Studies in clay, wood, metal, etc.

**CE 229 Structure 11**

2 hours per week 200 marks

For second second year Arch.

Force, Equilibrium, Coplanar concurrent force system, coplanar parallel force system, coplanar non-co current non-parallel force system; Free body diagrams; Introduction to simply supported beams and frames, calculation of bar force for simple trusses, shear force and bending moment. Introduction to shear force and bending moment diagrams; Maximum and volumes; Theorem of Pappus and Guldinus, Radius of gyration: Centre of pressure; Moments of inertia of simple and composite areas, product of inertia. Moments of inertia of masses; Noncoplanar forces.

**CE 231 Plumbing**

1 hour per week 100 marks

For Second year Arch

Water supply in buildings, drainage and sewage disposal.

**SOCIAL AND ENVIRONMENTAL STUDIES 111****Arch 311 Advanced Theories of Planning**

1 hour per week 100 marks

Physical Planning as a space dimension of national economic planning, economic development and regional growth; Economics, space, nature and principles of region; Theories and principles of resource use and their limitations.

**Arch 312 Urban Design**

1 hour per week 100 marks

Development of urban spaces through history; Principles and techniques for design of the city environment with special attention to its perceptual form, circulation and urban renewal.

**Arch 322 Architectural Acoustics**

1 hour per week 100 marks

The physiology of sound perception, generation and propagation of sound, behaviour of sound in closed spaces, auditorium acoustics; Noise measurement and control.

**THEORY AND HISTORY OF ARCHITECTURE****Arch 332 Art and Architecture 111**

2 hours per week 200 marks

Modern art and architecture in the 19th and 20th centuries.

**Arch 342 Specifications and Cost Estimating**

1 hour per week 100 marks

Written details answering what, where, when, how, in relation to drawn details for building construction and determining the cost of construction.

**STUDIO WORK 111****Arch 391 Design 111**

18 hours per week 900 marks

Complex building problems including large public building with technical analysis.

**Arch 392 Working Drawings**

3 hours per week 100 marks

Details of drawings for construction of buildings, plans, elevations, sections, large scale details, schedules etc.

**CE 329 Structure III**

2 hours per week 200 marks

For Third year Arch.

Fundamental concepts of strength of materials; stresses and strains in members subjected to tension, compression, shear and temperature changes. Shear force and bending moment diagrams for statically determinate structures. Space frame works; Flexural and shearing stresses in beams. Double integration and Area-Moment methods of finding slopes and deflection in statically determinate beams; Indeterminate beams analyses. Buckling of slender columns; Principal stresses.

**EEE 323 Basic Electrical Technology for Architects**  
(Electrical Equipments)

1 hour per week 100 marks  
for third year Architecture

Electrical units and standards, electrical networks and circuits theorems  
Alternating current-RLC series and parallel circuits.  
Introduction to electrical wiring for residential and commercial loads.  
Illumination and working principles of different types of lamp.

**ME 321 Mechanical Equipment**

1 hour per week 100 marks  
For third year Architecture

**Part A**

Review of basic concepts and definitions. Applications of Air conditioning, Psychrometrics, Cooling Load calculations, cooling and dehumidifying equipment, air handling and distribution, air conditioning systems, airconditioning equipment.

**Part B**

Fire hazards; fire detection and fire fighting methods. Vertical transportation; types of elevators, determination of size and quantity of elevators; Incoming and outgoing traffic handling, mechanical and electrical aspects of elevators, Escalators, moving ramps.

**Arch 412 Housing**

2 hours per week 200 marks

Housing and Community, their influence on individuals, societies and the environment; Physical, Social, economic and technical aspects of housing problem in Bangladesh.

The role of private and public sectors in housing; Housing finance, spaces, standards, housing infrastructure and other housing design requirements; Current housing technologies.

**Arch 413 Rural Planning**

1 hour per week 100 marks

Historical background of rural settlements; Nature and components of the rural environment; Social and economic characteristics of the rural communities; Rural resources and resource utilization.

The criteria for rural planning; the concept of integrated rural development; Policies and strategies for rural development; Organization of development activities; Development of institutions. quantitative, qualitative and spatial aspects.

**Arch 414 Landscape Design**

1 hour per week 100 marks

Introduction, elements and principles of landscape design, site analysis and design. Introduction to plant materials and their uses, application to design problems.

**ARCHITECTURAL SCIENCE IV**

**Arch 421 Surveying Techniques and Analytic Methods**

1-2 week 100 Marks

Introduction to surveying; Principles and techniques of physical and socio economic survey.

Introduction to analytic methods and their application; Fundamental quantitative techniques in demography, landuse, transportation, housing, physical infrastructure, services and community facilities.

**STUDIO WORK 1V**

**Arch 491 Design 1V**

18 hours per week 900 marks

Urban planning and design; Planning and design of towns and satellite towns, urban renewal of city blocks, slum clearance and housing, river front development, etc.

Study and design of complex multifunctional buildings in the light of modern technology, centres for different organizations such as AEC, BIDS, etc.

**Arch 492 Landscape Design**

3 hours per week 100 marks

Case studies through sketches, drawings and reports of buildings and built environment. Application of the principles and techniques of landscape design in design exercises.

**Hum 411 Logic and Philosophy**

2 hours per week 200 marks

**Logic**

Introduction to inductive and deductive logic, thought, propositions, Syllogisms, Fallacies, cause, hypothesis, analogy.

**Philosophy**

Nature of philosophic Inquiry, relationship of philosophy to religion, science, history, politics and education.

**CE 429**

2 hours per week 200 Marks

Different types of trusses. Wind load analysis and static load analysis for truss. Design of truss sections. Influence Lines for beams and frames.

Fundamentals of Reinforced Concrete members. Beams- Singly Reinforced, Doubly Reinforced and T-beam, Analysis and design of one-way slabs. Design of columns and footings.

**SOCIAL AND ENVIRONMENTAL STUDIES V****Arch 511 Health Facilities Planning**

2 hours per week 200 marks

Identification of the environmental and health need in Bangladesh. Analysis of the environmental and health problem in urban and rural areas of Bangladesh. Fundamental of health facilities planning, programming and design in realistic setting of Bangladesh.

**Arch 513 Seminar (Thesis, design, architecture)**

3 hours per week 100 marks

Discussion on design methodology, approach, design evaluation scope, prospects and methodology. Advanced technical and scientific knowledge in the building industry, current development in the field of architectural research.

**STUDIO WORK V****Arch 515 Design V**

21 hours per week 1050 marks

Advanced architectural problems involving socio-economics, psychological and cultural aspects.

Study, analysis and design for solutions of national problems such as rural development. Health, recreation and housing facilities development in industrial complexes etc.

**BUILDING ADMINISTRATION****Arch 541 Professional Practice**

1 hour per week 100 marks

Professional services, Professional ethics; Architect Client relationship. Contracts and law, Procedure in office and the field.

**Arch 543 Construction Management**

1 hour per week 100 marks

Basic concepts and principles of management; Development of management skills; Management of organisation; Decision making; Planning and control. Basic Statistics; Basic operations; Research; Plans; Bidding and Sub-contracting, Use of Operations Research Techniques.

**Hum 516**

1 hour per week 200 marks.

**PART A**

Different kinds of cheques, Coasting; Coasting; Elements of costs, Direct and indirect costs. Accounting for direct and indirect costs, Stores procedure, inventory control.

Overheads allocation. Cost sheet.

**PART B**

Break-even, analysis. Construction accounting, Budgeting and budgetary control. Standard costs-Computation of cost variances.

Planning in construction industry-Production Planning, Pre tender planning. Contract planning, Detailed planning, control, Scheduling, Use of statistical and other tools in construction industry

Project management, Network analysis, origin and recent developmet, Arrow diagram, Critical path method, PERT, Allocation of resources.

Construction Management, its nature and scope, climate and the Architect organisation of construction firm, Control of construction cost, operations, Control Techniques, Gantt chart, operations planning, its fundamentals.

Appraisal of resulsits, various methods of appraisal.



Operations Research, nature and significance, the techniques of or allocation sampling Replacement.

Inventory control, nature and significance, Types of inventory, economic order quantity, re-order point, safety stock.

Waiting line or queueing theory-natality line models problems on waiting line.

Linear programming, basic concept and use in business, Algebraic and simplex method of Linear programming, some elementary problems on linear programming.

Bidding and subcontracting, Use of various quantitative tools in the field of management.

### **CE 529 Structure V**

2 hours per week 200 marks

For Fifty year Arch.

Review of Reinforces. Concrete design. Introduction to ultimate strength design.

Concepts of structural system. Design of one-way and two-way slabs.

Preliminary design of flat plates. flat slabs. waffle slabs. one way and two way ribbed slabs. Columns-stocky and long.

Grids approximate analysis. Approximate analysis of multistoried buildings for gravity and lateral loads. Vierendeel truss. Folded plates.

Introduction of shearwalls preliminary design.

Prestressed Concrete-Introduction. Properties of materials. Losses of prestress analysis and preliminary design of beams sections.

Cables, Arches domes and shells-Introduction and preliminary design.

Classification of shells.

### **POSTGRADUATE COURSES**

#### **Arch 6101 Housing Problems and Policies in the Developing Countries**

3+1 = 4 credits

General introduction to the Developing Countries with particular reference to the housing contexts-background, historic growth, common characteristics and contemporary developments; Demographic Analysis; growth, poverty and income distribution; Agricultural transformation and Rural-urban migration; Unemployment issues; Meaning of development; Housing in development.

Specific problems of housing in the developing countries; the extent, dimensions and diversities of the housing problem; Major housing issues-land,

labour, materials, techniques; an overview of the theories and concepts of housing.

Analysis of contemporary housing policies; Institutional frame works; Housing finance; Process of devising a housing strategy; Formulation of standards.

#### **Workshop**

#### **Arch 6102 Thermal Environment in Built-form** 2+1 = 3 credits

Introduction; Effects of thermal environment on men; the determinants of the thermal environment; Measuring techniques of the elements; Thermal comfort and the thermal comfort criteria; Thermal environmental evaluation.

The thermal quantities; thermal performance of buildings-the process of heat gain and heat loss; Quantitative assessment; Periodic heat flow; Thermal environmental control by structural means-structural centre in relation to the sun, structural control in relation to ventilation and structural control in relation to precipitation.

#### **Workshop**

#### **Arch 6103 Theories of Urban Design** 1+1 = 2 credits

Introduction; Activity systems as a generator of physical forms and vice versa; Historical comparative analysis of the activity systems and the resultant built-form as a product of political, economic and social forces; Analysis of the grammar of urban physical pattern-paths, nodes, edges, spaces, and landmarks; Discussion of some major theories on urban form and design; Preservation, conservation and urban renewal.

#### **Arch 6104 Health Problems in the Contemporary Societies** 1 credit

Introduction; Identification of the environmental and health issues in the developed and the developing countries in general and Bangladesh in particular; Analysis of the magnitude and diversities of the problem and needs in the developed and the developing countries in general and Bangladesh in particular.

#### **Arch 6105 Analytic Methods**

1 credit

Introduction to analytic planning tools and their application; Fundamental quantitative techniques in demography, land use, transportation, housing,

physical infrastructure, services and community facilities; Use of quantitative methods in planning.

Statistical data collection, reduction and representation; Types of observation; Frequency distribution; Measures of central tendency; Measures of dispersion; Concept of correlation and regression; Multiple and partial correlation; Casual inference and path analysis; Analysis of co-variance and dummy variables; Factor and cluster analysis and analysis of variance.

#### **Arch 6109 seminar**

**1 Credit**

Study on current developments in the field of architectural research; Equips the students on the presentation of papers, seminar, publications etc.

#### **Workshop**

##### **Arch 6202 Urban Housing**

**2+1 = 3 credits**

Reviewing urban housing policies and their impact on life in the city; Inter relationship between housing and other issues-Business, Commerce and Industry; Form and control of public and community participation in shaping the housing environment.

Development a housing programme; Housing need-effective demand, potential demand and changing need; Analysis of different types of projects-upgrading projects. site and service projects; New-built low income projects, new urban settlements (Planned and spontaneous), self-help projects; Housing layout design; Provision of utility services; Building materials and techniques; Nature of design and construction; The role of professionals.

#### **Workshop**

##### **Arch 6203 Sonic Environment in Built-form**

**2+1 = 3 credits**

Introduction; Effects of sonic environment on men; the determinants of the sonic environment; the sonic quantities; Measuring techniques; Sonic environmental design criteria; Sonic environment evaluation.

Behaviour of sound in enclosed spaces; Geometrical and statistical methods of study; Designing rooms of speech; Designing rooms for music; Designing auditoriums cinema halls, recording studios; Sound reinforcing systems; Noise and noise control in spaces.

#### **Workshop**

##### **Arch 6204 Urban Systems**

**1+1 = 2 credits**

History and analysis of the city as a social system; the development of communities and neighbourhoods and effects of ethnic, racial and religious groups; the distribution of income and occupation, class structure, life styles and their effects on communities and neighbourhoods.

Analysis of the city as an economic system; Interrelationship between business, commerce and industry and their effects on urban pattern; Urban locational decisions and transportation; land value and urban form.

Analysis of the city as an economic system; interrelation-ship between urban planning and design and the political setup; the urban planning and design institutions and co-ordination of their activities; project programming, implementation, management and control workshop.

##### **Arch 6205 Health Facilities Planning and Design**

**1 credit**

Fundamentals of health facilities planning, programming and design; Case studies of approaches in health facilities planning and design in the developed as well as the developing countries; Review of the approach in Bangladesh, its problems and prospects.

##### **Arch 6206 Research Methodology in Architecture**

**1 credit**

Aspects and scope of research in architecture; problem identification and selection; Research design, data collection, processing and analysis, computer application; Research report writing.

##### **Arch 6207 Regional Architecture of Bengal**

Major aspects :

M. Arch. Programme

1. a. Architectural Heritage  
b. Vernacular Characteristics  
c. Contemporary Trend

2 + 1 = 3 credits

##### **2. Theory (2 credits)**

1. a. Arch. heritage : History of Architecture in Bengal region (from Chandragupta/Asoka's period, 3rd C. B. C) Buddhist, Hindu and Muslim structures, monuments, public buildings, palaces, mosques and

monasteries-studies on the spatial characteristic, proportion, use of materials, craftsmanship, constructions techniques, other architectural features.

b. Vernacular Characteristics; Investigation on the vernacular characteristics of the structures studied. Examination of the existence of the architectural elements with respect to the socio-cultural context; availability, application and use of building materials and other relevant aspects. Comparative analysis.

c. Contemporary trend : Critical evaluation of the transformation/reflection of the heritage question, vernacular features etc. on the contemporary architecture of the country.

## 2. Workshop/Fieldwork 1 credit

a. Detailed survey of at least one of the existing historical structure of Bengal region. Documentation of the fieldwork in form of reports.

b. Analytical exercise of the architectural works (contemporary period).  
Course Outline for M. Arch. Programme, Dept. of Architecture, BUET, Dhaka, Bangladesh.

## Arch. 6208 Safety and security in Buildings 2 + 1 = 3 Credits

### 1. Theory (2 credits)

Definition of safety and security, difference between safety and security, aspects of safety and security, aspects of safety and security in buildings.

Implication on design, legislation and current practices with reference to the followings:

#### A. Safety from accidents :

Definition, monitoring accidents, socio-economic effects of accidents, aims and objectives of the basic principles of safety responsibility, duties and responsibilities of owners, employers and users, types of accidents-general, process accidents and disasters, prevention of accidents, etc.

#### B. Security in Buildings :

Need for security in buildings, risks of security breach, aims of physical security control, targets, lines of defence against, intruders, thieves and vandals; relationship between security and fire prevention; protection of a building, its occupants and its effects; layout of buildings for achieving security; control

measures and barriers, access control systems; principles and laws of internal policing, etc.

#### C. Fire prevention and control :

Socio-economic and physiological implications of fire, history of fire, evolution of fire prevention regulations, risks of fire by building groups, classification of fires, objectives of fire precautions, action in case of fire, internal and external hazards, planning for fire prevention and control, pattern of fire development, structural measures against fire, causes of fire, design of escape route, effects of smoke, principles of compartmentation, fire detection, alarms and extinguishing systems, etc.

#### D. Safety signs and symbols :

Need for signs and symbols, psychology of signs and symbols, characteristics, reuse of colours, meaning of signs and symbols, examples of uses, etc.

#### E. Security and emergency lighting :

Objective, basic techniques, need for such lighting, transmission from normal to emergency lighting, luminaires for security and emergency lighting, planning for such lighting, etc.

## 2. Workshop/field work (1 credits)

## Arch 6303 Domestic Architecture 2 + 1 = 3 credits

Development of house through the ages; the pre-urban house; the oriental urban house; the occidental urban house; Rural house in Bangladesh Influence of socio-technical changes in domestic design; Meaning and purpose of different domestic spaces; Relationships between domestic organization and the house design; Family and house-changing need, adaptation, space appropriation in different stages of family life.

### Workshop

## Arch 6304 Luminous Environment in Built-forms 2+1 = 3 credits

Introduction; Effects of luminous environment on men; Daylighting and the determinants of the daylighting environment; Daylighting measurement and calculations; Daylighting design criteria and designing for daylighting. Artificial lighting and the determinants of the artificial lighting environment; Artificial lighting measurements and calculations; Artificial lighting design criteria and designing for artificial lighting.

## Department of Humanities

### UNDERGRADUATE COURSES

#### **HUM 101 English and Economics**

2 hours per week 150 marks

for First year CE, EEE, ME, Met. E. NAME

English

##### **PART A**

Definition of scientific terms, comprehension, precis writing, phrases and idioms, commercial correspondence and tender notice.

##### **PART B**

Essay writing, application and description, construction of sentences and paragraphs.

#### **Economics**

##### **PART A**

Nature of an economic theory, applicability of economic theories to the problems of developing countries. Some basic concepts-supply, demand and their elasticities. The relationship among average, margin and total and their derivation. Equilibrium-stable, straight and dynamic equilibrium. Consumer's equilibrium-indifference curve, producer's equilibrium isoquant.

##### **PART B**

Production-factors of production, production possibility curve-equilibrium of a firm, fixed cost and variable cost, the short run and the long run. The cost curves and supply of curves, law of returns, internal and external economies and diseconomies.

Economics of development and planning, basic concept-saving, investment, GNP, N.N.P. percapita income, growth rate, policy instruments of development. Fiscal policy. Monetary policy and trade policy-their relative applicability in Bangladesh. Some planning tools - capital output ratio, input-output analysis, planning in Bangladesh- five year plans, development problems related to agriculture, industry and population of Bangladesh.

### **Hum 103 English**

2 hours per week 200 marks  
for First year Ch. E.

#### **PART A**

Precis writing; comprehension; Commercial correspondence; Tenders; idioms; Proverbs; Synonyms; Prefixes and Suffixes and punctuation.

#### **PART B**

Paragraph writing; Essay writing; Common mistakes in grammar. Vocabulary; Amplification; Report writing; Analysis and figures of speech.

Calendar

### **Hum 111 Sociology and Psychology**

2 hours per week 200 marks  
for First year Architecture

Sociology: Introduction to sociology, principles of human relations, contribution of biology, geography group life and culture to development personality, living habits in Bangladesh, working habits in Bangladesh, social evolution.

Psychology: Principles of human behaviour, motivations of behaviour and mechanisms of adjustment to conflicts.

### **HUM 201 Government and Sociology**

2 hours per week 150 marks  
for Second year Ch. E.  
Government

#### **PART A**

Some basic concepts of Government and Politics. Functions, organs and forms of modern state and Government; Socialism, Fascism, Marxism, U.N.O.

#### **PART B**

Government and politics of Bangladesh. Some major administrative systems of developed countries. Local self-government.

### **Sociology**

#### **PART A**

Scope, social evolution and techniques of production, culture and civilization, Social structure of Bangladesh. Population and world resources. Oriental and Occidental societies, Industrial revolution.

#### **PART B**

Family- urbanization and industrialization, Urban Ecology, Co-operative and Socialist movements, Rural Sociology.

### **HUM 203 Accountancy and Industrial Management**

3 hours per week 250 marks.  
For Second year EEE.

#### **Accountancy**

1 hour per week 100 marks.

Basic Accounting principles, Different kinds of cheque, Cash book-Petty cash book, Elements of cost; Direct costs, Overhead allocation.

#### **PART B**

Preparation of cost sheet. Marginal analysis, Computation of breakeven point. Standard costing, Cost variance.

#### **Industrial Management**

2 hours per week 150 marks

#### **PART A**

Authority and responsibility administration, management and organization. Scientific management and organisation; Time and motion study; Learning curve; Organization structure; Principles of organization; Organization chart; Span of control; policies; Decision making. Analytical methods in management- Linear programming; Waiting line and cost data for decision, network analysis, arrow diagram, critical path; Planning- Types of planning investment policy and criteria; Depreciation, various methods, Equipment policy, Personal management- Selection and recruitment of employees, interview and indoctrination; training and its types; Promotion; Basis of promotion- industrial reaction; Wage systems and incentive and supplementary wage and salary administration. Accident prevention and safety instruction. Job-evaluation and merit rating. Statistical quality control.

## PART B

Plant layout, layout of physical facilities. Transportation and storage, material handling. Maintenance; Classification of objects to be maintained; Maintenance policy; Planning maintenance function, turn-around or stand-by machine, control of maintenance function. Production control in intermittent and continuous manufacturing industry, objectives and functions of production control; Supplementary planning; Scheduling; Despatching; Assembly line control. Forecasting; utility and various methods; Coordination between sales and manufacturing; Manufacturing economics.

Purchasing procedure; Inventory control-need and methods of control; Factors affecting inventory build-up, economic lot size and re-order point. Sales: Organisation and promotion; Measures of performances, measurement and analytical problem of productivity, cost of management and industrial reorganisation. Production standard and work measurement; work sampling and its methods; Allowance in production standards.

## Hum 207 Accounts and Sociology

2 hours per week 150 marks

For Second year CE

### Accounts

#### PART A

Basic Accounting principles, Different kinds of cheque, Cash book; petty cash book. Elements of cost. Direct and indirect elements; Accounting for direct and indirect costs. Overhead allocation.

#### PART B

Preparation of cost sheet. Marginal analysis, Computation of break-even point, Standard costing-cost variances

### Sociology

#### PART A

Scope, Social evolution and techniques of production. Culture and Civilizations. Social structure of Bangladesh, Populations and World resources. Oriental and occidental societies. Industrial Revolution.

#### PART B

Family-Urbanization and industrialization, Urban ecology, Co-operative and socialist movements, Rural sociology.

## Hum 305 Industrial Law, Sociology and Accounts

3 hours per week 300 marks

For Third year ME, NAME

### PART A

Industrial law in Bangladesh-various legislation affecting labour; Factories acts; Industrial relations; ordinance; Payment of wages; Legislation regarding employment in industry, agriculture mines.

### PART B

Workman's compensation Act; Labour policy of the State; ILO and other international bodies affecting labour welfare; Employment of labour (Standies order); Trade union; Employment in shops and establishment.

### Sociology

#### PART A

Scope, Social evolution and techniques of production. Culture and civilization. Social structure of Bangladesh, Population and world resources. Oriental and occidental societies; Industrial revolution.

#### PART B

Family-Urbanization and industrialisation. Urban ecology, co-operative and socialist movements. Rural sociology.

### Accounts

#### PART A

Basic Accounting principles, Different kinds of cheque, costing, Elements of cost. Accounting for direct and indirect costs. Inventory control and stores records. Overhead allocation, Preparation of cost statement.

#### PART B

Cost-volume profit relationships, computation of break-even point. Budgeting and budgetary control; How to forecast. Preparation of sales and production budgets. Standard costing; computation of cost variances, computation of sales variances. Opportunity costs, Joint and by-products costs.

## HUM 309 Economics and Development Economics

2 hours per week 200 marks

For Third year ChE



## PART A

Micro-economics and Macro-economics. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Some basic concepts-demand, supply and their elasticities. Equilibrium-Consumer's equilibrium-indifference curve analysis, producer's equilibrium-isoquant. Production-Factors of production, Production function, Forms of productivity, Rational region of production, profit maximisation. Equilibrium of firm, the short run and the long run. Fixed cost and variable cost. The concept of optimization, least cost input combination. Internal and external economics and diseconomics. Economics of development & Planning, basic concepts-saving, investment, GNP, NNP, GDP, per capita Income, Inflation, Policy Instruments of development-Monetary policy, fiscal policy and trade-policy-their relative applicability in Bangladesh. Some planning tools-capital output ratio, input-output analysis.

## PART B

Economics of underdevelopment. Interdependence of developed and underdeveloped economies. Necessity of economic development; underdeveloped economies-characteristics, vicious circle of poverty. The meaning of economic development. The stages of economic growth. Determinants of economic growth; Economic factor, Non-economic factors, strategy of economic development. Big push, balanced and unbalanced growth. Investment criteria. Role of Government in economic development. Economic planning, planned and unplanned economic plan, features of a plan; Forms of planning- Total and partial, structural and functional, centralised and decentralised; Planning by direction and planning of inducement. Financing of economic plan, taxation, borrowing; deficit financing. planning in Bangladesh, five year plans of Bangladesh. Nature and features of Bangladesh economic development. Development problems related to agriculture, industry and population of Bangladesh.

## Hum 313 Industrial Law, Sociology and Accounts

3 hours per week 300 Marks

For Third year MetE.

Industrial Law

## PART A

Industrial law in Bangladesh-various legislation affecting labour; Factories Acts; Industrial relations; ordinance; Payment of wages, Legislation regarding employment in industry, agriculture, mines.

## PART B

Workman's compensation Act: Labour policy of the State; ILO and other international bodies affecting labour welfare; Employment of labour (Standing order); Trade union; Employment in shops and establishments.

## Sociology

## PART A

Scope, Social evolution and techniques of production. Culture and civilization, Social structure of Bangladesh. Population and world resources, Oriental and occidental societies, Industrial revolution.

## PART B

Family-Urbanization and industrialisation, Urban ecology, co-operative and socialist movements. Rural sociology.

## Accounts

## PART A

Basic Accounting principles, Different kinds of cheque, costing; Elements of cost, Accounting of direct and indirect costs. Inventory control and stores records. Overhead allocation, Preparation of cost statements.

## PART B

Cost-volume profit relationships, computation of break-even point, Budgeting and budgetary control; How to forecast, Preparation of sales and production budgets. Standard costing computation of cost variances, computation of sales variances. Opportunity costs. Joint and by-products costs.

## Hum 411 Logic and Philosophy

2 hours per week 200 marks

for Fourth year Arch.

## Logic

Introduction to inductive and deductive logic. Thought, propositions, Syllogisms. Fallacies, cause, hypothesis, analogy.

## Philosophy

Nature of philosophic inquiry, relationship of philosophy to religion, science, history, politics and education.

### **Hum 516 Accounting**

1 hour per week 100 marks

For Fifth year Arch.

#### **PART A**

Different kinds of cheques, Costing Elements of costs, Direct and indirect costs. Accounting for direct and indirect costs. Stores procedure. Inventory control. Overheads allocation. Cost sheet.

#### **PART B**

Break-even analysis. Construction accounting, Budgeting and budgetary control. Standard costing- Computation of cost variances.

### **ARCH 543 Construction Management**

1 hour per week

100 marks

#### **PART A**

1. Basic concepts of management- origin and function of management- Planning-Policy concepts- Process of Delegation- Decision-making process in business-various quantitative tools used in decision making.
2. Planning in construction industry- Production Planning-Pre-tender planning, Contract Planning, Detailed Planning Control-Scheduling-Use of statistical and other tools in construction industry.
3. Project management-Network analysis-origin & recent development - Arrow diagram- Critical Path Method- PERT- Allocation of resources.
4. Construction Management-- Its nature and scope -- Client and the Architect--- Organisation of a construction firm, --- Control of construction cost-- Operations Control Techniques -Gantt Chart--- Operations planning --its development and fundamentals.
5. Appraisal of results --various methods of appraisal.

#### **PART B**

6. Operations Research--nature and significance-- the techniques of OR--- Allocation- Sampling -Replacement.

7. Inventory Control-nature and significance- Types of inventory-- Economic Order Quantity--Re-Order point-- Safety Stock.
8. Waiting Line or Queing Theory-- nature & utility --- Waiting line models-- problems on waiting line.
9. Linear Programming--basic concept and use in business-Algebraic and Simplex method of Linear Programming -some elementary problem on linear programming.
10. Bidding and sub-contracting-- Use of various quantitative tools in the field of management.

## Department of Urban and Regional Planning

### POST- GRADUATE COURSES

(The three numbers within parentheses immediately after the title of the course show (a) lecture hours per week; (b) Studio or sessional hours per week and (c) Number of credit, respectively).

#### **Plan 6000 : Thesis 18 credits**

Independent study supplemented by frequent conferences with staff members.

#### **Plan 6001 : Human Settlement & Land Economics (2-0-2)**

Factors determining the nature, form and character of human settlements in different historical periods. Human ecological process. Basic concepts and theories of Urban ecology; ecology and changing spatial pattern, theories of urban growth, structure and land use pattern. The rural urban fringe. The size, distribution, spacing and historical orders of urban settlements. Economics of urbanization.

Space and the context of land and land economics; components of urban and rural land use; physical, economic and institutional characteristics of urban land. Urban land-income, value and price. Determinants of urban land value and use. Imperfections in urban land market and planning policies. Rural land use market, pricing and use.

#### **Plan 6002 : Economics for Planners (2-0-2)**

Concern of economics, e. g. resources and wants, economics for planners, the need, nature and type of economic analysis viz., market mechanism, micro vs macro economics. Theory of consumer's demand. Theory of production, scale of production, internal/external economies/diseconomies, production function, returns to scale, efficiency of resource allocation and product pricing under different market situations. Nature of cost and cost curves. Theory of distribution, e.g. rent for land, wages for labour, interest for capital and profit. Macro-economics, national income, theory of income and employment.

Welfare economics, economics of environment-externality; international trade, public finance, budget, and municipal finance.

**Plan 6003 : Planning Process and Theories (2-0-2)**

Fundamental aspects of planning as a general human endeavour- planning as a subject of study and as professional activity; Considerations of the need for planning and possible scope of planning activity; The role of urban and regional planning and its relationship with the general theory and process of planning; Urban and regional planning at the local and strategic levels; Practical limitations and typical practice dilemmas, their causes and possible resolutions; Gradual development of ideas and concepts towards a standard body of planning knowledge and doctrine.

Contemporary conceptions, methods and technique use in plan preparation, policy formulation and implementation in view of the requirements of planning as a continuous process; The plan making process; planning process and Decision Theory.

**Plan 6004 : Urban Planning I (2-0-2)**

The shape, size and spatial structure of cities and towns. Component of urban land uses- residential, commercial, industrial, recreational, institutional, urban periphery and circulation system, Spatial organisation of residential, commercial industrial and recreational areas, planning and design considerations for development and redevelopment of Town centre, Neighbourhood, open space and Industrial Estates.

**Plan 6005 : Rural Development I (2-0-2)**

The meaning of rural development. Rural development and structural transformation-theory. The rural development in the Fifties -in Indian sub-continent : Bangladesh, India, Nepal, Srilanka. The rural development programs and projects in Sixties and seventies-including international experiences. Rural development in Bangladesh context : Co-operatives Comilla Model, Gram Sarker, Shannirvar Movement etc. The role of planning Commission, Ministry of IGRD, IRDP, BADC, Jatiya Samabaya Bank, International Agencies. Development of rural infrastructure, institutions and services. Development of rural communities. Process of rural planning- issues and strategies.

**Plan 6006 : Regional Planning I (2-0-2)**

Definition of region and regionalism. The nature of regions. The factors determining a region. The influence of natural and cultural elements on regional development; climate, topographical and geographical conditions, population, land use, agriculture, industry, power and transportation, resource and soil conditions, City and region; urban and rural settlements; trends and characteristics of development. Regional economy and regional order. Economic Development vs. regional growth. Regional distribution of public investment-dispersal vs. concentration; balance vs. imbalance; growth vs. Welfare. Examination of resource endowment and regional growth. Export activities and residuary activities. The economic base of cities; the basic and non-basic concept.

**Plan 6007 : Quantitative Techniques in Planning Analysis I (2-0-2)**

Statistical data collection; presentation of data; Measures of central tendency and dispersion; Graphical representation of statistical facts; Elementary Probability; Probability density function and distribution- The Binomial Distribution. The Normal Distribution, The Chi-Square Distribution, Student's Distribution; Elements of sampling theory; Statistical Decision theory for large and small samples; Simple linear regression and correlation; Population projection; Forecasting Techniques.

Introduction to multivariate analysis; Introduction to digital computation; Fortran programming; Introduction of packages for planning analysis.

**Plan 6008 : Transportation Planning (2-0-2)**

Functional requirement and interrelationship of all means for the movement of people and goods as they affect the physical pattern of the community; Characteristics of the different modes of transportation- road, rail, water and air; choice of mode of transportation; Modes of transportation in Bangladesh and scope of their future development; The problems of public transportation at national, regional and local levels (in Bangladesh) and considerations for their development; The transport planning process at urban and national level; Roadway capacity; Traffic management techniques;

**Plann 6009 : Housing and Community Development (2-0-2)**

Definition of housing -its influence on man, society and environment. Factors influencing housing situation. Evaluation of housing problems. General problems of housing in Bangladesh-specific problems of private enterprise, government and consumer; evaluation of social, economic, design, administrative and political problems. Housing policies in developed and developing countries -policy goals, policy methods, strategies and policy instruments. Housing standards, house ownership, land values, taxation on house property. Finance for housing-financing problems, sources of finance, mobilisation of resource for housing. The role of housing in promoting social integration; social programming of housing in urban areas.

**Plan 6010 : Planning Administration, Implementation and Management Process I (2-0-2)**

The organisation and function of planning agencies at different levels of Government. The complex questions of inter-sectoral co-ordination both in planning and implementation. Aspects of implementation and institutional capability -legal, financial, manpower and other. Legal aspects of planning.

**Plan 6011: Project Evaluation and Management Techniques (1-3-2)**

Preparation of projects; Purpose of Project evaluation; Economic versus Financial evaluation; Private versus social costs and benefits-concept of cost-benefit Analysis; Problems of identification, categorisation, quantification and evaluation of costs and benefits; The welfare basis of cost-benefits Analysis; Consumers surplus, Producers surplus, Pareto criterion, transfer payments, shadow pricing, equity problem; Basis of project selection-Financial criteria, Discounted Cash Flow Techniques, Choice of discount rate and social time preference; selection criteria; ranking rules, deferment criteria, Dealing with risk and uncertainty; Treatment of income distribution and inequalities; Workshop on project evaluation. Introduction to Critical Path Analysis Techniques.

**Plan 6012 : Seminar on Special Problems in Planning (2 credits) and Development-I**

**Plan 6020 : Project (6 credits)**

Individual student will select a problem on a particular aspect of urban and regional planning.

**Plan 6101 : Urban Planning II (2-0-2)**

Hierarchy of urban circulation system; concept of environmental areas and planning of environmental areas free from traffic nuisance. The urban renewal process; methods of urban renewal and central area redevelopment, planning of industrial estates, townships, satellite town, new town and town expansion. Theories dealing with current planning problems- problems characteristic of the large city including traffic, transportation, redevelopment, recreation and problem arising in sub-urban areas adjacent to cities and arterial highways.

**Plan 6102: Aesthetic Component and Urban Design (2-0-2)**

The role of plan organisation; spatial relations, symbol, scale, view, movement, panorama, light, colour, shade and details; composition, scale, proportion, harmony and contrast in the creation of urban spaces, building groups and building facades.

Principles and techniques for the design of the city environment, with special attention to its perceptual form, Development of the form of urban environment-influence of utopian and ideal concepts. The relation between city form and community objectives, the visual plan as part of the total planning process. Basic design principles of space, and circulation applied to the physical pattern of cities.

**Plan 6103 : Housing and Site Planning (2-0-2)**

Cost components of housing; potential areas for housing cost reduction. Housing density-building height and land saving relationship. Basics of housing management. Estimating housing needs. Principles of housing design and layout. Building codes; building regulations. Problems emphasizing physical development of specific sites involving population densities, public utilities, traffic, building grouping, land use, circulation planning and site engineering.

**Plan 6104: Physical Infrastructure Planning (Urban & Rural) (2-0-2)**

The systematic approach to planning of basic utilities, water systems, sewerage and land drainage, and roads. The urban and regional road pattern; The various types of road and structures-their alignment, width, gradient, construction and layout, Road capacities; The planning & design of road and



road junctions; Derivation of design standards from traffic considerations, parking standards, systems, policies and control.

Rural and urban water supply sewerage, sewage disposal and land drainage, other utilities such as electricity, gas etc. and their relationship with general development.

**Plan 6105 : Planning Administration Implementation and Management Process II (2-0-2)**

Enabling legislation; Eminent Domain; Police Power, Planning administration and laws in U.K. and other advanced countries. Development plans. The meaning of development. The control of development including planning permission, development orders, special forms of control. The enforcement of planning controls. Purchase notices. New Towns development. Compensation and betterment problems including compensations for restriction on urban development and urban renewal practice.

**Plan 6106 : Low-income Housing and Settlement (2-0-2)**

Structural and functional analysis of low-income settlement. The basic problem factors of Low-income housing. Limitation of current development policies. Myths of high rise. Low income housing policy. The sites and services scheme-its planning, design and implications.

**Plan 6108 : Systems Analysis in Urban & Regional Planning (2-0-2)**

Introduction to system approach; society as a system; Urban, Rural and Regional system; Need for systems analysis in Planning; Planning goal and systems structure; The systemic Planning process. Planning in the control of complex systems; system simulation-modelling; system guidance, control, and review.

**Plan 6109 : Quantitative Techniques in Planning Analysis (0-6-2)**

Demographic rate and ratio; population theories and projection and census study. Sampling Techniques; Random and stratified sampling. Estimation of mean, proportion, their standard errors. Urban and Rural Demographic pattern in Bangladesh. General ideas about different stages of survey operation.

Extraction of data from different official records and publications; preparation of forms for recording data. Acquaintance with contents of important statistical publications of Bangladesh and of the United Nations. Introduction to different types of mathematical curves and areas under curves in cartesian and polar co-ordinates.

**Plan 6110 : Special Studies (2-0-2)**

Individual studies on special topics related to the area of specialisation.

**Plan 6113 : Studio : Urban Planning Technique (0-6-2)**

Survey, analysis and design methods and practices in comprehensive Planning; Land use, circulation and other components of the city or metropolitan General Plan; relationship of planning to implementation techniques, zoning, urban renewal etc.

**Plan 6114 : Studio: Housing and Area Planning Technique (0-6-2)**

Practical application of theoretical principles for the development of housing projects. Problems emphasizing physical development of specific sites involving population densities, public utilities, street patterns, building grouping, land use, site engineering, architectural forms, gardening and landscaping. Problems dealing with neighbourhood structure, community facilities and urban renewal.

**Plan 6120 : Regional Development Planning and Resource Use (2-0-2)**

Theories and principles of the resource use and their limitation in regional development. Human and non-human resources. Movable and immovable resources. Changes in the concept of resources and their uses. Problems of resource allocation and efficient distribution of activities. Review of resource use policy in the U. S. A. , U. K. and some developing countries with special emphasis on Bangladesh.

**Plan 6121 : Rural Development Planning II (2-0-2)**

Part -I : Political Economy of Rural Development : The political system as they relate to the development planning of rural areas, special attention will be paid to political constraints. Will explore the purpose and methods of introducing change.



## **Part - II : Decision making for Rural Economic Development**

Emphasis on the application of decision making technique to the evaluation of alternative investment projects and the design of broad sectoral policies. Discussion on the theory of cost benefit analysis, project appraisal and related decision making tools; primary focus on a series of case studies which will require students to derive necessary parameters from a body of data representative of Bangladesh context which allow for the evaluation of investment opportunities.

### **Plan 6122 : Economics of Population Growth and Migration (2-0-2)**

Economic approach to population policy. Emphasis on effects of population growth on problems of underdeveloped countries. The welfare economics of population growth and economic variables (e.g. population growth and consumption, savings, investment, employment and economic growth and its distributive effect). Population growth and urbanization. The concept of urbanization and its process of development. Rural urban problem of migration and settlement management.

### **Plan 6123 : Studio : Regional Planning Technique (0 - 6 - 2)**

Group projects regarding the physical planning of the region. Work will include field research, design analysis, and presentation of workable recommendation as to appropriate objectives and actions for solutions.

### **Plan 6124 : Studio : Rural Planning Technique (0 - 6 - 2)**

Practical application of theoretical principles for the development of rural communities. Planning and development of urban villages.

### **Plan 6130 : Urban and Regional Economics (2-0-2)**

Use of the tool of urban and regional economics to analyze a number of urban problems, including housing, transportation, poverty and public finance. Determinants of regional and metropolitan growth, theories of urban spatial structure, and the location of firms and households within urban areas.

### **Plan 6131 : Public Finance in Underdeveloped Countries (2-0-2)**

The role of public sector in developing countries, with emphasis on resource allocation, income redistribution, capital formation, and the control of inflation. Analysis of means of financing economic development, including capital imports, domestic saving, inflation, deficit financing and taxation.

### **Plan 6132 : Rural/Agricultural Development (2-0-2)**

Rural development and structural transformation: Theory and critical review of theoretical approaches to the role of agriculture in the development process. Process of rural planning: Issues and strategies; Agricultural modernisation and the rural poor, industrial growth, Rural growth linkages. Planning and strategy for growth.

### **Plan 6133: Agriculture in Economic Development (2-0-2)**

The course will present a framework for evaluating rural and agricultural development strategies within the context of national development goals.

Will examine sources of agricultural productivity, with particular attention to resource allocation of farms and within technology development institutions and other agricultural services. Will explore the roles farm size, land reform, and price policy, as well as the process of technology adoption by peasant and non-peasant farms. Concludes with an evaluation of various agricultural strategies and policies with respect to development policy goals.

### **Plan 6134 : Economic Development (2-0-2)**

Continuation of Economic Development-I, with special emphasis on some of the major policy issues facing today's less developed nations-savings, aid, and foreign investment, the role of entrepreneurship, role of multi-nation firms and technical change; the efficiency and location of investment; the role of government planning and private enterprise; economic growth and the distribution of income, wealth and political power.

Plan 6501: Graphic representation and surveying Techniques. (Noncredit prerequisite course).

## **Faculty of Civil Engineering**

### **Department of Civil Engineering**

#### **UNDERGRADUATE COURSES**

##### **CE 100 Civil Engineering Drawing**

3 hours per week 100 Marks

Introduction- lettering and numbering, heading instrument and their use; Plane Geometry-triangle, square, pentagon, hexagon, octagon, circle, ellipse, parabola, hyperbola.

Projection (Solid Geometry)- line, square plate, cube, triangular prism, square prism, pentagonal prism, hexagonal prism, prism, cone, cylinder.

Development-cube, pyramid, cone, prism. Section and True Shape-cube, pyramid, cone, prism. Isometric Drawing-cube, pyramid, cone. Oblique Drawing-cube, pyramid, cone. Interpretation of Solids.

##### **CE 101 Engineering Mechanics**

3 hours per week 200 Marks

###### **PART A**

Introduction to SI Units; Resultants and components; Coplanar concurrent forces; Moments and parallel coplanar forces; Non-concurrent non-parallel coplanar forces; Non-coplanar forces; Centroids; Moment of inertia of areas; Moment of inertia of masses, Graphical Methods.

###### **PART B**

Maximum and minimum forces; Friction; Flexible chords; Plane motion; Force systems that produce rectilinear motion, work, kinetic energy; Power, impulse and momentum.

##### **CE 102 Surveying**

2 weeks field survey 50 marks

For First year ME and NAME

Two weeks field work on different type of surveying.

### **CE 104 Civil Engineering Drawing**

3 hours every alternate week 50 marks

For First year EE, CheE, ME, and NAME

Plan, Elevations and section of one story buildings; Plan, Elevations and sections of Multi storied Residential Buildings; Plan and section of septic tank; Detailed drawing of Roof truss; Plan, elevation and sections of culvert.

### **CE 108 Survey Practical**

For 2 weeks 50 Marks

For First year MetE and EEE

Handling of Instruments

The students will learn handling of all types of instruments issued to them. They also will check the permanent adjustments and will detect defects (if any of their instruments) and will show it to the respective teacher in-charge.

### **Chain Survey**

The students will select the stations, measure the lines and take the offsets of different objects in the field.

### **Theodolite Survey**

The students will measure the included angles and the sides of pentagon with the help of a theodolite. The bearing, the reduced bearing, the latitude and the departure of all the sides are to be calculated. The total error should be determined and be adjusted in tabular form. The students will then calculate the area within the traverse in acres and decimals and also in bighas and kattas.

### **Plane Table Survey**

The students will plot all the important features of the plot by intersection and/or by the radiation method of plane tabling.

### **Levelling**

In levelling, the profile of a 6 chain long stretch of land will be made by taking readings at 50' interval along the chain line. The cross-section will be taken at 100' interval, 50' or less (depending on site) on either side. Staff readings on the cross-section will be taken at an interval of 25'. The longitudinal profile and the cross-sections will be plotted on a tracing paper.

### **Stadia Survey**

Determination of stadia constants and plotting of objects of a small plot as instructed by the teacher.

### **Height and Distance Problem**

The students will measure the height of an object and the spatial distance between two points by measuring angles with the help of the theodolite.

### **CE 200 Details of Construction and Estimating**

3 hours per week 100 marks

#### **PART A**

Foundations; Different types of Foundation;

Brick masonry; Framed structures and bearing walls; Arches and lintels; Details of floors and roofs; Pointing; Plastering and interior finishing; Scaffolding; Staging; Shoring and underpinning; Thermal insulation and acoustics.

#### **PART B**

Analysis of rates; Detailed estimate of all items of work of a building bridge truss, highway.

Specifications of materials for the above constructions.

### **CE 201 Surveying**

3 hours per week 250 marks

#### **PART A**

Calculation of areas and volumes; Reconnaissance survey; Chain survey; Traverse survey; Plane table survey; Levelling and contouring; Problems on heights and distances; Curves and curve ranging, transition curve, vertical curves.

#### **PART B**

Tacheometry: Introduction, Principles and problems on tacheometry; Astronomical surveying: Definition, Instruments, Astronomical corrections, Systems of time; Photogrammetry: Introduction; Terrestrial photography; Aerial photography; Reading of photo mosaic, scale; Project surveying; Errors in surveying; Remote sensing.

**CE 202 Practical Surveying**

3 weeks of field work 100 marks

Field work based on CE 201

**CE 203 Engineering Materials**

3 hours per week 250 marks

**PART A**

Properties and uses of bricks, efflorescence, cement, cement chemistry, aggregates, cement and lime mortars, concrete, standard tests of bricks, cement and concrete, salinity problem in concrete, corrosion and its prevention, paints, varnishes, metallic coating.

**PART B**

Design of concrete mix, atomic structure and bonding; crystal structures, mechanical properties, yielding, fracture, elasticity, plasticity, properties and uses of rubber, timber and plastics. Concrete for special purposes. Ferrocement.

**CE 205 Computer Programming and Numerical Methods in Civil Engineering**

2 hours per week 150 marks

**PART A**

Basic components of computer systems; FORTRAN language; Numerical solution of algebraic and transcendental equations; Solution of systems of linear equations; Matrices; Interpolation.

**PART B**

Computer applications to Civil Engineering problems; Curve-fitting by least squares; Numerical differentiation and integration; Finite differences; Numerical solution of differential equations.

**CE 206 Computer Programming Sessional**

3 hours every alternate week 50 marks

Development of FORTRAN programs and solution of problems using a digital computer.

**CE 207 Geology and Geomorphology**

2 hours per week 150 marks

**PART A**

Minerals; Identification of minerals, Common rock forming minerals; Physical properties of minerals; Mineraloids Rocks; Types of rocks, cycle of rock change; Earthquake and seismic map of Bangladesh.

Structural Geology; Faults; Types of faults; Fold and Fold type; Domes; Basins; Erosional process; Quantitative analysis of erosional land forms.

**PART B**

Channel development; Channel widening; Valley shape; Stream terraces; Alluvial flood plains; Deltas and alluvial fans; Channel morphology; Channel patterns and the river basin; Geomorphology of Bangladesh;

**CE 211 Mechanics of Materials**

3 hours per week (hour tutorial) 250 marks

**PART A**

Fundamental concepts of stress and strain. Mechanical properties of materials; Stresses and strains in members subjected to tension, compression, shear and temperature changes; Rivetted and welded joints; Bending moment and shear force diagrams; Flexural and shearing stresses in beams; Shear centre.

**PART B**

Torsional stresses-in shafts; helical springs; thin walled pressure containers; principal stresses; deflection of beams; columns; unsymmetrical bending.

**CE 212 Structural Mechanics and Materials Sessional (Strength of Materials Sessional)**

3 hours every alternate week 50 marks

For Second year CE and NAME

Tension, direct shear and impact tests of mild steel specimen, Compression test of timber specimen, slender column test; Static bending test; Hardness test of metals; Helical spring tests.

### **CE 214 Concrete Sessional**

3 hours every alternate week 50 marks

General discussion on preparation and properties of concrete. Test for specific gravity, Unit weight, Moisture content and absorption of coarse and fine aggregates; Normal consistency and initial setting time of cement; Direct tensile and compressive strengths of cement mortar; Gradation of coarse and fine aggregates; Design and testing of a concrete mix.

### **CE 225 Mechanics of Materials**

2 hours per week 150 marks

For Second year EEE

#### **PART A**

Introduction: Analysis of forces, stress and strain; Mechanical properties of Materials; Allowable stresses; Stresses in the pressure vessels; Torsional stresses in circular shafts and circular beams.

#### **PART B**

Shear force and bending moment diagrams for statically determinate structures.

### **CE 226 Mechanics of Materials Sessional**

3 hours every alternate week 50 marks

For Second year EEE

Tension test and impact test of mild steel specimen; Compression test of timber specimen; Direct shear test; Slender column test; Static bending test; Hardness test of metals; Helical spring test.

### **CE 229 Structure II**

2 hours per week 200 marks

For second year Arch

Force, Equilibrium, Coplanar concurrent force system, coplanar parallel force system, coplanar non-concurrent non-parallel force system; Free body diagrams; Introduction to simply supported beams and frames, calculation of shear force and bending moment. Introduction to moment diagrams; Maximum and minimum forces; Areas, composite areas and volumes; Theorem of Centroid; Radius of gyration; Centre of pressure; Moments of

inertia of simple and composite areas, Product of inertia. Moments of inertia of masses; Noncoplanar forces.

### **CE 231 Plumbing**

1 hour per week 100 marks

For Second year Arch.

Water supply in buildings, drainage and sewage disposal;

### **CE 311 Structural Analysis and Design I**

3 hours per week 300 marks

#### **PART A**

stability and determinacy of structures; Analysis of statically determinate frames, trusses and arches; Influence lines; Moving loads on beams, frames and trusses.

#### **PART B**

Wind and earthquake loads; Approximate analysis of statically indeterminate structures. e.g. braced trusses, portal frames and multi storied building frames; Deflection of trusses and beams by various methods; Space trusses; Cables and simple cable supported structures.

### **CE 312 Structural Analysis and Design I Sessional**

3 hours every alternate week 50 marks

Analysis and design problems on CE 311; Design of members and connection of steel structures; e.g. trusses and plate girders.

### **CE 313 Reinforced Concrete**

3 hours per week 300 marks

#### **PART A**

Fundamental behaviour of reinforced concrete; introduction to WSD and USD methods; Analysis and design of Singly reinforced, Doubly reinforced and T-beams according to WSD and USD methods; Diagonal tension; Bend and anchorage according to WSD and USD methods.

#### **PART B**

Columns; Footings; Two-way slabs; Retaining walls.

**CE 314 Reinforced Concrete Sessional**

3 hours every alternate week 50 marks

Analysis and design problems based on CE 313; Design of a slab bridge, simple girder bridge and a low-rise building.

**CE 320 Strength of Materials Sessional**

3 hours every alternate week 50 marks

For third year NAME

Model tests on bending of unsymmetrical sections; Location of shear centres; Strain measurement techniques; Strength of riveted and welded connections; Model analysis of a truss.

**CE 329 Structure III**

2 hours per week 200 marks

For Third year Arch.

Fundamental concepts of strength of materials; stresses and strains in members subjected to tension, compression, shear and temperature changes. Shear force and bending moment diagrams for statically determinate structures. Space frame works; Flexural and shearing stresses in beams.

Double Integration and Area- Moment methods of finding slopes and deflections in statically determinate beams; Indeterminate beam analysis; Buckling of slender columns; Principal stresses.

**CE 331 Environmental Engineering I**

3 hours per week 300 marks

**PART A**

Water Supply Engineering : Introduction, Population prediction and water requirements; Ground and surface water sources, collection, and transportation; Pumps and pumping machinery; Water quality, plain sedimentation, sedimentation with coagulation, filtration, disinfection and miscellaneous water treatment methods; Water distribution.

**PART B**

Sewerage Engineering: Introduction, Characteristics of sewage, Sewer system, Design of sewer, Sewer appurtenances, Sewer construction and maintenance. Plumbing, physical, chemical and biological treatment of sewage; Sewage

disposal sludge treatment and disposal, Sewage treatment and disposal at unsewered areas; Rural sanitation programme in Bangladesh.

**CE 332 Environmental Engineering Sessional**

3 hours every alternate week 50 marks

Physical, chemical and bacteriological tests of water and sewage based on CE 331. Design of water treatment plants.

**CE 341 Geotechnical Engineering I**

3 hours per week 300 marks

**PART A**

Identification and classification of soils; Soil grain and aggregate properties; Weight-volume and moisture-density relationship; Soil structure and consistency; Stress-strain characteristics of soils; Permeability; Seepage; Capillarity and flownets; Hydraulic and consolidation properties; Principles of total and effective stress; Method of soil exploration and sampling; Direct measurement of consistency and relative density; Correlation of strength parameters with N-values; Field exploration and exploratory programmes.

**PART B**

Earth pressure; Stress distribution and settlement computation; Slope stability; Bearing capacity and settlement.

Various types of foundation; Factors determining type of foundation; Foundations on clay, sand, silt and non-uniform deposits.

**CE 342 Geotechnical Engineering Sessional**

3 hours every alternate week 50 marks

Standard tests based on CE 341.

**CE 351 Transportation Engineering I**

3 hours per week 300 marks

**PART A**

Elements of transportation system; Considerations in the planning, financing and development of transportation system with special reference to Bangladesh. Highway materials and bituminous mix design.

Railways: General requirement, alignment, permanent way, station and yards, signalling points and crossing, maintenance.



## **PART B**

Highways: Highway types, geometric design of highways; Design, construction and maintenance of pavements; Brick and block pavements. Water ways and terminals; Airways and airports.

### **CE 352 Transportation Engineering Sessional**

3 hours every alternate week 50 marks

Tests on bituminous materials, Tests on subgrade, subbase and base materials; Mix design.

### **CE 400 Project and Thesis**

6 hours per week 200 marks

Experimental and theoretical investigation of various topics in structural engineering, concrete technology, environmental engineering, transportation engineering and geotechnical engineering. Individual or group study of one or more topics from any of the above fields. The students will be required to submit thesis/project report at the end of the work.

### **CE 401 Project Planning and Management**

2 hours per week 200 marks

#### **PART A**

Principles of management; Principles of construction management; Contract and specification; Planning and scheduling: PERT, CPM, Case studies, Resource scheduling; PERT: A cost accounting system, Linear programming.

#### **PART B**

Psychology in administration; Materials management; Demand forecasting; Inventory control; Stores management; Procurement.

Project planning evaluation; Feasibility reports, Cash flow, Pay back period, Internal Rate of Return. Benefit-cost ratio, Construction equipments and plants.

### **CE 411 Structural Analysis and Design II**

3 hours per week 300 marks

#### **PART A**

Analysis of statically indeterminate structures by displacement method: Slope deflection, Moment distribution, Stiffness matrix; member stiffness; Stiffness transformations; assembly of stiffness matrices and solution for beams, frames and plane trusses.

## **PART B**

Analysis of statically indeterminate structure (plane frames, trusses, grids) by method of consistent deformation; Flexibility matrix.

Column Analogy method. Influence lines for statically indeterminate beams, frames, arches and grids.

Structural forms and their applications.

### **CE 412 Structural Analysis and Design Sessional**

3 hours every alternate week 50 marks

Design of various reinforced concrete structures, e.g. cantilever bridge and multistoried building.

### **CE 413 Structural Analysis and Design III**

3 hours per week 300 marks

#### **PART A**

Energy theorems and their applications to structural analysis: Introduction to plastic design of steel structures; Fundamentals of structural dynamics: Introduction to theory of elasticity.

#### **PART B**

Introduction to elastic instability of structures; Analysis of thin plates, membrane shells and folded plates.

### **CE 415 Structural Analysis and Design IV**

3 hours per week 30 marks

#### **PART A**

Prestressed concretes: Materials; Prestressing systems; Loss of prestress; Analysis of sections for flexure, Shear, bond and bearing; Beam deflections and cable layout; Partial prestress. Reinforced concrete floor and roof systems.

#### **PART B**

Design of prestressed sections for flexure, shear, bond and bearing; Structural systems for tall buildings; Yield line method; Review of codes.

### **CE 416 Structural Analysis and Design Sessional**

3 hours every alternate week 50 marks

Design of various reinforced concrete structures, e.g. water tower, rigid frame bridge, folded plate roof.

**CE 431 Environmental Engineering II**

3 hours per week 300 marks

**PART A**

Impurities in ground and surface waters; Water quality standards; Basic principles and unit operations of water treatment; Planning and design of complete water supply system; Industrial water supply; Plumbing of multistoried building.

**PART B**

Microbiology of sewage and waste water; Chemical and biological unit processes in waste water treatment; Sewage treatment in tropical climate; Treatment of industrial waste. Design of collection, treatment and disposal facilities for sewage and industrial effluent; Environmental sanitation.

**CE 433 Environmental Engineering III**

2 hours per week 200 marks

**PART A**

Collection, treatment, and disposal of solid waste; Recycling of waste; Air pollution; soil pollution.

**PART B**

Water pollution and its control; Pollution problems in Bangladesh; Pollution control programme and legislation.

**CE 434 Environmental Engineering Sessional**

3 hours every alternate week 50 marks

Analysis of air, water, waste water and solid waste based on CE 431 and CE 433.

**CE 441 Geotechnical Engineering II**

3 hours per week 300 marks

**PART A**

Design and Construction of footings, rafts and piles; Foundation for Structures subjected to lateral loads; Retaining walls and abutments. Operation and methods of construction, dewatering and slurry-wall construction.

**PART B**

Flexible earth retaining structures, sheet piles, cofferdams, Caissons; Machine foundations- elementary vibrations, shear modulus and elastic constants, foundation design for vibration.

**CE 443 Geotechnical Engineering III**

2 hours per week 200 marks

**PART A**

Stress deformation and failure of soil masses, Principle of effective and total stress measurement of soil suction. One, two and three dimensional consolidation problem; Pore pressure coefficients, stress path method in soil mechanics.

**PART B**

Soil structure-interaction, Foundation failure case studies, soil liquefaction, soil improvement; Numerical solution of problems using a digital computer.

**CE 444 Geotechnical Engineering Sessional**

3 hours every alternate week 50 marks

Standard tests and design of foundations based on CE 441 and CE 443.

**CE 451 Transportation Engineering II**

3 hours per week 300 marks

**PART A**

Design, construction and maintenance of flexible pavements, Highway subgrade, subbase and base courses; Soil stabilization and soil aggregates in road constructions.

**PART B**

Design, construction and maintenance of rigid pavement; Planning and design of airports.

**CE 453 Transportation Engineering III**

2 hours per week 200 marks

**PART A**

Highway planning and surveys, economic evaluation of highway with reference to Bangladesh. Highway drainage and drainage structures.

## PART B

Geometric design of highways: Design controls and criteria, elements of design, Cross-section elements, road intersections. Traffic engineering: Vehicle and traffic characteristics, traffic control devices, traffic studies, parking and roadway lighting.

### CE 454 Transportation Engineering Sessional

3 hours every alternate week 50 marks

Design of rigid and flexible highway and airfield pavements, design of roadway intersection, geometric design of bridge approach; traffic studies.

## POSTGRADUATE COURSES

### CE 6101 Theory of Elasticity

3 credits

Stress-strain relationship; Plane-stress and plane-strain; Stress functions; Two dimensional problems in rectangular and polar coordinates; Torsion; Energy principles; Stress and strain in three dimensions; General theorems; Three dimensional problems; Theories of failure; Computer solutions of elasticity problems.

### CE 6103 Theory of Plates

3 credits

Rectangular plates with various edge conditions; Circular plates; Energy methods; Approximate methods; Orthotropic plates; Numerical methods in the solution of plate problems. Non-linear analyses of plates.

### CE 6105 Plastic Design of Structures

3 credits

Review of fundamental concepts- plastic hinges, collapse of beams and frames; Effects of axial load and shear forces; Investigation of plastic collapse mechanisms and calculation of collapse loads; Upper and lower bounds; Plastic analyses and design of beams, frames and grillages; Plastic collapse of reinforced concrete and masonry structures; Elastic-plastic analysis; Repeated loading; Shakedown theorems; Minimum weight design; numerical analysis; Design of multistorey frames.

### CE 6106 Elastic Stability of structures

3 credits

Stability of struts and beam-columns; Initial imperfections; Inelastic buckling; Stability functions; Stiffness matrix; Fixed end moments; Energy method;

Elastic instability of plane frames; Critical load; Buckling modes; Failure load analysis. Torsional buckling under various conditions of end loads; Buckling by combined torsion and flexure. Lateral buckling of beams; Local buckling phenomenon; Buckling of thin plates and membrane shells; Buckling of built-up sections.

### CE 6108 Analysis and Design of Shells

3 credits

Review of membrane theory of shells; Bending theory of cylindrical shells and shells of revolution; Synclastic and anticlastic shells; Design of shell roofs of various shapes. Finite difference and finite element methods; Model analysis.

### CE 6109 Finite Element Methods I

3 credits

Introduction to finite element concepts, basic techniques, shape functions. Finite element formulation of various elastic problems-plane stress, plane strain, axisymmetric and three dimensional cases.

Isoparametric elements, the elastic membrane; thick shell and plate elements, body of revolution with pressure and sinusoidal loadings. Nodal loads from shape function routines.

Bending of plates, axisymmetric shells, shells-the semiloof beam and shell. Developing and implementing elements. Convergence- the patch test. Solution techniques- front and band solutions, element assembly and equation solving, roundoff errors. Variational principles in finite element analysis.

### CE 6110 Computer Methods in Civil Engineering

3 credits

Advanced programming techniques related to civil engineering problems; Program optimization; Computational pitfalls; Management of files and data bases; File structures; Direct access backing storage; Computational aspects of matrix algebra-relaxation methods, various reduction and elimination schemes; Eigenvalue problems, storage of and computation with large and sparse matrices; Numerical differentiation and integration; Interpolation and curve fitting; Linear and non-linear programming algorithms; Software packages; Computer graphics; Interactive analysis and design; Programming for civil engineering problems on microcomputers.

### CE 6111 Advanced Design of Concrete Structures

3 credits

Review of principles: beams, slabs and columns. Design of columns; long columns, two way slab systems, grids, waffle slabs, ribbed slab, deep beams,

curved beams shear walls, building frames. Design for torsion. Bulk storage structures, creep and temperature effects. Details of reinforced concrete members. Advanced problems in foundations of structures. Codes and specifications and their influence in design. An individual or group project to design a complete structural system. Prestressed concrete structures.

**CE 6114 Analysis and Design of Tall Buildings 3 credits**

Structural forms of tall buildings-floor system, vertical load resisting systems, lateral load resisting systems. Choice of systems optimum design. Coupled shear walls- continuous medium, wide-column analogy, and finite element solutions. Interaction of walls and frames-approximate methods, analysis. Tubular structures- approximate methods, computer analysis. Masonry high-rise buildings. The future of high-rise buildings.

**CE 6115 Bridge Engineering 3 credits**

Planning concepts, various types of bridges and their suitability for different span ranges. Bridge loadings. Orthotropic plate decks. Grillage, space frame, finite element and finite strip methods of bridge deck analysis. Long span bridges- cable stayed bridge, suspension bridge. Substructures: Design and construction.

**CE 6116 Finite Element Methods II 3 credits**

General sources of nonlinearity in structures. Solution of nonlinear equations-incremental, iterative- Newton-Raphson and Modified Newton Raphson solution procedures.

Geometric Nonlinearity- large displacement and structural instability, Lagrangian approach-both total and updated, Eulerian approach. Material Nonlinearity- Material modelling. Yield criteria, plasticity, creep, elasto-plasticity, viscoplasticity, elastio-viscoplasticity, modelling of reinforced concrete.

Combined geometric and material nonlinearity.

Modelling of dynamic problems and solution procedure.

Finite element analysis of non-structural problems- fluid flow, heat conduction, electro-magnetic field analysis etc.

**CE 6117 Structural Dynamics and Seismic Design of Structures**

**3 credits**

Fundamentals of structural dynamics. SDOF, Free vibration response, response to harmonic, periodic, impulsive and general dynamic loading. MDOF, undamped free vibrations. Analysis of dynamic response. Beam: vibrations, random vibrations. Probability theory. Deterministic and nondeterministic analysis of earthquake response. Earthquake resistant design of buildings, bridges and dams.

**CE 6118 Structural Brickwork 3 credits**

Properties of bricks and mortar; Strength and deformation properties of brickwork; Strength of brick masonry compression element; Analysis and design of unreinforced brickwork structures; Reinforced and prestressed brickwork structures; Composite action of brick masonry walls.

**CE 6201 Advanced Concrete Technology 3 credits**

Properties of plain concrete, physico-chemical aspects of behaviour; Constituent materials; Cements, aggregates and admixtures; Influence of material properties on stress distribution in structural members. Durability, permeability and porosity; physical and chemical deterioration. Mix design, manufacture, transportation and placing. Form works. Field control and acceptance. Testing-destructive and nondestructive. Concrete for special purposes.

**CE 6301 Theory of Water Treatment 3 credits**

Water and its impurities. Criteria of water quality; Physical, chemical and biological treatment processes. Desalinization and demineralization processes. Controls of aquatic growth. Control of taste and odour.

**CE 6304 Theory of Sewage Treatment 3 credits**

Composition, properties and analysis of sewage. Biology and bio-chemistry of sewage treatment. Principles of physical, chemical and biological treatment processes. Tertiary treatment of effluents. Sludge digestion. Sludge dewatering and disposal.

**CE 6305 Biology of Sewage and Polluted Waters 3 credits**

Important microorganisms related to water and waste water engineering: Cell physiology; Introductory Biochemistry; Bacterial growth and disinfection

kinetics; Enumeration of bacterial population; Indicator organisms and water borne pathogens; Sampling and bacteriological examination of water and waste water.

**CE 6309 Environmental Sanitation**

**3 credits**

Application of engineering principles to the control of communicable diseases. Vector control. Insecticides and bacteriocides. Collection and disposal of municipal refuse. Housing, Milk and food sanitation. Industrial and personal hygienes. Air pollution. Plumbing. Ventilation, airconditioning, Hospital sanitation. Camp sanitation.

**CE 6310 Industrial Water and Waste Treatment**

**3 credits**

Requirements of water for various industries; Quality and treatment of industrial water; Characteristics and volume of industrial waste; Problems associated with industrial wastes; Physical, chemical and biological methods of treatment; Industrial waste problems of major industries and their methods of treatment and disposal.

**CE 6311 Municipal and Rural Sanitation**

**3 credits**

Transmission and control of communicable diseases; Importance of safe water supply and safe disposal of waste on sanitation; Principles of excreta disposal with and without water carriage; Individual water supply facilities and their sanitary protection; Solid waste management; Municipal and rural sanitation facilities in Bangladesh; Public health organizations.

**CE 6312 Water Pollution and its Control**

**3 credits**

Sources of pollution; Effects on water; Basic theory of control devices; Pollution surveys and control programs. Water pollution problems in Bangladesh.

**CE 6315 Water Supply Engineering Design**

**3 credits**

Development of design criteria for municipal and rural water sources; Intakes, pipe lines, distribution systems, storage facilities and water treatment systems; Ground water resources and well design.

**CE 6316 Sewerage and Drainage Engineering Design**

**3 credits**

Design of collection system, pump house; Functional hydraulic and structural design of complete sewage treatment plant and drainage systems.

**CE 6401 Soil Mechanics I**

**3 credits**

(2 hours per week theory and 3 hours per week practical).

Identifying characteristics of soils, clay minerals, clay-water relation, fabric, Compression. One and three dimensional consolidation, swelling, collapse and rheological properties.

Soil shear strength, concept of cohesion and internal friction. Failure theories. Bearing capacity equations and factors.

Subsoil exploration programme, interpretation of topographic, geological and agricultural soil maps. Laboratory testing of soils and their interpretation for engineering purposes.

**CE 6402 Soil Mechanics II**

**3 credits**

Soil porosity and moisture effects relative to effective stress principles, capillarity, permeability and frost action. Hydraulic fracturing. Principles governing flow of water through soils. Soil seepage analysis for isotropic and anisotropic conditions. Numerical techniques for vertical and radial drainage.

Description, design procedure and usage of current site improvement techniques, preloading, earth reinforcement, dynamic consolidation, vibrocompaction, blasting densification, lime treatment, drains and geotechnical fabrics.

**CE 6403 Foundation Analysis Methods**

**3 credits**

Elastic foundations, loads on infinite slabs, subgrade coefficient, settlement on non-homogeneous half space, linearly-elastic pile and soil, laterally loaded pile, soil foundation interaction for footing and mat designs. Analysis of simple pile and pile group foundations. Exact and numerical solutions to above problems.

**CE 6404 Earth pressure and Retaining Structures**

**3 credits**

Fundamentals of lateral earth pressure and classical methods of analysis. Analysis of braced excavations, retaining walls and design of sheet piling system. Principles of cofferdam design.

Bearing capacity theories related to shallow and deep foundations.

**CE 6405 Earth Dams and Stability of Slopes**

**3 credits**

Seepage in composite sections. Methods of stability analysis, stability of slopes. Compaction, Measurement of performance, construction and control of embankment.



**CE 6406 Rock Mechanics****3 credits**

Classification and engineering properties of intact rocks, brittle fracture theory. Characterization and properties of rock discontinuities criteria of rock failure. Engineering problems associated with construction in rocks; Stabilization, anchoring and rock bolting; Rock slope stability and reinforcement; Design of underground opening and structures; Geotechnical aspects of open pit and underground mining; soft and hard rock; Material handling, waste disposal;

**CE 6407 Soil Dynamics****3 credits**

Sources and types of dynamic loading. Vibration of elementary systems, Wave propagation in soils. Dynamic soil properties and methods of their determination, liquefaction, shear modulus and damping effects. Vibrations of foundations on elastic media, machine foundations, earthquake response, blast effects including nuclear weapon effects.

**CE 6408 Advanced Engineering Geology****3 credits**

Advanced physical geology concerning transported and residual soils. Erosion and deposition. Geomorphology. Study of the formation of delta. Engineering geology of soft clays.

Engineering properties of rocks. Geologic structures. Historical geology. Geology of Bengal Basin. Earthquake zones of Bangladesh. Geological considerations for engineering designs.

**CE 6409 Reinforced Earth****3 credits**

Materials used in reinforced earth; constitutive laws; Design parameters and testing techniques; Conceptual performance of reinforced soil; Analysis, design and construction of reinforced earth retaining structures; Reinforced slopes; Design & construction of reinforced paved and unpaved road; Analysis, design and construction of granular and insitu stabilized columns; Soil nailing, root or micropiles. Random (non-oriented) fibre reinforced soil.

**CE 6501 Transportation Engineering****3 credits**

Historical development, systems of transportation, technical and operating characteristics of highways, railways, waterways, airways and pipelines; transportation planning and development.

**CE 6502 Geometric Design of Highways****3 credits**

Highway classification; Design controls and criteria; Traffic, vehicle characteristics, speed capacity; Elements of design; Sight distance, horizontal and vertical alignment; Cross-section elements; Road intersections, grade separation and interchanges; Highway drainage.

**CE 6503 Highway Materials****3 credits**

Origin, production, specifications properties and uses of bituminous materials; binder mixtures; design and analysis of bituminous paving mixes; field operations, surface treatments, stabilization methods; aggregates, base, subbase and subgrade; cement concrete in pavement constructions.

**CE 6504 Advanced Surveying****3 credits**

Triangulation; Classification and schemes, instruments, linear and angular measurements, field works errors and corrections, computations; Geometric levelling; Field astronomy; Motions of earth, and other stars, time, coordinate systems, errors and corrections; Hydrographic surveying; determination of depth under water, measurement of discharge and stream current; Terrestrial and aerial photogrammetry; Instruments, field works, plotting of maps, analysis and interpretation of photographs, stereophotogrammetry, remote sensing and its application in civil engineering.

**CE 6505 Structural Design of Pavements****3 credits**

Pavement types, wheel loads, stresses in flexible pavements, stresses in rigid pavements, pavement performance, evaluation of subgrade and base support, design theories and practices, construction methods and maintenance, pavement rehabilitation.

**CE 6507 Traffic Engineering****3 credits**

Characteristics of vehicles and driver, traffic stream characteristics, traffic control and operation, traffic surveys, accidents and road safety, parking, roadway lighting, traffic management and administration.

**CE 6508 Railway Engineering****3 credits**

General requirements, permanent way, alignments, gradient and curves, points and crossings, signalling and interlocking, tunnelling, construction and maintenance.



**CE 6509 Waterways****3 credits**

Historical development of navigation, navigational channels, survey of waterways, classification of waterways, traffic, vessels, ports and harbours, navigational aids, maintenance of waterways.

**CE 6510 Planning and Design of Airports****3 credits**

Growth and demand of air transport, airport site selection and configuration, geometric design of runways and taxiways, terminal areas, capacity analysis, lighting and marking, air traffic control systems, structural design, construction and maintenance of airport pavements, airport drainage.

**CE 6511 Transportation Planning****3 credits**

Techniques and processes used in solving transportation problems, relationship between trip generation and land use, collection and characteristics of base year data, formulation of mathematical models to simulate existing travel patterns, forecasting procedures and evaluation of transportation systems.

**CE 6512 Transportation Engineering Economics****3 credits**

Introduction to basic economic theories; principles and methodologies appropriate to transportation engineering; Identification and measurement of transportation costs and benefits; Road user charges and principles of road pricing; Evaluation of transportation proposals in terms of their economic, social and environmental consequences; Techniques of cost benefit analysis; Selected case studies- application of economic principles to one or more current issues in transportation policy and planning.

**Department of Water Resources Engineering****UNDERGRADUATE COURSES****WRE 211 Fluid Mechanics**

3 hours per week 250 marks

**PART A**

Fluid properties; Fluid statics; Kinematics of fluid motion; Continuity equation; Energy equation; Momentum equation; Viscous effect and fluid resistance.

**PART B**

Fluid flow measurements; Closed conduit flow; Pipes in series and parallel; Pipe networks; Water hammer.

**WRE 212 Fluid Mechanics Sessional**

3 hours every alternate week 50 marks

Reynold's experiment; Centre of pressure; Bernoulli's experiment; Impact of jet; Experiments based on Orifice, Mouthpiece, V-Notch, and Venturimeter; Fluid friction; Orificemeter.

**WRE 311 Open Channel Flow**

3 hours per week 300 marks

**PART A**

Open channel flow and its classification; Velocity and pressure distribution; Energy and momentum principles; Critical flow-its computations and applications; Uniform flow concept and computation.

**PART B**

Gradually varied flow; Hydraulic jump; Similitude and dimensional analysis; Regime channel; Design of open channels.

**WRE 312 Open Channel Flow Sessional**

3 hours every alternate week 50 marks

Sharp-crested weir; Broad-crested weir; Sluice gate; Venturi flume; Parshall flume; Hydraulic jump; Current meter; Determination of Manning's roughness coefficient.

**WRE 313 Hydrology**

2 hours per week 200 marks

**PART A**

Hydrologic cycle; Air circulation; Precipitation; Stream flow; Infiltration and soil moisture; Evaporation and transpiration; Runoff; Hydrographs.

**PART B**

Rainfall-runoff relations; Factors affecting utilization and conservation of water resources; Unit hydrograph concept and its application; Flood routing; Statistical methods in hydrology.

**WRE 400 Project and Thesis**

6 hours per week 200 marks

Experimental and theoretical investigation of various topics in Water Resources Engineering. Individual or group study of one or more topics. The students will be required to submit a thesis/project report at the end of the work.

**WRE 411 Water Resources Engineering -I**

3 hours per week 300 marks

**PART A**

Present status of irrigation in Bangladesh; Traditional methods of irrigation; Soil-plant-water relationship; Sources of irrigation water; Irrigation water quality; Consumptive use and estimation of irrigation water; Methods of irrigation; Irrigation efficiency; Water conservation for irrigation; Problems of irrigated land.

**PART B**

Design of irrigation canal system; Small scale irrigation structures; Measurement of irrigation water; Irrigation pumps; Drainage and its importance; Methods of drainage and design of drainage canals; Water management on the field; Planning concept of irrigation and drainage projects.

**WRE 412 Hydraulic Machinery Sessional**

3 hours every alternate week 50 marks

Characteristic curves; Pumps in series; Pumps in parallel; Pipe surge and Water hammer; Scour around bridge piers; Irrigation gates; Rain gauges.

**WRE 413 Water Resources Engineering - II**

3 hours per week 300 marks

**PART A**

Flood and its effects; Causes of flood; Different methods of flood mitigation; Behaviour of rivers; Control and training of rivers; Introduction to sediment transportation and bed forms.

**PART B**

Tides and currents; Forces of waves and tides in the design of coastal and harbour structures; Coast delta and estuary; Introduction to design of hydraulic structures; Weir; Barrage; Dams; Spillways; Energy Dissipator; Cross drainage structures.

**WRE 415 Water Resources Engineering-III**

2 hours per week 200 marks

**PART A**

Groundwater in hydrologic cycle; Occurrence of groundwater; Groundwater movement; Groundwater and well hydraulics; Well drilling methods; Water well design; Developing and completing water wells.

**PART B**

Principles of hydraulic machines; Hydraulic prime movers; Pumps; Testing of hydraulic machines; Irrigation pumps used in Bangladesh.

**WRE 416 Water Resources Engineering Sessional**

3 hours every alternate week 50 marks

Design based on WRE 413 and WRE 415

**POST - GRADUATE COURSES****WRE 6101 Fluid Mechanics-I****(3 hrs/wk)**

Eulerian and Lagrangian coordinates; Reynolds transport theorem; Basic conservation laws; Continuity equation; Navier-Stokes equation; Energy equation; Two-dimensional potential flows, complex potential and complex velocity; Circle theorem; Blasius integral formula and Cauchy integral formula; Three-dimensional potential flows; Velocity potential and Stokes stream function and apparent mass.

**WRE 6102 Fluid Mechanics-II****(3 hrs/wk)**

Dimensionless parameters in viscous flow, nondimensionalizing the basic equations and boundary conditions; Solutions of the Newtonian viscous flow equations; Couette shear flows; Steady fully developed duct flows; Unsteady flow with moving boundaries; Laminar boundary layer equations; Similarity solutions for steady two-dimensional flows; Blasius solution for flat-plate flow; Falkner-Skan wedge flows; One-parameter momentum integral solution of laminar boundary layer; Turbulent boundary layer equations; Eddy viscosity theories; Law of the wall; Law of wake.

**WRE 6103 Open Channel Flow****(3 hrs/wk)**

Energy and momentum principles; Flow resistance; Boundary layer theory; Nonuniform flow computation; Channel controls; Channel transitions; Hydraulic jump and surges; Unsteady flow; Hydraulic method of flow routing; Overland flow; Mathematical models of open channel flow; Practical problems.

**WRE 6201 Hydrology****(3 hrs/wk)**

Precipitation, its temporal and spatial variability; Evapotranspiration; Runoff and its time-space distribution; Conceptual models; Hydraulics of overland flow; Flood flow in stream channel and flood estimation; Flood forecasting; Hydrology of urban, agricultural and forest lands; Computer simulation of hydrologic techniques; Watershed models.

**WRE 6202 Statistical Methods in Hydrology****(3hrs/wk)**

Characteristics of hydrologic phenomena; Random phenomena and their distributions; Various probability topics applied to hydrology; Empirical distributions of hydrologic variables; Parameters and statistics; Probability distribution functions; Estimation methods; Sampling theory; Testing hypothesis and goodness of fit; Correlation and regression; Autocorrelation and cross-correlation; Analysis of variance; Time series, spectral and cross spectral analysis; Stochastic models.

**WRE 6203 Ground Water Hydraulics****(3 hrs/wk)**

Ground water movement, storage exploration and data; Basic principles and fundamental equations; Well hydraulics; Aquifer test and flow-net analysis; Transient flow; Unsaturated flow; Well design criteria; Construction, production tests and maintenance; Surface and sub-surface water relations; Groundwater

recharge and runoff; Groundwater quality; Saline water intrusion; Subsidence and lateral movement of the land surface due to ground water pumping; Flow system analysis and models; Development and management of aquifers.

**WRE 6204 Flow through Porous Media****(3 hrs/wk)**

Mechanics of fluid movement in porous media; Seepage force and critical gradient; Anisotropy; Application of the Dupuit theory of unconfined flow; Conformal mapping by elementary functions; Confined flow; Relaxation method; Method of fragments; Flow through foundation of structures; Seepage from canal and ditches.

**WRE 6205 Irrigation & Drainage Engineering****(3hrs/wk)**

Determination of consumptive use; Soil-Water-Plant relations; Infiltration; Crop irrigation; farm delivery and diversion requirements; Irrigation techniques; Irrigation efficiencies; Water management in irrigated lands; Salinity problems; Relation between irrigation and drainage; Surface and subsurface drains; Drainage systems and their design; Small irrigation structures.

**WRE 6301 River Engineering****(3 hrs/wk)**

River hydraulics and morphology; Bedforms in alluvial channels; River channel patterns; Flood plain and their formation; Fluvial process in geomorphology; River training and bank protection works; Rivers in Bangladesh.

**WRE 6302 Sediment Transport****(3 hrs/wk)**

Sediment properties; Sources of sediment in rivers and canals; Types of loads: bed load, suspended load and total load; Critical review of the sediment transport theories and formulas; Sampling techniques; Modelling of sediment transport phenomena.

**WRE 6303 Waterpower Engineering****(3 hrs/wk)**

Introduction; Sources of energy; Estimation of waterpower potential; Types of hydro power plants; Intakes; Penstocks; Forebays; Tunnel; Power station; Wave and tidal power.

**WRE 6304 Hydrodynamic Structures****(3 hrs/wk)**

Design principles Dams; Barrages; Channels and flumes; Spillways; Stilling basins; Transitions and control structures; Locks; Use of models in Hydraulic design.

**WRE 6305 Photogrammetry in Water Resources (3 hrs/wk)**

Principles of photogrammetry; Use of aerial photography; Land form analysis; Interpretation of drainage patterns; Geomorphological and hydrological features: surface soils, vegetation and land use; Airphotos in the planning and designing of water resources projects; Remote sensing;

**WRE 6401 Development of Water Resource Project (3 hrs/wk)**

General principles of water resources development planning; Economics of water resources projects; Regional and social considerations; Different aspects of feasibility studies; Study of alternatives; Complete design of water resources project for a selected area.

**WRE 6402 Planning of Water Resources System (3 hrs/wk)**

Nature of water resources systems; Tools of systems analysis; Differential calculus method; Gradient search procedures; Linear programming; Dynamic programming; Systems analysis and mathematical modelling; Objective functions of water resources development; Short term operation of water resources system; River basin modelling.

**WRE 6403 Physical Modelling and Hydraulic Similitudes**

**(3 hrs/wk)**

Principles and illustration of dimensional analysis; Principles of the theory of similarity; Reynolds models; River and open channel models; Filtration models; Design of experiments; Materials and methods of construction; Equipment in models; Model calibration.

**WRE 6404 Mathematical Modelling (3 hrs/wk)**

Introduction; Concept of a mathematical model; Types of model; Numerical modelling techniques: finite difference, characteristics and finite element; Consistency, convergence, stability and accuracy of a numerical integration scheme; Hydrologic and hydrodynamic models; Data organization, schematization and boundary conditions; Calibration, validation and application of a model; Models of water resources systems elements.

**WRE 6501 Coastal Engineering (3 hrs/wk)**

Introduction; Waves: theory and forecasting; Ports and marine structures: wharves, jetties, piers, bulkheads, dolphins, moorings, locks and shore protection works; Dredging; Use of models

**WRE 6501 Estuarine Hydraulics (3 hrs/wk)**

Estuarine behaviour: Hydrodynamics of estuaries; Mixing process; Tides and harmonic analysis; Modelling of tides; Saline water intrusion; Hydraulics of deltas; Pollution in estuaries; Control of estuaries; Estuarine problems in Bangladesh.

**WRE 6600 Special Studies in Water Resources Engineering  
(1 to 3 hrs/wk)**

## Faculty of Electrical and Electronic Engineering

### Department of Computer Science and Engineering

#### UNDERGRADUATE COURSES

##### FIRST YEAR

##### PHYSICS - 101

3 hrs. per week

200 Marks

##### PART A

##### Heat and Thermodynamics

Kinetic theory of gases: Deduction of gas laws, principle of equipartition of energy, Equation of State : Andrew's experiment, Vander Waals equation, critical constants, Transmission of Heat : Conduction, Convection and Radiation.

Laws of Thermodynamics: First law of thermodynamics, Internal energy, specific heats of gases, work done by expanding gas, elasticities of a perfect gas; Second law of thermodynamics, Carnot's cycle, efficiency of heat engines, Absolute scale of temperature, Entropy and its physical concept, Maxwell's thermodynamic relations, Statistical mechanics.

##### Optics

Combination of Lenses : Equivalent lens and equivalent focal length. Defects of images formed by lenses : Spherical aberration, astigmatism, coma, distortion, curvature of the image, chromatic aberration. Theories of Light : Huygen's principle and construction. Interference of light : Young's double slit experiment, biprism, Newton's rings, interferometers, interference by multiple reflection. Diffraction of light : Fresnel and Fraunhofer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings. Polarization: Production and analysis of polarized light, optical activity. Optics of crystals.

##### Waves and Oscillations

Oscillations : Simple harmonic motion, Combination of S.H.M and Lissajous figures, Damped Oscillations, Forced Oscillations, Resonance, Vibrations of membranes and columns.

Waves: Travelling waves, the principle of superposition, Wave velocity, group velocity and phase velocity, power and intensity in wave motion, Interference of waves, diffraction of waves, Reflection and transmission of waves at a boundary, standing waves.

Sound Waves : Audible, Ultrasonic, infrasonic and Supersonic waves; Propagation and speed of longitudinal waves, travelling longitudinal waves, Standing longitudinal waves, Vibrating systems and sources of sound, beats, The Doppler effect.

Architectural Accoustics : Reverberation, Noise insulation and reduction, compound absorption, sound distribution, Room accoustics, Recording.

#### PART B

Properties of Matter

Atomic Structure of Matter : Atoms, ions and molecules, States of matter; Solids, Liquids and gases, Interparticle Forces, Elasticity : Stress Strain, Elastic constants. Viscosity : Critical Velocity and reynold's number, Poiseulli's equation, Stoke's law. Hydrodynamics : Equation of continutiy, Bernoulli's equation and its Applications. Surface Tension : Surface effects, free surface energy, Molecular theory of surface tension, excess-pressure theorem, contact angle, capillarity, Crystallography : types of. bonds, Types of Crystals, X-ray diffraction and Bragg's law, Plasticity and crystal defects, metals, Insulators and semiconductor, elementary band theory, Superconductors and plasma.

Modern Physics

Relativity: Michelson-Morley experiment, Lorentz-Einstein transformation, Mass energy relation. Quantum effect : Photo electric effect, Compton effect. Wave Mechanics : de-Broglie wave, Correspondence principle, Uncertainty principle, Schrodinger's wave equation. Atom, pde; : Bohr's theory of one electronatoms, vector atom model, Radioactivity : Radio active decay, Half life, lawa of successive disintegration, radioactive equilibrium. The Nucleus Properties of a Nucleus-binding energy, Nuclear reactions-nuclear reactors.

Electricity and magnetism

Electrostatics : Charge and matter, coulomb's law, the electric field, Gauss's law, electric potential, capacitors and dielectrics.

Current Electricity : Current and resistance, Ohmic and non-ohmic material, variation of resistance with temperature-resistance thermometer; thermo-electricity-thermoelectric thermometer.

Electromagnetism : Magnetic fields. Ampere's law, Fraday's law Lenz's law, Inductance-Self and mutual inductance.

Magnetic Properties of matter : Magnetomotive force, magnetic field intensity, Permeability and susceptibility, clasification of magnetic material, magnetization curves of Ferromagnetic materials, magnetic circuitis, magnetostriction.

#### PHY-102 Physics Sessional

3 hours, every alternate week 50 marks

Experiments based on Phy-101

#### CHEM-101 Chemistry

3 hours. per week 200 marks.

##### PART A

Inorganic chemistry : The structure of atom : Particles constituting the atomic model. Wave nature of electrons and shape of the orbitals. Periodic table : Classiffication of elements, Mande-Leev's periodic table, critical studies on periodic table with its usefulness and limitations. Physical chemistry: Properties of gases and equation of state : Aqueous solution : Types of solution, factors influencing the solubility of a substance, the Le-chatelier's principle, mechanism of dissolution, evolution and absorption of heat. Different units of concentration, problems involving acid base titrations. Solution of gases in liquids. Distribution of solute between two immiscible solvent, application of distribution law. Properties of dilute solution, vapour pressure, Raoult's law-its application. Elevation of boiling point, depression of freezing point and osmotic pressure. Colloids and properties of Colloidal system; Stoichiometry : Empirical and molecular formulas, ionic equation, solution of problems.

##### PART B

Inorgaific chemistry : Nobel Gases; Occurence, discovery, isolation, general properties, and uses, Importance of noble gas elements in the study of chemistry : chemical bond; Different types of chemical bond, general properties of ionic and covalent compounds. Modern approach of covalent bond, Modern concepts of acids and bases. Different types of chemical reactions. Physical chemistry : Kinetics and chemical equilibria; Rate of a reaction, factors determining the rate. Law of mass action, evaluation and characteristics of equilibrium constant of a reaction. Ionisation of water and concept of  $p^H$  Thermo-chemistry : Types of energy, enthalpy, heat of reaction, heat of



combustion, heat of formation and heat neutralization. Experimental determination of thermal changes during chemical reaction. Electrochemistry : Electrolytes, mechanism of electrolytic conduction, transport number and electrolytic conductance.

#### **CHEM-102 Chemistry Sessional**

3 hours. per week      100 Marks.

Introduction and scope of analytical chemistry, elementary concepts of quantitative analysis; Volumetric analysis. Chemical balance, evaluation of analytical data. Report writing. Experiments; Preparation of standard solutions of sodium oxalate, oxalic acid, Potassium dichromate etc, standardization of sodium hydroxide, hydrochloric acid, sodium thiosulphate, potassium permanganate etc. Determination of total alkalinity of soda ash. Determination of acetic acid content of vinegar. Determination of copper in copper sulfate solution. Determination of  $F^{++}$  in Mohr's salt and calculation of purity of Mohr's salt. Determination of bleaching powder by iodometry. Determination of sulfur by gravimetric method. Determination of aluminium as Aluminum oxide.

#### **MATH-105 Mathematics paper-1**

2 hours. per week      150 Marks.

##### **PART A**

##### **Section A: Differential Calculus**

Limit, continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainder. Expansion of functions by differentiation and integration, partial differentiation, Euler's theorem.

##### **Section B : Differential Calculus**

Tangent, Normal, Subtangent and subnormal in cartesian and polar co-ordinates, Determination of maximum and minimum values of functions and points of inflexion, Applications, evaluation of indeterminate forms by L' Hospital's rule, Curvature, radius of curvature, circle of curvature, centre of curvature and chord of curvature, Evolute and involute, Asymptotes, Envelopes, Curve tracing.

##### **PART B**

##### **Section A : Co-ordinate Geometry**

Change of axes: Transformation of co-ordinates, simplification of equation of curves. Pair of straight lines : Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Bisectors of the angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circle : Equation of the circle in cartesian and polar co-ordinates. General equation of a circle, Centre and radius of a circle, Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common chord, Chord in terms of its middle point, Orthogonal circles. Radical axis. Radical centre. Properties of radical axes, Coaxial circles and limiting points.

##### **Section B : Co-ordinate Geometry**

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates, Tangents and normals, Pair of tangents, Chord of contact, chord in terms of its middle point, Parametric co-ordinates, Diameters, conjugate diameters and their properties, Director circles and asymptotes.

#### **MATH-105 Mathematics Paper-II**

2 hours, per week      150 Marks

##### **PART A**

##### **Section A : Integral Calculus**

Definitions of integrations, integration by method of substitution. Integration by parts, Standard integrals, Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Wallis's formulae.

##### **Section B : Integral Calculus**

Improper integrals, Beta function and Gamma function. Area under a plane curve in cartesian and polar co-ordinates, Area of the region enclosed by two curves in cartesian and polar co-ordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

## PART B

### Section A: Ordinary Differential Equations

Degree and order of ordinary differential equation. Formation of differential equations, Solutions of first order differential equations by various methods. Solutions of second and higher orders with constant co-efficients. Solutions of homogeneous linear equations, Applications.

### Section B: Matrices, Vectors and three dimensional Co-ordinate Geometry.

Matrices: Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix. Three dimensional Co-ordinate Geometry: System of co-ordinates. Distance of two points. Section formula, Projection, Direction cosines, Equations of planes and lines.

Vectors: Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products, Applications to geometry and mechanics, Linear dependence and independence of vectors.

## HUM-101 English and Economics

2 hours. per week      150 Marks

### English

#### PART A

Definition of scientific terms, comprehension, precis writing, phrases and idioms, commercial correspondence and tender nitice.

#### PART B

Essay writing, Application and description, construction of sentences and paragraphs.

### Economics

#### PART A

Nature of an economic theory, applicability of economic theories to the problems of developing countries. Some basic concepts-supply, demand and their elasticities. The relationship among average, margin and total and their derivation. Equilibrium-stable, straight and dynamic equilibrium. Consumer's equilibrium-indifference curve, producer's equilibrium-isoquant.

#### PART B

Production-factors of production, production possibility curve-equilibrium of a firm, fixed cost and variable cost, the short run and the long run. The cost curves

and supply curves, law of returns, internal and external economics and diseconomics. Economics of development and planning, basic concept-saving, investment, GNP, NNP, percapita income, growth rate, policy instruments of development. Fiscal policy, monetary policy and trade policy their relative applicability in Bangladesh. Some planning tools-capital output ratio, input analysis, planning in Bangladesh-first five year plan, development problems related to agriculture, industry and population of Bangladesh.

## CSE- 103 Programming Languages

3 hours. per week      200 Marks.

### PART A

Introduction to digital computers and programming algorithm and flow chart construction. Information representation in digital computers. Writing debugging and running programs (including file handling) of various digital computer using FORTRAN, BASIC.

### PART B

Introduction to data structures. Formal specification of syntax. Elements of language theory : mathematical preliminaries. Formal languages. Structured programming concepts. Survey of features of existing major high level languages. Appropriate application using PASCAL.

## CSE-104 Programming Languages Laboratory

3 hours. per week      100 Marks

Laboratory works based on CSE-103

## ME-103 Basic Mechanical Engineering

2 hours. per week      150 Marks

### PART A

Study of fuels, steam generating units with accessories and mountings, performance study of steam generator, steam turbine, their study and performance; study of pumps and compressors.

### PART B

Introduction to internal combustion engines and their cycles : study of petrol engines, diesel engines and gas turbines with their accessories; performance-study of internal combustion engines, study of refrigeration system.

## PART B

Computational methods for solving problems in : linear algebra, nonlinear equations, approximations, interpolation, integration and ordinary differential equations.

### ME-104 Basic Mechanical Engineering Sessional

3 hours. every alternate week 50 Marks.

sessional classes based on ME-103.

### ME-112 Basic Mechanical Engineering Drawing

3 hours. every alternate week 50 Marks.

Introduction, Scale drawing, Sectional views, Isometric views.

Missing Line. Auxiliary view.

### EEE-109 Introduction to Electrical Engineering

3 hours. per week 200 Marks.

#### PART A

Fundamental electrical concepts and measuring units, D. C. voltage, current resistance and power. Laws of electrical circuits and methods of network analysis. Principles of D.C. measuring apparatus. Laws of magnetic fields and methods of solving simple magnetic circuits.

#### PART B

Alternating current-instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C. circuits. Phasor representation of sinusoidal quantities.

### EEE-110 Introduction to Electrical Engineering Laboratory

3 hours. every alternate week 50 Marks.

laboratory experiments based on EEE-109.

## 2nd Year

### CSE-200 Software Development-I

3 hours. per week 100 Marks.

Students will develop structured programs with proper documentations in at least two high level languages as assigned and will run on micro/mainframe computers.

### CSE-201 Discrete Mathematics and Numerical Analysis

2 hours. per week 150 marks.

#### PART A

Set theory, Elementary number theory, Graph theory, Paths and trees, Generating functions, Algebraic structures, Semigraph, Permutation groups, Lattices, Finite fields and coding theory, Linear programming, Mathematical Logic, Propositional calculus and predicate calculus.

### CSE-203 Data Structures and Algorithms

2 hours. per week 150 Marks.

#### PART A

Basic data structures : representation of data, lists, trees, arrays, graphs, strings, files, stacks and string manipulation. Development of efficient algorithms : use of recursion, data types, parsing, grammars and compiling.

#### PART B

Methods for the design of efficient algorithms : divide and conquer, dynamic programming, greedy analysis. Design and analysis of algorithms for sorting, merging, hashing and merging large data sets. Methods of algorithmic analysis. algorithmic entropy and information.

### CSE-204 Data Structures and Algorithm Laboratory

3 hours. per week 100 Marks.

Laboratory based on CSE-203.

### CSE-205 Machine and assembly Language Programming

2 hours. per week 150 Marks.

#### PART A

Basic structure of a digital computer. The main memory, control unit, I/O organization & peripherals. Registers. machine and Assembly instruction types and their formats. Character representation Instructions. Instruction execution. Machine language programming (large systems). Instruction sets and their implementations. The assembly process. Addressing methods. Subroutines, macros and files. I/O programming, interrupts and multiple processes.

#### PART B

Advance programming techniques in Assembly language. Interfacing with high level languages. Timing and bench-marking techniques. Programming of microcomputers in machine and assembly language. Methods of addressing and machine control.

#### **CSE-206 Assembly Language Program Development**

3 hours. per week      100 Marks

Students will develop application programs with proper documentations in Assembly language assigned in groups or individually.

#### **CSE-207 Switching Theory and Logical Design**

2 hours. per week      150 Marks.

##### PART A

Number systems and codes. Digital Logic : Boolean algebra, De-Morgan's law, Logic gates and their truth tables, canonical forms, combinational logic circuits, Minimization techniques. Arithmetic and data handling logic circuits, decoders, drivers and encoders. Multiplexers and demultiplexers. Combinational circuit design. Flip-flops, race around problems. Counters : asynchronous counters, synchronous counters and their applications. Odd sequence counter design. Registers : different types and their applications. Minimization of sequential circuits. Memory units.

##### PART B

Review of odd sequence counter design. Logic design of functional digital units-binary and decimal, serial and parallel digital arithmetic units; control unit design and microprogramming. Concept of bus structure. Design of control unit of a small digital computer, memory subsystems, channels, I/O and storage subsystems.

#### **CSE-208 Switching Theory and Logical Design Laboratory**

3 hrs. in alternate week      50 Marks.

Laboratory works based on CSE-207.

#### **EEE-209 Electronic Devices and circuits**

2 hrs. per week      150 Marks.

##### PART A

Semiconductors, Junction diode characteristics, Bipolar transistor characteristics, Small -signal low frequency h-parameter model. Hybrid model. Amplifiers, the darlington pairs. Introduction to oscillators, differential amplifiers,

##### PART A

Semiconductors, Junction diode characteristics, Bipolar transistor characteristics, Small -signal low frequency h-parameter model. Hybrid model. Amplifiers, the darlington pairs. Introduction to oscillators, differential amplifiers, operational amplifiers. Linear applications of opamps, gain, input and output impedances, off-set null adjustments, frequency response and noise.

##### PART B

Introduction to JFET, MOSFET, PMOS, NMOS and CMOS; Biasing and application in switching circuits. SCR, TRIAC, DIAC, UJT : Characteristics and applications. Introduction to rectifiers, active filters, regulated power supply. Basic idea about IC fabrication techniques.

#### **EEE-210 Electronic Devices and circuits laboratory**

3 hrs. in alternate week      50 Marks.

Laboratory works based on EEE-209.

#### **EEE-213 Electrical Technology**

2 hrs. per week      150 Marks.

##### PART A

Review of D.C. circuit, single phase AC circuit analysis, network theorem and application, coupled circuits-self and mutual inductance, transient analysis of simple circuits Polyphase circuit analysis and power measurement. Single phase transformers, equivalent circuits, three phase transformers.

##### PART B

D.C Generator and motor : operation and characteristics, 3-phase induction motors : types, operations, equivalent circuit, characteristics, starting. Introduction to 3-phase alternators and synchronous motors. Fractional horse-power motors.

#### **EEE-214 Electrical Technology Laboratory**

3 hrs. in alternate week      50 marks.

Laboratory based on EEE-213.

#### **HUM-203 Accountancy And Industrial Management**

3 hrs. per week      250 Marks.

##### **Accountancy**

1 hrs. per week 100 marks.

#### PART A

Basic Accounting principles. Different kinds of cheque. Cash book-Petty cash book. Elements of cost: Direct costs. Overhead allocation.

#### PART B

Preparation of cost sheet. Marginal analysis. Computation of breakeven point. Standard costing, Cost variance.

#### Industrial Management

2 hrs. per week 150 Marks.

#### PART A

Authority and responsibility, administration, management and organization. Scientific management and organization; Time and motion study; Learning curve; Organization structure; Principles of organization chart; Span of control; Policies; Decision making.

Analytical methods in management-Linear programming; Waiting line and cost data for decision, network analysis, arrow diagram, critical path; Planning-Types of planning; investment policy and criteria; Depreciation, various methods; Equipment policy. Personnel management-Selection and recruitment of employees, Interview and indoctrination; training and its types; Promotion; Basis of promotion-industrial reaction; Wage systems and incentive and supplementary wage and salary administration; Accident prevention and safety instruction. Job-evaluation and merit rating. Statistical quality control.

#### PART B

Plant layout, layout of physical facilities, Transportation and storage, material handling. Maintenance; Classification of objects to be maintained; Maintenance policy; Planning maintenance function, turnaround or stand by machine, control of maintenance function. Production control in intermittent and continuous manufacturing Industry; objectives and functions of production control; Supplementary planning; Scheduling; Dispatching; Assembly line control. Forecasting; utility and various methods; Coordination between sales and manufacturing; Manufacturing economics.

Purchasing procedure : Inventory control-need and methods of control; Factors affecting inventory build-up, economic lot size and re-order point. Sales; organization and promotion; Measures of performance, measurement and analytical problem of productivity, cost of management and industrial

reorganization. Production standard and work measurement; work sampling and its methods; Allowance in production standards.

#### MATH-215 Mathematics

3 hours. per week 300 Marks.

#### PART A

Statistics :

Frequency distribution, Mean Median Mode and other measure of central tendency. Standard deviation and other measures of dispersion, Moments, Skewness and Kurtosis, Random Variables and expectation.

Elementary probability theory. Discontinuous probability distribution e.g. Binomial, poisson and negative-Binomial, the geometric and hypergeometric. Continuous probability distribution e.g. normal and exponential. Elementary sampling theory, confidence interval Tests of hypothesis.

Complex Variable:

Complex number, argan diagram, power and roots, Function of complex variables, Mapping of  $\frac{1}{z}$ ,  $z^n$ ,  $z^{\frac{1}{2}}$ ,  $e^z$  etc. Linear and bilinear transformation.

Limits, continuity and differentiation formulae, Cauchy-Riemann equations and conformal transformations.

#### PART B

Matrices:

Rank and elementary transformations of a matrix, Solution of linear equation by matrix methods. Vector spaces, linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix.

Vector Calculus:

Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of a scalar function. Divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Various formula.



Partial Differential Equation:

Solution of differential equations with variable co-efficient, Solution of first order partial differential equations. Solution of partial differential equation with constant and variable coefficient, application.

### 3rd Year

#### **CSE-300 Software Development -II**

3 hrs. per week 100 Marks

Students will work in groups or individually to produce high quality software including new I/O drives and similar projects involving operating system modules in different languages. Students will write structural programs and use proper documentation.

#### **CSE-303 Database and Management Information System**

2 hrs. per week 200 Marks

##### **PART A**

Concepts and methods in data base system. File organization and retrieval. Data manipulation. Query formulation and language. Data base models. Data decription languages, data base integrity and security. Data dictionary/directory systems, data base administration. Data base design. Survey of some existing data base management systems.

##### **PART B**

Development of computerized information system in support of the key decision making responsibilities of management. Some applications using COBOL program. An introduction to the role of information and system theory in managerial design makings. The effectiveness and critical analysis in meeting the needs of management.

#### **CSE-304 Database and Management Information Systems Laboratory**

3 hrs. per week 100 Marks

Laboratory work based on CSE-303

#### **CSE-305 Data Communication**

2 hrs. per week 200 Marks

##### **PART A**

Introduction to modulation techniques : Pulse modulation; pulse amplitude modulation; pulse width modulation and pulse position modulation. Pulse code

modulation; quantization; Time and frequency multiplexing, phase shift keying, frequency shift keying, representation of noise; threshold effects in PCM and FM. Probability of error for pulse systems, Concept of channel coding and capacity.

##### **PART B**

Asynchronous communications; synchronous communications. Concept of networks; store and forward message system; low level protocol; modems and protocols. Virtual terminal protocols. Data security, encryption, public keys; local area networks : types, protocols, hardware interfaces, software structures, capacity assignment in networks. Network design; multiplexers, concentrators and buffers.

#### **CSE- 307 Computer Architecture and Operating Systems**

2 hrs. per week 200 Marks

##### **PART A**

A functional description of computer hardware, hardware/concepts and current technology. An investigation of computer system design concepts including requirements, specifications, implementation and modification. Memories, buffers, CPU characteristics, performance factors, overlay, parallel and pipeline system, virtual memory organization; I/O systems. Interrupt mechanisms; channels; control units; input devices including telecommunication equipment.

##### **PART B**

Principles of operating systems; Design objectives; sequential processes; concurrent processes, concurrency, functional mutual exclusion, processor cooperation and deadlocks, processor management. Control and scheduling of large information processing systems. Resource allocation, dispatching; processors access methods, job control languages.

Memory management, memory addressing, paging and store multiplexing. Multiprocessing and time sharing, batch processing. Scheduling algorithms, file systems, protection and security; design and implementation methodology, performance evaluation and case studies.



**CSE-309 Microprocessors and Interfacing**

2 hrs. per week 200 Marks

**PART A**

Introduction to different types of microprocessor. Microprocessor architecture, instruction set, interfacing, I/O operation, Interrupt structure, DMA. Microprocessor interface ICs.

**PART B**

Review of interface ICs. Bit slice microprocessors; Advanced microprocessor; parallelism in microprocessors. Concept of Microprocessor based systems design.

**CSE-310 Microprocessors and Interfacing Laboratory**

3 hrs. in alternate week 50 Marks

Laboratory work based on CSE 309.

**CSE-313 Digital Electronics and Pulse Techniques**

2 hrs. per week 200 Marks.

**PART A**

Diode logic gates, transistor switches, transistor transistor gates, MOS gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details. Propagation delay, product and noise immunity. Open collector and High impedance gates. Electronic circuits for flip-flops, counters and register, memory systems, PLAS. A/D, D/A converters with applications. S/H circuits, LED, LCD and optically coupled oscillators. Non-linear applications of OP AMPs. Analogue switches.

**PART B**

Linear wave shaping: diode wave shaping techniques, clipping and clamping circuits, comparator circuits, switching circuits. Pulse transformers, pulse transmission. Pulse generation; monostable, bistable and astable multivibrators; Schmitt trigger; blocking oscillators and time-base circuit. Timing circuits. Simple voltage sweeps, linear current sweeps.

**CSE-314 Digital Electronics & Pulse Techniques Laboratory**

3 hrs. per week 100 Marks.

Laboratory based on CSE-313.

**CSE-320 Digital Circuit Design**

6 hrs. per week 200 Marks.

Digital computing system design project; Design of memory, control, arithmetic units, input and output in a computer.

**EEE-315 Electrical Circuit Theory**

2 hrs. per week 200 Marks

**PART A**

Analysis of non-sinusoidal waveforms by Fourier series. Fourier methods applied to linear circuits Laplace transformation and its application.

**PART B**

Impulse function; convolution integral and its application. Introduction to analogue and digital filters.

Z-transformation. HF Transmission lines theory.

**EEE-317 Measurement and Instrumentation**

2 hrs. per week 200 Marks

**PART A**

Multiplexers, Comparators, Amplifiers in instrumentation: Differential, Logarithmic, Chopper amplifiers. Phase, Frequency and Period measurement. Digital voltage measurement; instrumentation characteristics and limitations. Measurement of signal in presence of noise. Noise reduction in instrumentation.

**PART B**

Recorders and display devices. Spectrum analyzers, logic analyzers. Introduction to instrument transducers, characteristics for interfacing to digital systems. Measurement and control of Temperature, pressure, flow level, displacement; vibration, acceleration, density and humidity. Nondestructive testing-ultrasonic and eddy current test methods. Data logger/Direct digital control.

**EEE-318 Measurement and Instrumentation Laboratory**

3 hrs. in alternate week 50 Marks.

Laboratory experiments Based on EEE-317

**MATH-315****Mathematics**

2 hrs. per week      200 Marks

**PART A**

Statistics : Analysis of variance, Two factor factorial experiments, Stochastic processes and queuing Discrete-time Markov Chains, Continuous time Markov Chains. The Birth-death process in queuing, Queuing models.

Laplace's Transform : Definition of Laplace's transforms, Elementary transformations and properties, Convolution. Solution of differential equations by Laplace's transforms. Evolution of improper integrals by Laplace transforms.

**Part B:**

Fourier Series : Fourier series expansion, Complex form of Fourier series, Fourier Integral theories. Fourier transforms and Applications.

Harmonic Analysis : Laplace's equation in cartesian, polar, Cylindrical and spherical co-ordinates, Solutions of Laplace's equation in different co-ordinates, Application of spherical Harmonic in determining gravitational potential due to a ring and potential about spherical surface kept at prescribed potential.

**4th Year****CSE-400 Project and thesis**

6 hrs. per week      200 Marks

Study of problems in the field of Computer Science & Engg.

**CSE-403 Computer Networks**

2 hrs. per week      200 Marks

**PART A**

Network Architectures-Layered Architectures and ISO Reference Model. Switching Techniques: Physical layer-X. 21 interface. Data link protocols; Error-correcting codes, HDLC, X.25; Network layers. Flow and Congestion control. Overview of ARPANET, SNA and DECNET. Topological design.

**PART B**

Distributed Computing systems. Use of shared memory and distributed data bases, Synchronization and concurrency problems in distributed systems. Geographically distributed systems. Satellite networks, Packet radio network and Local Area Network. Multiple Access Protocols and Queuing methods for networks-analysis.

**CSE-405 Computer system analysis**

2 hrs. per week      200 Marks.

**PART A**

System concepts. System and Systems Analysis, systems planning, approach to systems development, user involvement, feasibility assessment System investigations: objectives, methods, recording. Logic system design, physical design of computer and manual sub-system, project management and documentation.

**PART B**

Software project management; life cycle, specification design, documentation, maintenance and control; Nature and sources of software tools. Program system organization, analysis of program performance, testing and verification methods, Editing, Formatting, Microprocessing coordination of multiple programs.

**CSE-407 Computer Graphics and Pattern Recognition**

2 hrs. per week      200 Marks

**PART A**

Introduction to Graphical data processing. Fundamentals of interactive graphics programming. Architecture of display devices and connectivity to a computer. Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping and transformations. Hidden line Algorithms. Raster graphics concepts : Architecture, algorithms and other image synthesis methods. Design of interactive graphic conversations. Future trends in computer graphics.

**PART B**

Introduction to pattern recognition : features, classification, learning. Applications to speech recognition, remote sensing and biomedical area. Learning algorithms. Syntactic approach : Introduction to Pattern grammars and languages. Parsing techniques. Pattern recognition in computer aided design. Recent trends.

**CSE-408 Computer Graphics and Pattern Recognition Laboratory**

3 hrs. alternate week      50 Marks

Laboratory works based on CSE-407

**CSE-409 Artificial Intelligence and Expert Systems**

2 hrs. per week 200 Marks

**PART A**

Survey of concepts in artificial intelligence. Knowledge representation, search and control techniques. A machines and features of the LISP and PROLOG languages.

**PART B**

Problem representation; search, inference and learning in intelligent systems; systems for general problems solving, game playing, expert consultation, concept formation and natural language processing: recognition, understanding, and translation. Some expert systems.

**CSE-410 Expert System Design**

3 hrs. in alternate week 50 Marks.

Students will develop expert systems using expert system development tools with proper document.

**CSE-411 Computers and Societal Problems**

2 hrs. per week 200 Marks.

**PART A**

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. History of computing and effects of computers on society. Group projects emphasizing research and investigation related to student interests.

**PART B**

Principles and operations of personnel administration and industrial relations systems. Historical, legal, economic and behavioral dynamics of management relationships in private and public sectors.

**CSE-413 Computer Peripherals and applications**

2 hrs. per week 200 Marks.

**PART A**

Magnetic devices, keyboard, tape and disk equipment. DCR, OMR, Speech I/O devices. Bulk store devices : continuous run magnetic tape (CRMT), magnetic drums, disk, magnetic core, semiconductor memory, magnetic bubble memory, CCD, microfilm store. Display peripherals. Printers. New devices; fiber optics,

video disks, optical disks. Advanced trends computer interfacing, buses and their functions, peripheral control units, Buffered I/O (BIO) channels.

**PART B**

I/O control systems-software device drivers. Analogue and digital interfacing, performance factors; Interfacing of different peripherals. Interfacing standards. Computer control of stepper motors; use of optical isolators and transducers for interfacing. Real time data processing. Digital control systems. Computers in measurement instrumentation, communication and control. Instruments for medical, industrial and other applications.

**CSE-416 Microprocessor Based Design**

3 hrs. in every week 100 Marks

Design of microprocessor and microcomputer hardware and software; use of microprocessor in control of systems. Use of simulators, cross-compilers and development systems.

**CSE-421 Systems Programming and Software Engineering Methods**

2 hrs. per week 200 Marks

**PART A**

Review of machine structure and evaluation of programming systems and operating systems. assembler; general design procedures. Designing an assembler, Table processing. Macro language and Microprocessor. Loaders : loader schemes, design of absolute loader; design of a direct linking loader, programming languages. Formal systems & programming languages.

**PART B**

Concepts in software engineering : requirements definition, modularity, structured design, data specification, functional specifications, verification, documentation, software maintenance. Programming using program design languages, HIPO charts. Software tools. Software project organization, quality assurance approaches.

**CSE-422 System Programming and Software Engineering Methods Laboratory**

3 hrs. alternate week 50 marks

Laboratory experiments based on CSE-421.

**CSE-423 Fault tolerant systems**

2 hrs. per week 200 Marks

**PART A**

Introduction to Fault Tolerant Systems and Architectures. Fault detection and location in combinational and sequential circuits; Fault test generation for combinational and sequential circuits; Digital simulation as a diagnostic tool.

**PART B**

Automatic test pattern generator, Fault modeling, automatic test equipment, Faults in memory, memory test pattern and reliability. Performance monitoring, self checking circuits, Burst error correction and Triple modular redundancy; Maintenance processors.

**CSE-424 Fault Tolerant Systems Laboratory**

3 hrs. alternate week 50 Marks

Laboratory experiments based on CSE-423.

**CSE-425 Compiler Design**

2 hrs. per week 200 Marks

**Part A :**

Introduction to compilers. Programming Languages data elements and structures, operators, assignment statements, parameter transmission storage management. Finite automata and Lexical analysis.

**Part B:**

Syntactic specification of programming languages. Basic parsing techniques. Automatic construction of efficient parsers syntax directed translation; symbols, error detection and recovery; code optimization, loop optimization. Compiler projects.

**CSE-426 Compiler Design Laboratory**

3 hrs. every alternate week 50 Marks.

Laboratory based on CSE-425.

**CSE-427 Computer Simulation**

2 hrs. per week 200 Marks

**PART A**

Simulation methods : random number generation, queuing, discrete random variable. Simulation languages. Model building. Validation and verification technique.

**PART B**

Digital simulation of continuous systems. Hybrid computation. Statistical analysis of results. Application of simulation to problems e.g. shops, business, operation research, operating system computer design. Introduction to development of simulation packages.

**CSE-428 Computer Simulation Laboratory**

3 hrs. every alternate week 50 Marks

Laboratory Based on CSE-427

**CSE-429 Computer Vision and Robotics**

2 hrs. per week 200 marks

**PART A**

An introduction to computer vision and perception. Image generation, the physics of images and sensors, statistical estimation, binary vision and industrial vision systems, representations of the visual world.

**PART B**

Introduction to robotics. Intelligent robot control systems. Robot Programming systems, geometric reasoning, assembly planning, collision avoidance, mobile robots, the robotic. I/O test, smart robotics.

**CSE-430 Computer Vision and Robotics Laboratory**

3 hrs. per alternate week 50 Marks

Laboratory works based on CSE-429

**CSE-431 VLSI Design and Applications**

2 hrs. per week 200 Marks

**PART A**

Design and analysis techniques for VLSI circuits. Design of reliable VLSI circuits, noise consideration, design and operation of large fan out and fan in circuits, clocking methodologies, techniques for data path and data control design. Simulation techniques.

## PART B

Parallel processing, systolic architectures, special purpose architectures in VLSI, properties of VLSI layouts partitioning and placement routing and wiring in VLSI. Reliability aspects of VLSI design.

### **CSE-432 VLSI Design and applications Laboratory**

2 hrs. alternate week 50 Marks.

**Department of Computer Science & Engineering**

### **UNDERGRADUATE COURSES FOR NON-DEPARTMENTAL STUDENTS**

#### **CSE-101 Computer Techniques**

2 hours per week 150 marks

##### **PART A**

Elements of computer structures and languages. Number system. Binary arithmetic. Principles of programming. Flow charts. The FORTRAN language.

##### **PART B**

Numerical methods and computational algorithms. Application of computers in solving electrical and electronic engineering problems.

#### **CSE-102 Computer Techniques Sessional**

3 hours every alternate week 50 marks

Laboratory experiments based on 101

#### **CSE- 301 Digital Techniques**

2 hours per week 200 Marks

##### **PART A**

Number System and Codes: Number system-binary, decimal, octal and hexadecimal number systems and their representation, conversions, complementation, addition, subtraction, multiplication and division. BCD, alphanumeric, gray and excess-3 and parity codes.

Digital logic: Boolean algebra, De Morgan's laws, logic gates and their truth tables. Canonical forms, combinational logic circuits, Karnaugh Map. Logic Families : TTL, ECL, I<sup>2</sup>L, and CMOS; logic, brief description and principle of operation. Propagation delay, speed delay; product and noise immunity. Arithmetic and data-handling logic circuits : Half adder, full adder, half

subtractor, full subtractor, BCD to decimal decoders, BCD to seven segment decoder/drivers, encoders, multiplexers/demultiplexers. Study and use of TTL Data Handbooks.

##### **PART B**

Review of Combinational Circuits; Combinational Circuit design. Flip-Flops. R-S Flip-Flop, Clocked R-S Flip-Flop, simple D-type Flip-Flop, race problems. T Flip-Flops, J-K master-slave Flip-Flop, direct set and reset facilities. Counters-Asynchronous counters, propagation delay in asynchronous counters, synchronous counters and applications. Registers-different types, shift registers, serial to parallel and -parallel to serial, left shift, right shift and circular registers and their applications, D to A and A to D converters with applications. Different types of digital storage media.

#### **CSE-302 Digital Techniques Sessional**

3 hours every alternate week 50 Marks

Laboratory experiments based on CSE-301

#### **CSE-401 Microprocessors and Digital Computers**

2 hours per week 200 marks.

##### **PART A**

Introduction to different types of microprocessors. Instruction sets. Hardware organization. Microprocessor interfacing. Introduction to available microprocessor peripheral IC's. Bit-slice processors. Microprocessor applications.

##### **PART B**

Design of digital computer subsystems, flow of information and logical flow diagram in timing and control signals. System organization. Hardware structures. Design of the control unit of a digital computer. Introduction to microprogramming. Multi-programming, time-sharing and real time computer systems.

Data and instructions. Data systems, addressing of operative memory. Machine instructions. Channel programs. Assembler program. Program execution. Interrupt systems. I/O systems. Inter-connection of computers. Operating systems. Control program. File handler. Program structure Virtual memory.



3 hours every alternate week      50 Marks  
Laboratory experiments based on CSE-401

CSE 6101 Microcomputers and Microprocessors 3 Credits

CSE-6201 digital Computer Theory and Design 3 Credits

Design of the control unit of a small digital computer for laboratory use. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming and time-shared operation. Interrupt systems. Concurrent process in multiprocessors.

CSE 6202 Computer Organization 3 Credits

CSE 6203 Advanced Topics in Microcomputers 3 Credits

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Principles and practice of modern data communication techniques. Transmission-Codes, modes for data transmission, multiplexers, concentrators, terminals. Modems and interfaces. Digital network interface. Error control, crypton, security. Network protocols and line control procedures. Protocols for buffer Management, reassembly, queue control. Communication/carrier systems planning. Distributed intelligence. Message and packet switching. Hardware and software interfacing. International data communication, analytical results on network topology, alternatives, resource sharing and file allocation.

CSE 6301 Computer Science 3 Credits

CSE 6302 Machine and Assembly Language Programming 3 Credits

Machine instruction types, number representation and addressing schemes, programming of microprocessors and microcomputers and mainframe computers in machine and assembly language. Use and design of macro-assemblers; Conditional assembly, control of I/O via access methods. Program status and control, Interrupt handling, job control languages and file structures. File and storage managements. Linkers, loads and load modules. Introduction to operating systems. Assembly language programme testing in mainframe computer IBM-370/115. Applications using BUET Computer.

CSE 6303 Operating system I 3 Credits

Introduction to operating systems for batch oriented multiprogrammed computer system. Memory management in fixed and variable partitions; device and storage management. Input-output programming, interrupt structure and processing. Information managements. File systems; systems programming. Access control verifications. Performance modelling and evaluation.

CSE 6304 Operating system II 3 Credits

Operating system for time-shared and multiprocessor computer systems, processor management-state modelling, job scheduling, process scheduling, process synchronization, time slicing and time-sharing operating systems and sub-systems. Memory Management in a paged and segmented virtual memory



systems. Performance evaluation of computer network software, introduction to computer as a utility. Introduction to security and large data base system.

**CSE 6305 Data base Management 3 Credits**

Relational network and hierarchical data models; sequential, indexed sequential, inverted, multilist, computer access and clustered files; External sorting algorithms, secondary indices optimization, security decomposition of query; Differential fields; evaluation of the organization, current literature.

**CSE 6306 Compiler Construction 3 Credits**

Theory and practice of constructing translators for high level programming languages. Scanning and parsing of formal languages, introductory theory of context free languages and syntactic analysis. Object code generation and economization. Automatic generations of syntax analyzers, translator writing systems, extensible translations.

**CSE 6307 System Analysis and Design 3 Credits**

The systems cycle. Structured systems analysis. Detailed analysis and feasibility study. Tools for the systems designer. Systems design-Input and output design; organizing and designing files - designing a data Base; Process design and acquisition of hardware and software; design review and Program Definition Module Design; programming and coding and testing, documentation and maintenance; management of the systems process .

## Department of Electrical and Electronic Engineering

### UNDERGRADUATE COURSES

**EEE 101 Basic Electrical Engineering.**

3 hours per week 200 marks  
for first year EEE

**PART A**

Electrical units and standards, electrical networks and circuit theorems, introduction to measuring instruments. Magnetic concepts and circuits.

**PART B**

Alternating current, definition of A. C. quantities, phasors, RL, RC, RLC series and parallel circuits.

**EEE 102 Basic Electrical Engineering Sessional**

3 hours every alternate week 50 marks  
For first year EEE  
Laboratory experiments based on EEE 101

**EEE 103 Basic Electrical Engineering (Technology)**

3 hours per week 200 Marks  
For First year Civil Engineering

**PART A**

Electrical units and standards. Electrical networks and circuit solutions series, parallel and mesh current methods. Measurement of electrical quantities-current, voltage, resistance, Measuring instruments; ammeters, voltmeters, watt meters and multimeters.

Instantaneous current, voltage and power, effective current and voltage, average power.

**PART B**

Phasor algebra (as applied to A. C. circuit analysis), sinusoidal singlephase RLC circuits, balanced three phase circuits, Introduction of electrical wiring for residential and commercial loads. Familiarization with different types of electrical machines such as D. C. generators and motors. A. C. alternators,

motors, transformers. Working principles of transformers, induction motors. Introduction to electronics principles with simple applications.

**EEE 104 Basic Electrical Engineering (Technology) Sessional**

3 hours every alternate week 50 marks

Laboratory experiments based on EEE 103

**EEE 105 Electrical Engineering Fundamentals**

(Basic Electrical Engineering)

2 hours per week 150 Marks

For First year ChE and MetE

**PART A**

Electrical units and standards. Electrical networks and circuits theorems, introduction to measuring instruments.

**PART B**

Alternating current, RLC series, parallel circuits, magnetic concepts and magnetic circuits.

**EEE 106 Electrical Engineering Fundamentals Sessional**

(Basic Electrical Engineering Sessional)

3 hours every alternate week 50 Marks

Laboratory experiments based on EEE 105.

**EEE 107 Electrical Engineering Principles**

3 hours per week 150 Marks

For first year ME and NAME

**PART A**

Electrical units and standards, electrical networks and circuit theorems, introduction to measuring instruments.

**PART B**

Alternating current, RLC series, parallel circuits, magnetic concepts and magnetic circuit.

**EEE 108 Electrical Engineering Principles Sessional**

3 hours every alternate week 50 Marks

Laboratory experiments based on EEE 107.

**EEE 109 Introduction to Electrical Engineering**

3 hrs/Week, 200 Marks

For first year CSE

**Part-A**

Fundamental electrical concepts and measuring units, D.C. voltage, current resistance and power. Laws of electrical circuits and methods of network analysis, Principles of D. C. measuring apparatus, Laws of magnetic fields and methods of solving simple magnetic circuits.

**PART B**

Alternating current-instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C circuits. Phasor representation of sinusoidal quantities.

**EEE 110 Introduction to Electrical Engineering Laboratory**

3 hours every alternate week 50 Marks

For first year CSE

Laboratory experiments based on EEE 109

**EEE 200 Electrical Design and Drafting**

3 hours every alternate week 50 Marks

Safety rules, electricity rules and electricity codes. Electrical and electronic symbols. Electrical wiring, house wiring, industrial installation wiring. Insulation measurement, use of meggers. Battery charging.

**EEE 203 Electrical Circuits**

3 hours per week 250 Marks

**PART A**

Waveforms, response of single elements to different waveforms. Single Phase circuit analysis. Q of a circuit, wave trap, maximum power transfer, Network theorems, Y-Delta transformation; coupled circuits, Polyphase balanced and unbalanced circuits; Power measurement.

**PART B**

Periodic nonsinusoidal waves, frequency spectrum, effective values and power. Electric wave filters: basic principles, constant K, M-derived half and full-section, transients.

**EEE 204 Electrical Circuits Sessional**

3 hours every alternate week 50 Marks

Experiments based on EEE 203

**EEE 205 Electrical Machines 1**

3 hours per week 250 Marks

**PART A**

D. C. generator: Principles, construction, classification, armature winding, voltage build up: Armature reactions and commutation, performance and testing. D. C. motor operation, types, speed-torque characteristics, methods of speed control.

Transformers: Construction, cooling, principle, vector diagrams and voltage regulation.

**PART B**

Transformer: Equivalent circuits, performance and testing, special transformers uses and harmonics in polyphase transformers.

Induction motors: Principle of operation, constructional details, equivalent circuits, speed-torque relations, losses and efficiency. Circle diagram, Induction generator.

Synchronous Generators: General outline of synchronous generators; salient pole and non-salient pole. Armature and field cores. Winding insulation, cooling.

**EEE 206 Electrical Machines Sessional**

3 hours every alternate week 50 Marks

Experiments based on EEE 205

**EEE 207 Electronics I**

3 hours per week 205 Marks

**PART A**

Electronic phenomena in metals and semi-conductors; Electron emissions and their different types; vacuum types-diodes, triodes, tetrodes, pentodes, and multigrid tubes, their characteristics and equivalent circuits. Semi-conductor diodes, bipolar and field effect transistors, MOSFETS and other electronic devices, their characteristics and equivalent circuits. Applications of vacuum diodes and semi-conductor diodes in rectification and power supplies, logic circuits and switching circuits (All treatment circuit & device oriented).

**PART B**

Detailed discussion of load line, bias and stabilization for transistor and FET amplifiers. Different transistor configurations and their equivalent circuits. h-parameters, Basic transistor and tube amplifiers and their analysis at I.F., M.F., and H. F. ranges; Untuned voltage amplifiers. Regulated power supplies using zener diodes and transistors.

**EEE 208 Electronics I Sessional**

3 hours every alternate week 50 Marks

Laboratory experiments based on EEE 207

**EEE-209 Electronic Devices and circuits**

2 hours. per week 150 Marks.

For second year CSE

**PART A**

Semiconductors, Junction diodes characteristics, Bipolar transistor characteristics, small signal low frequency h-parameter model. Hybrid II model. Amplifiers, the darlington pairs. Introduction to oscillators, differential amplifiers, operational amplifiers. Linear applications of op. amps, gain, input and output impedances, off-set null adjustments, frequency response and noise.

**PART B**

Introduction to JFET, MOSFET, PMOS, NMOS and CMOS : Biasing and application in switching circuits. SCR, TRIAC DIAC, UJT : Characteristics and applications. Introduction to rectifiers, active filters, regulated power supply. Basic idea about IC fabrication techniques.

**EEE 210 Electronic Devices and circuits laboratory**

3 hours. in alternate week 50 Marks.

Laboratory works based on EEE 209

For second year CSE

**EEE 211 Electrical and Electronics Technology**

3 hours per week 250 Marks

For Second year ME and NAME

**PART A**

Balanced three-phase circuit analysis and power measurement. Single phase transformer-equivalent circuit and laboratory testing, introduction to three-phase transformer.

D. C. Generator- Principle, types, performances and characteristics D. C. motor-principles, types of motor, performances, speed control, starters and characteristics. A. C. Machines-three phase induction motor principles, equivalent circuit. Introduction to synchronous machines and fractional horse power motors.

#### **PART B**

Vacuum tubes, Semiconductor diode, Transistor-characteristics, equivalent circuits, self-biasing circuits, emitter follower amplifiers, push-pull amplifier. Introduction to silicon controlled rectifier and its application, Oscilloscope. Transducers : Strain, temperature, pressure, speed and torque measurements.

#### **EEE 212 Electrical and Electronics Technology Sessional**

3 hours every alternate week 50 Marks

Laboratory experiments based on EEE 211.

#### **EEE 213 Electrical Technology**

2 hours. per week 150 Marks

For Second year CSE

#### **PART A**

Review of D. C. circuit, single phase AC circuit analysis, network theorem and application, coupled circuits-self and mutual inductance, transient analysis of simple circuits, polyphase circuit analysis and power measurement. Single phase transformers, equivalent circuits, three phase transformers.

#### **PART B**

D. C. generator and motor : operation and characteristics, 3-phase induction motors : types, operation, equivalent circuit, characteristics, starting. Introduction to 3-phase alternators and synchronous motors. Fractional horse-power motors.

#### **EEE 214 Electrical Technology Laboratory**

3 hours in alternate week 50 Marks

Laboratory Based on EEE 213.

For Second year CSE

#### **EEE 231 Electrical and Electronic Technology**

3 hours per week 300 Marks

For third year ChE and MetE

#### **PART A**

Balanced three-phase circuit analysis and power measurement, single phase transformer-equivalent circuit and laboratory testing. Introduction to three-phase transformer.

D. C. Generator-principle, types, performances and characteristics. D. C. motor-principle, types of motors, performances, speed control, starters and characteristics. A. C. machines-three phase induction motor-principles, equivalent circuit. Introduction to synchronous machines and fractional horse power motor.

#### **PART B**

Vacuum tubes, Semiconductor diode, transistors-characteristics, equivalent circuits, self-biasing circuits, emitter follower amplifiers, push-pull amplifier. Introduction to silicon controlled rectifier and its application; Oscilloscope. Transducers; Strain, temperature, pressure, speed and torque measurements.

#### **EEE 232 Electrical and Electronic Technology Sessional**

3 hours every alternate week 50 Marks

Laboratory experiments based on EEE 231

#### **EEE 300 Electronics Shop Sessional**

3 hours every alternate week 50 Marks

Radio receivers-study and circuit tracing, fault finding by signal injection and other means, alignment. Trouble shooting of amplifiers, oscillators, oscilloscopes. Trouble shooting of television receivers.

#### **EEE 301 Electronics II**

3 hours per week 300 Marks

#### **PART A**

Feedback, effect of feedback on amplifier characteristics; Types of feedback, stability, Nyquist criterion; Negative feedback amplifiers; Feedback amplifier frequency response. Conditions of self-oscillation and study of different types of oscillators. Direct coupled amplifiers. Tuned voltage amplifiers, untuned power amplifiers- Class A, Class AB and Class B.

#### **PART B**

Tuned Class B and Class C power amplifiers : Modulation-amplitude modulation and demodulation : study of superheterodyne radio receivers, AGC. Television engineering : Introduction and principles of operation; Camera tubes; Synchronising pulses; Television transmitters and receivers; Introduction to colour television.

**EEE 302 Electronic II Sessional**

3 hours per week      100 Marks

Laboratory experiments based on EEE 301

**EEE 303 Electrical Circuits II**

3 hours per week      300 marks

**PART A**

Characteristics of a linear system-methods of transient and steady state solutions of Differential and Integrodifferential equations, Network theorems, Analogous systems. Analysis by Fourier methods.

**PART B**

Laplace Transformation and its application to linear circuits. Impulse function; Convolution integral and their applications. Matrix with simple applications in circuits: Network function, poles and zeroes of a network. Introduction to Topological concepts in electrical and magnetic circuits network.

**EEE 305 Electrical Machines II**

3 hours per week      300 marks

**PART A**

Synchronous Generators : Air gap flux and voltage expressions, armature winding, alternator regulation, determination of machine parameters from tests, vector diagrams, armature reaction, direct and quadrature-axis reactances, losses and efficiency. Blondel's two reaction analysis, transient conditions in alternators, interconnected system of alternators, conditions, methods and problem of parallel operation and load sharing of alternators. synchronous motors : General constructional features, theory of operation, motor terminal characteristics, mathematical analysis, vector diagrams, V-curves, motor tests, losses, efficiency and starting.

**PART B**

Generalized energy conversion processes, general principles of electro-mechanical energy conversion, energy storage, transformation and conversion methods of formulation of motion equations and co-ordinate transformation. Interpretation of generalized machines from field concepts.

Special Machines: Single phase machines-types, principle of operation, characteristics and starting problems, electrostatic motor, repulsion motor,

permanent magnet motor, hysteresis motor and power modulators, power rectifiers, amplidynes, power thyristors and frequency multipliers.

**EEE 306 Electrical Machines Sessional**

3 hours per week      100 marks

Laboratory experiments based on EEE 305

**EEE 307 Measurement and Instrumentation**

2 hours per week      200 Marks

**PART A**

Measurement of resistance, inductance and capacitance. Measurement of conductivity of bulk materials. Cable faults and localization of cable faults. Magnetic measurements, ballistic galvanometers, flux meters. Measurements and separation of iron losses. Illumination measurements. High voltage measurements. Operational amplifiers and their applications.

**PART B**

Instrumentation amplifiers. Transducers ; Measurement of strain, pressure, temperature and flow. Measuring instruments: Classification. Ammeters, Voltmeters and multimeters; Extension of instrument ranges; Current and voltage transformers; Measurement of power and energy: Wattmeters Watt-hour meters and maximum demand indicators. Measurement of speed, frequency and phase differences; Electronic measuring instruments: Oscilloscopes, Digital meters, DMM, VTVM, Q meters. Statistical methods in measurements.

**EEE 308 Measurement and Instrumentation Sessional**

3 hours every alternate week      50 Marks

Laboratory experiments based on EEE 307

**EEE 309 Electromagnetic Fields and Waves**

2 hours per week      200 marks

**PART A**

Review of Vector Analysis. Electrostatics: Coulomb's Law, force, electric field intensity, electrical flux density. Gauss theorem with application, electrostatic potential, boundary conditions, method of images, Laplace's and Poisson's equations, energy of an electrostatic system, conductor and dielectrics.



Magnetostatics: Concept of magnetic field, Ampere's Law, Biot-Savart law, vector magnetic potential, energy of magnetostatic system, mechanical forces and torques in electric and magnetic fields, Curvilinear co-ordinates. Rectangular, cylindrical and spherical coordinates, solutions to static field problems.

Graphical field mapping with applications, solution to Laplace's equation. Rectangular, cylindrical and spherical harmonics with applications.

Maxwell's equations: their derivations, continuity of charges, concepts of displacement current: Boundary conditions for time-varying systems, Potentials used with varying charges and currents. Retarded potentials. Maxwell's equations in different coordinate systems.

#### PART B

Relation between circuit theory and field theory: Circuit concepts and the derivation from the field equations. High frequency circuit concepts, circuit radiation resistance. Skin effect and circuit impedance. Concept of good and perfect conductors and dielectrics. Current distribution in various types of conductors, depth of penetration, internal impedance, power loss, calculation of inductance and capacitance.

Propagation and reflection of electromagnetic waves in unbounded media: Plane wave propagation, polarization, power flow and Poynting's theorem. Transmission line analogy, reflection from conducting and conducting dielectric boundary; Display lines in dielectrics, liquids and solids, plane wave propagation through the ionosphere. Introduction to radiation.

### EEE 311 Transmission and Distribution of Electric Power

3 hours per week    300 marks

#### PART A

Inductance of Transmission Lines: Flux linkage; Inductance due to internal flux; Inductance of single phase two-wire line. Flux linkage of one conductor in a group, inductance of composite conductor lines. G.M.D. examples; 3 phase line with equilateral and with unsymmetrical spacing. Parallel circuit 3 phase lines. Use of table.

Electric field; Potential difference between points due to a charge, capacitance of a two wire line. Group of charged conductors. Capacitances of 3 phase line

with equilateral and with unsymmetrical spacing. Effect of earth; Parallel circuit lines.

Resistance and skin effects: Resistance and temperature, skin effects, influence on resistance. Use of table, current and voltage relation on a transmission line: Representation of line-short, medium, and long transmission line, tee and pi representation, exact solution. Equivalent circuit of a long line. Mechanical characteristics; Transmission line, sag and stress analysis. Wind and ice loading; supports at different elevations: Conditions at erection; Effect of temperature changes.

#### PART B

Generalized line constant: General line equations in terms of A. B. C. D. constants. Relations between constants, charts of line constants, constants of combined networks, Measurement of line constants.

Circle Diagrams : Receiving and sending end power-circle diagrams. Power transmitted; Maximum power, Universal power-circle diagrams. Voltage and power factor control in transmission systems. Tap changing transformers; On load tap changing. Induction regulators. Moving coil regulators; Boasting transformers. Power factor control; Static condensers; Synchronous condenser, Insulators for overhead lines; Types of insulators, their constructions and performance. Potential distribution in a string of insulators, string efficiency. Methods of equalizing potential distribution; Special types of insulators. Testing of insulators.

Insulated cables: Cables versus overhead lines. Insulating materials. Electrostatic stress grading. Three core cables; Dielectric losses and heating; Modern development; Oil filled and gas filled cables. Measurement of capacitances. Cable testing.

Introduction to Transmission Line Protection: Overcurrent relay and time grading, reverse power relays. Differential protection. Distance relays Distribution: Distributor calculation, ring mains and interconnections.

### EEE 314 Electrical Design Sessional

3 hours every alternate week    50 Marks

General design principles of electrical apparatus involving electric and magnetic circuits. Design and specification of chokes, transformers, starters, field regulators etc. Elements of design of rotating machines. Design and interpretation of electrical system layouts.



General design aspect of electronic components; filters, amplifiers, oscillators, audio transformers, Power supply from both mains and batteries. Typical design problems.

### **EEE 315 Electrical Circuit Theory**

2 hours. per week      200 Marks.

For Third year CSE

#### **PART A**

Analysis of non-sinusoidal waveforms by Fourier series. Fourier methods applied to linear circuits. Laplace transformation and its application.

#### **PART B**

Impulse function, convolution integral and its application. Introduction to analogue and digital filters. z-transformation. HF transmission lines theory.

### **EEE 317 Measurement and Instrumentation**

2 hrs. per week      200 Marks.

For Third year CSE

#### **PART A**

Multiplexers, Comparators, Amplifiers in instrumentation : Differential, Logarithmic, Chopper amplifiers. Phase Frequency and period measurement. Digital voltage measurement: instrumentation characteristics and limitations. Measurement of signal in presence of noise. Noise reduction in instrumentation.

#### **PART B**

Recorders and display devices, spectrum analysers, logic analysers, Introduction to instrument transducers, characteristics for Interfacing to digital systems. Measurement and control of temperature, pressure, flow level, displacement; vibration, acceleration, density and humidity. Nondestructive testing ultrasonic and eddycurrent test methods. Data logger, direct digital control.

### **EEE 318 Measurement and Instrumentation Laboratory**

3 hours in alternate week      50 Marks.

For Third year CSE

Laboratory experiments Based on EEE 317

### **EEE 323 Basic Electrical Technology for Architects**

(Electrical Equipments)

1 hours per week      100 Marks

For third year Architecture

Electrical units and standards, electrical networks and circuits theorems. Alternating current-RLC series and parallel circuits. Introduction to electrical wiring for residential and commercial loads. Illumination and working principles of different types of lamp.

### **EEE 400 Project and Thesis**

6 hours per week      200 Marks

Study of problems in the fields of Electrical and Electronic Engineering

### **EEE 401 Control Systems**

2 hours per week      200 Marks

#### **PART A**

Introduction to linear dynamic system and their representation by different equations and Laplace transform. Block diagram representation and transfer function. Routh's criterion for stability. Frequency response methods-Bode, Nyquist, Nichols plot etc.

#### **PART B**

Type of systems and system analysis in time domain. Root locus. Cascade compensation using root locus and frequency methods. Feedback compensation. Introduction of state variables.

### **EEE 402 Control Systems Sessional**

3 hours every alternate week      50 marks

Laboratory experiments based on EEE 401

### **EEE 403 Power System Analysis**

2 hours per week      200 Marks

#### **PART A**

Power network representations, per-unit system of calculations, reactances of a synchronous generator and its equivalent circuits, voltage characteristics of load, power and reactive power flow in simple systems, load flow studies of large systems using the Gauss-Seidel methods. control of voltage, power and

reactive power, use of network analysers and digital computers, symmetrical fault calculations, limitation of short-circuit currents using regulators.

#### **PART B**

Symmetrical components positive, negative and zero sequence networks of generators, transformers and lines, sequence network of systems, unsymmetrical fault calculations.

Power system stability involving two-machine systems, swing equation, Equal-area criterion of stability and its applications, solution of swing equation, factors, affecting transient stability.

#### **EEE 404 Power System Analysis Sessional**

3 hours every alternate week 50 marks

Laboratory work based on EEE 403

#### **EEE 405 Power Stations**

2 hours per week 200 Marks

##### **PART A**

Power plant load curves: Estimates of load, load curves, study and analysis of load curves, Interpretation of load curves. Determination of actual demand and capacity of various components in a system, plotting the expected load curve of a system. Use of the load curves. Load growth and extrapolation of load curves. Selection of service requirements, its effect on plant design. Cost consideration. Equations of performance for plant equipment and electric service. Selection of units. Standby units, large or small units. Number and sizes of units. Plant location. Considerations for site selection for different types of plants; General considerations for different types of power plants-Big, medium and small, conventional and nuclear.

##### **PART B**

Economic marginal transmission cost. Graphical solution for location of different types of distribution. Rectangular distribution of loads. Economic conductor section. General consideration.

The ideal conductor. Effect of any deviation from the ideal cross section. Limits for size of underground cables. Selection of ideal supply voltage. Plant performance and operation characteristics. Performance characteristics. Efficiency. Heat rate. Incremental rate method. Station performance characteristics. Station incremental rate. Capacity scheduling. Base load and

peak load. Load division between steam and hydro stations. Bus systems, Importance of power control. Current Limiting reactors. Different types of bus system lay out. Forces on buses in the case of short circuits. Nuclear power stations. Comparison with conventional generation methods. Chain reactors. Moderators. Classification of reactors. Types of reactors. Special power reactors. Shielding.

#### **EEE 407 Integrated Circuits and Industrial Electronics**

3 hours per week 300 marks

##### **PART A**

Review and analytical treatment of bipolar-transistor, FET, UJT, MOS and CMOS transistors. IC technology : Fabrication and characteristics of ICs. Detailed study of FET, MOS and CMOS integrated circuits. IC devices: amplifiers, oscillators and special devices.

##### **PART B**

Power rectifying devices, gas-filled tubes and power transistors. Controlled rectification using Thyristors, Ignitrons and SCR, Use of DIACS and TRIACS in power control. Saturable reactors and magnetic amplifiers. Electronic control of motors. Industrial relay circuits. Timing circuits. Photo-electric devices and circuits. Electronic control of welding machines. Induction and dielectric heatings and their application in industry. Solar Cells and their applications.

#### **EEE 408 Integrated Circuits and Industrial Electronics Sessional**

3 hours every alternate week 50 marks

Laboratory experiments based on EEE 407

#### **EEE 409 Telecommunication Engineering**

2 hours per week 200 marks

##### **PART A**

Introduction to telegraphy, single current and double current telegraphy, teleprinters. VFT and carrier telegraphy, introduction to telephony, manual switching system, electro-mechanical switching-strowger and EMD systems, electronic switching, Reed relays, basic impulsing circuits, uniselectors, group selectors and final selectors; Trunking diagrams – strowger system and EMD systems; Distribution frames – testing and protection of telephone lines, traffic calculations, introduction to network planning.

Introduction to information theory – Measurement of channel capacity, signal transmission through RC network.

#### PART B

Transmission principles, power levels, attenuation and delay distortions, cross talks, transmission standards, echo and noise, wireless telephony, carrier telephony, repeater, SSB transmitters and receivers, high accuracy crystal lattice filters, introduction to VHF and UHF systems, space communications, tropospheric scatter and satellite communication, lasers and masers with application in communications. Frequency modulation and demodulation periodic sample and pulse modulation, comparative analysis of information transmission system, signal to noise ratio calculation in PPM, PCM and qualification for noise, introduction to statistical methods in communications.

#### EEE 410 Telecommunication Engineering Sessional

3 hours every alternate week 50 marks

Experiments based on EEE 409

#### EEE 411 Science of Materials

2 hours per week 200 marks

##### PART

Atoms and aggregates of atoms, crystals, waves in crystals, Schrodinger Wave Equation. Quantum statistics; Conductivity theory, collision theory and conductivity of metals, conductors, Carrier Transport theory. P-N junction, metal semiconductor junction, surface phenomenon, photocell, solar cell, tunneling principles, dielectric: polar and non-polar dielectrics; Langevin function, Clausius-Mossotti equation, ferroelectricity.

##### PART B

Magnetic properties of materials; magnetic moment, domain wall motion and coercive force in crystals; polycrystalline and permanent magnetic materials, magnetic resonance, testing of magnetic materials, superconductivity. Quantum electronics.

#### EEE 413 Switchgear and protective Relays

2 hours per week 200 marks

##### PART A

Circuit breakers; Speed of circuit breakers. Relays Voltage rating (high, medium, lower, low) of circuit breakers. Oil circuit breakers. Circuit breaker

operating mechanisms and control systems. Arc extinction. Recovery voltage. Devices to aid arc extinction in oil. Maintenance of oil circuit breakers. Air circuit breakers. Air blast circuit breakers.

Ratings of power circuit breakers and selection of circuit breakers. Testing of circuit breakers. Protective Relays: General requirements. Relay operation principles. Construction of relays. Relay currents and voltages; Use of instrument transformer for relays.

##### PART B

Problem of high speed relaying of transmission lines. Overcurrent relays. Directional relays. Distance relays. Sequence and negative sequence relays. Balanced current relaying of parallel line. Ground fault relaying. Pilot relaying principles. Carrier pilot relaying. Operating characteristics of different types of relays. Apparatus protection; Circuits and relay setting. Generator motor protection; Transformer protection. Bus protection; Line protection.

#### EEE 414 Switchgear and Protective Relays Sessional

3 hours every alternate week 50 marks

Laboratory experiments based on EEE 413

#### EEE 415 Microwave Engineering

2 hours per week 200 marks

##### PART A

H. F. transmission lines, Smith chart, impedance matching and applications, E. M. propagation, reflection and refraction, wave guides; parallel plane, rectangular, coaxial wave guides.

##### PART B

Transit time effects. Velocity modulation, space charge wave, microwave tubes, klystron, magnetron, travelling wave tube amplifier. Wave guide components, cavity resonators, antennas and radiation, hertzian dipole, long antennas analysis, radiation patterns, rhombic and slot antenna, frequency independent and longperiodic antennas, antenna arrays, introduction to antennas and array design.

#### EEE 416 Microwave Engineering Sessional

3 hours every alternate week 50 marks

Laboratory experiments based on EEE 415.

**EEE 417 Electronic III**

2 hours per week    200 marks

**PART A**

Wave shaping, Electronic circuit design using OPAMP, Television engineering: basic television system, composite video signal and television standards, television cameras, transmission and relay systems. Television receivers: black and white, Principles of colour T.V.

**PART B**

Propagation of Radio waves, Ionospheric, Tropospheric and ground wave propagation. Effect of earth curvature on propagation. Radar -principles of operation and radar systems, Radar equation, magnetron, pulser, TR, ATR, tubes, duplexer, radio-aid to navigation, LORAN and LIS; Civil, military and weather application of radar.

**EEE 418 Electronics III Sessional**

3 hours every alternate week    50 marks

Laboratory experiments based on EEE 417

**419 High Voltage Engineering**

2 hours per week    200 marks

**PART A**

High voltage supplies: AC Cascaded Transformers. Test coils: DC Valve rectifier Circuits. Cascaded rectifiers. Electrostatic generators; Van de-Graff generators. Corona: Power loss calculations. Break down of solid, liquid and gaseous dielectrics. Insulation tests. Standard specification.

**PART B**

Impulse generators, impulse shapes. Mathematical analysis and design consideration of impulse generators, Triggering of impulse generators. Measurement of high voltages. Transmission line design based on direct strokes, insulation co-ordination, Lightning arresters and protector tubes.

**EEE 420 High Voltage Engineering Sessional**

3 hours every alternate week    50 marks

Laboratory experiments based on EEE 419

**EEE 423 Electrical Circuits III**

2 hours per week    200 marks

**PART A**

Introductory network concepts. Definition and symbols. Sign convention. Terminals and ports. Network functions. Complex frequency, Driving point and transfer functions, Representation by poles and zeros. Properties of network function, Properties of immittance function; Positive real function. Hurwitz polynomials. Natural frequencies of network; Parts of a network function (Magnitude phase plots, code and Nyquist diagrams). Minimum phase transfer function, Calculation of a network function from prescribed real part, imaginary part magnitude or phases. Synthesis of two element: Kind-one port LC, RC and RL one port network.

**PART B**

Two port networks, Classification and characterization of two ports. Two port parameters and natural frequencies. Interconnections of two ports. Common two port configuration. Scattering parameters. One end parameters; Iterative and image parameters. Filter; Design frequency transformation, Butterflies, Block diagrams; Signals flow graphs. State variable techniques. Lattice networks. Bartlett's bisection theorem. Synthesis of Lattice network. Unbalancing of Lattice networks transmission characteristics. Signal distortions. Relationship between bandwidth and rise time, and between rise time, delay time and net-functions.

**EEE 424 Electrical Circuits III Sessional**

3 hours every alternate week    50 marks

Laboratory experiments based on EEE 423

**POSTGRADUATE COURSES****EEE 6011 Engineering Analysis****3 Credits**

Professional methods of dealing with problems. Mathematical and physical principles applied to problems of diverse topics in electrical engineering. Simulation techniques; statistical methods.

**EEE 6012 Energy Conversion****3 Credits**

Energy conversion processes; General introduction, energy sources, principles of conservation of energy balance equations. Direct electrical energy conversion: Introduction; Magnetohydrodynamic (MHD); Fuel cell; Thermo-electrostatic; Ferro-electric; Photo-electric; Photovoltaic, electrostatic and

piezoelectric energy conversions; characteristics including efficiency, power densities, terminal properties and limitations. Electro-mechanical energy conversion; General introduction of electrical to mechanical energy conversion; General introduction of electrical to mechanical, mechanical to electrical and electrical to electrical conversions; Bulk energy conversion devices; General formulations of equations; Co-ordinate transformation and terminal characteristics.

**EEE 6101 Linear System Analysis 3 Credits**

Concepts and properties associated with state and state equations; Linearity and time invariance; State vectors and state equations of time invariant differential systems; Linear time invariant differential systems; Stability of linear differential systems; Impulse response of non-differential linear systems; Impedance functions. Transfer functions and their properties; Discrete-time systems.

**EEE 6102 Network Synthesis I 3 Credits**

Properties of driving point and transfer impedance; Driving point and transfer functions of two-element kind networks; Synthesis of LC driving point impedances; Synthesis of R-C driving point impedances, properties of two terminals-pair networks; Synthesis of loss-less two terminals pair network, real-part sufficiency and related topics; Synthesis of RLC driving point impedances, filter design.

**EEE 6103 Network Synthesis II 3 Credits**

Transformer-loss driving point impedance synthesis, conventional methods of transfer function synthesis. Other methods of realizing transfer function. RC transfer function synthesis. The approximation problems. Time domain synthesis.

**EEE 6104 Nonlinear Circuits 3 Credits**

Numerical methods; Graphical methods; Equations with known exact solution; Analysis of singular points; Analytical methods; Forced oscillating system; Systems described by differential difference equations. Linear differential equation with varying co-efficient. Stability of nonlinear systems.

**EEE 6105 Advanced Topics in Network Theory 3 Credits**

Approximation problem; Potential analog method; Distributed networks; Filters, delay lines, matching transformers, directional couplers, multiplexers, sensitivity analysis, time domain synthesis.

**EEE 6201 Statistical Theory of Communication 3 Credits**

Periodic and random signals; Stationary random processes; Elements of probability theory, statistical characteristics of messages and noise; Autocorrelation; Cross-correlation and spectral analysis. Determination of correlation functions and separation of signals from noise.

Application of correlation techniques. Optimum filter, predictor etc. Synthesis of optimum linear systems.

**EEE 6202 Information Theory 3 Credits**

Fundamentals of probability theory with a brief review of the methods for the representation and analysis of linear system. Definition of a measure of information. Discrete noiseless and noisy systems; Channel capacity, coding the continuous case.

**EEE 6203 Telephone Traffic Theory 3 Credits**

Introduction: Types of switching systems; Nature of telecommunication traffic; Full availability; Limited availability and link system: Lost call cleared theory; Lost call held theory; Non-blocking networks; Characteristics of telecommunication network planning; Traffic measurement; Traffic prediction; Traffic simulation.

**EEE 6204 Advanced Telecommunication Engineering 3 Credits**

Telecommunications system design, types of information and their characteristics, channel characteristics, economic consideration; Noise, noise allocation in large system, S/N ratio, etc; Telephone transmission, Switching, networks, CCITT recommendations; Multiplexing, FDM, TDM; Communication links, coaxial, line of-sight links, tropospheric scatter, millimeter wave/Link, fibre optic; HF, VHF, UHF radio systems, mobile operations; Facsimile communications, basic operation, parameters and standards, PCM and delta modulation, modems, data networks; digital radio, digital microwave links; Radio detection, LORAN; Satellite Communication.

**EEE 6301 Power Semiconductor Circuits 3 Credits**

Review of power semiconductor devices thyristors, triacs, power transistors, GTOs, etc. Circuits, operating principles and analysis of single and three phase ac voltage controllers, rectifiers, inverters and cycloconverters. DC to DC converters (choppers). Applications of converters to motor drives.



**EEE 6302 Design of Power Electronic Circuits 3 Credits**

Characteristics and limitations of power semiconductor as switching devices. Effects of reverse recovery time, stray and series inductances on the commutation circuits. Design of power filter, heat sinks, fuse ratings, snubber and protection circuits. Design of firing and control circuits for different converter configurations.

**EEE 6401 Advanced Electronics 3 Credits**

Bias and thermal stability; High frequency and transient behaviour of transistors; Z, Y and H parameters in T and equivalent circuits; Matrix approach; Amplifiers; Amplifier stability; Oscillators; Integrating, differentiating, counting, timing and pulse circuits; Wave forming and wave shaping circuits; Logic circuits.

**EEE 6402 Quantum Electronics 3 Credits**

Topics in quantum theory important for measure and other quantum-electronic devices. Interaction of radiation and discrete energy level systems. Stimulated transitions rate equations; Generalized block equations; Micro wave solid state masers; Optical masers; Noise and fluctuation phenomena in masers and other amplifiers. Introduction to the quantized electromagnetic fields. Interaction of matter with quantized radiation field. Quantum statistics and description of noise; Non-linear quantum effects.

**EEE 6403 Solid State Devices 3 Credits**

Solid state diodes and triodes; Solid state microwave devices; Integrated electronic circuits.

**EEE 6404 Active Circuit Design 3 Credits**

Multi-stage low pass and feedback amplifiers; High frequency band-pass amplifiers; Coupling and matching networks.

**EEE 6501 Electric and Magnetic Properties of Materials 3 Credits**

Crystal structure; Dielectric of materials; Magnetic properties of materials; conduction in materials and semi-conductors. Gaseous discharges and properties of plasma.

**EEE 6502 Electronics of Solids 3 Credits**

Crystallography; Energy bands and phonon transport theory of solids with emphasis on semiconductors; Superconductivity. Solid state devices, solid state diodes and triodes; Solid state microwave devices; integrated electronic circuits.

**EEE 6503 Laser Theory 3 Credits**

Quantum electronics applied to electronic energy level transitions. Classical radiation and absorption by electronic narrow band spectra of solids. Principles of gaseous and solid state laser devices. Laser rate equations.

**EEE 6601 Applied EM Theory 3 Credits**

Generalized approach to field theory; Introduction to reaction concept; Wave propagation through isotropic, anisotropic and gyrotropic media. Scattering of EM waves. Microwave antennas - theory and design. Advanced topics in EM theory.

**EEE 6602 Microwave Theory and Techniques 3 Credits**

Microwave oscillators amplifiers; Principles generation of millimeter and sub-millimeter wave; Detailed analysis of Klystrons, Magnetrons and TWT amplifiers and backward wave oscillators. Harmonic generators, Gunn-effect devices, Microwave circuits; Microwave network analysis and synthesis. Matrix representation and scattering cavities and strip-lines Methods of microwave precision measurements.

**EEE 6603 Microwave Tubes and Circuits 3 Credits**

Electron guns and their design; Interaction of electron beams and electromagnetic fields. Details of microwave tubes. Masers, parametric amplifiers, solid state microwave devices, microwave circuits; Matrix representation of microwave component design. Analysis of waveguide discontinuities and on-reciprocal microwave circuits, selected topics.

**EEE 6604 Antennas and Propagation 3 Credits**

Definitions, antenna as an aperture; Arrays of point sources; Review of dipoles, loop and thin linear antennas. Helical antenna, biconical and spheroidal antennas. Integral-equation methods, current distribution; Self and mutual impedances; Arrays; Design and synthesis; Reflectarray antennas. Balmain's principle and complementary antennas; Slot and Horn antennas. Lens and other types of antennas. Application of reaction concept and variational principles in antennas and propagation; Frequency independent antennas. Scattering and diffraction. Selected topics in microwave antennas. Antenna measurements. Application to broadcasting, microwave links, satellite communications and radio astronomy.



**EEE 6701 Non-Linear control Systems****3 Credits**

General introduction: The phase plane; method of isoclines; Lienard's method; Pelts method; Common non-linearities: Transient response from phase trajectory; Describing function and their applications; Relay servo mechanism, Liapunov's method.

**EEE 6702 Sampled-Data Control System****3 credits**

Introduction; Transform and modified Z transform; Root-Locus and frequency method of analysis of sampled-data systems. Compensation, discrete and continuous method. Physical realization of discrete compensations.

**EEE 6703 Modern Control Theory****3 Credits**

General Introduction; State space concept; System design by state — Transition method, concept of controllability and observability. Optimal control-variational calculus method; Principle of maximum and dynamic programming. Stochastic and adaptive control processes. On-line computer control.

**EEE 6704 Optimal Control Systems****3 Credits**

The optimal control problem. Cost functionals. Use of calculus of variations in optimal control. Optimization by Pontryagin's maximum principle and dynamic programming; applications. Linear regulator problems. Computational methods of solving two-point boundary value problems.

**EEE 6705 Statistical Models for Engineering Systems****3 Credits**

Introduction to different engineering systems and types of mathematical models. A brief introduction to statistical models with applications. Complex curve fitting, models from sampled time response of various engineering systems with emphasis on electrical engineering systems. Modelling of electrical energy generating systems. Recent advances in system modeling.

**EEE 6801 Generalized Machine Theory****3 Credits**

Introduction to generalized machine theory. Kron's primitive machine; Moving to fixed-axis transformation; Park's transformation; Three-phase to d-q transformation; Variable co-efficient transformation, other transformation; Matrix and tensor analysis of machine, Three-phase synchronous and induction machine; Two-phase servo motor; Single phase induction motor. Smooth-motor two-phase doubly excited machine; Smooth-airgap two-phase synchronous machine. Two-phase induction machine. The n-m winding symmetrical

machine; Diagonalization by a change of variable; Symmetrical three-phase machine and special limiting cases.

**EEE 6802 Special Machines****3 Credits**

Course will be broadly on current research topics on electrical machines and devices. The following areas will be covered: Permanent magnet machines, hysteresis machine, eddy current torque devices; Homopolar machines, PAM motors, and reluctance machines.

**EEE 6803 Advanced Machine Design****3 Credits**

General Treatment Electrical Machine Design. Review of standard procedures in design of D. C. machines, A. C. machines, transformers and special machines. Optimization and synthesis of design procedures. Application of material balance and critical path principles in electrical design. Design economics and safety factors. Applications of computers in modern designs including the operation of the machine in non-linear ranges; Magnetic flux-plots and heat transfer process, etc. mechanical design of electrical machinery and relation between mechanical and electric machine design.

**EEE 6901 Optimization of Power System Operation****3 Credits**

General principles of optimization, its application to power system planning, design and operation. Probability analysis for bulk power security and outage data. Economic operation of power system-economic operation of thermal plants, combined thermal and hydro-electric plants. Theory of economic operation of interconnected Areas. Development and application of transmission loss formulae for economic operation of power systems. Method of optimum scheduling and dispatch of generator.

**EEE 6902 Computer Aided Power System Design****3 Credits**

General review of network and matrix theories. Algorithms for formation of network matrices. Three-phase networks flux-linkage calculations, line parameter calculations, short Circuit Calculations load flow studies, system stability studies, prediction of reliability, over voltage and relay co-ordinations.

**EEE 6903 Protective Relays****3 Credits**

Relay design and constructions; Main characteristics of protective relays. Over current, directional differential distance and pilot relays. Static relays, Comparators. Errors introduced by C. T's P. T.'s on relays operation. Linear computers.

Effects of transients on relay operation. Harmonic relaying. Reliability of relays. Maintenance and testing of relays. Relaying of the future.

**EEE 6904 Power System Stability 3 Credits**

The stability problems of power system. Distinction between steady state and transient stability. The swing equation and its solution. Solution of networks for stability studies. Transient stability limits criteria. Two machine and multimachine problems. Stability under different types of faults. Typical stability studies and methods of improving stability.

**EEE 6905 Transients in Power Systems 3 credits**

Transients in simple electric and magnetically linked circuits; Fundamentals; Impacts of switching on rotating machinery. Parallel operation of interconnected networks; Distribution of power impacts. Interaction of Governor's in power systems. Overvoltages during power system faults. Systems voltage recovery characteristics. Effect of arc restriking on recovery voltage Switching surges and overvoltage arrester requirements. Overvoltage caused by sudden loss of load and by open conductor.

**EEE 6906 Reliability of Power System 3 Credits**

Review of Basic probability theory. Basic reliability concepts. Markovian model of generation unit. Development of load models. Probabilistic simulation of generating systems. Reliability indices; Recursive, segmentation and cumulant method to obtain loss of load probability (LOLP). Modeling of forecast uncertainty. Reliability evaluation of energy limited systems. Different techniques of evaluating reliability, reliability indices of interconnected systems. Composite transmission and generating system reliability.

**EEE 6907 Power System Planning 3 Credits**

Basic objectives of power systems planning; Generation expansion planning process. Electrical demand forecasting; Current demand forecasting approaches. Generating planning; economic analysis, expected energy generation, expected fuel cost, Booth-Baleriux, cumulant and segmentation methods. Probabilistic simulation of hydro and energy limited units. Expected energy production cost of interconnected systems. Economic aspects of interconnection. Different aspects of Load Management; effects of Load Management of reliability and on production cost. Joint ownership of generation.

**EEE 6908 Advanced Power System Control**

**3 Credits**

Introduction to power system monitoring and control: Voltage, power and frequency control. Principles of small-scale and large-scale power system control; applications of network decomposition and sparsity. Modern control schemes: closed loop generation control, load frequency control and security control. Centralized and decentralized computer control of power system: functional geographical and voltage level hierarchy. Analysis of various on-line functions: network topology, state estimation, short term load forecasting, unit commitment, active and reactive power control. Applications of pattern recognition and artificial intelligence in power system restoration, voltage prediction and contingency analysis.

## **Faculty of Engineering**

### **Department of Chemical Engineering**

#### **UNDERGRADUATE COURSES**

##### **ChE 101 Elements of Chemical Engineering**

2 hours per week 150 marks

###### **PART A**

Scope of Chemical Engineering. Principles of chemical engineering calculations: Systems of units, basic concepts of dimensional analysis, process variables, basis of calculation, conservation of mass and energy. Material balance : overall component balance, recycle and bypass, simple reactive systems and combustion reactions. Energy balance: forms of energy and the First law of thermodynamics, thermodynamic data and tables, energy balance on closed and open systems.

###### **PART B**

Application of mass and energy balance to real processes. Measurements of process variables: fluid statics and manometry, mechanical energy balance, flow measurement, temperature measurement. Computational techniques: the method of least squares, solution of algebraic equations by Newton's method, numerical integration, application of computers in chemical engineering.

##### **ChE 201 Material and Energy Balance**

3 hours per week 250 marks

###### **PART A**

Review of material and energy balance involving recycling, parallel and by pass operations. Operations involving vapourization, humidification, psychrometry, phase diagrams. Material balances with chemical reactions and multiple components; use of algebraic techniques. Energy balance involving change of phases.

###### **PART B**

Energy balances on chemical processes. Heats of formation and reaction, effects of temperature and pressure. Heats of mixing, solution. Enthalpy-

composition diagram. Combustion, theoretical flame temperature, optimum excess air, ultimate CO<sub>2</sub>. Stoichiometry and unit operations in industrial processes.

#### **ChE 202 Material and Energy Balance Sessional**

3 hours every alternate week      50 marks

Laboratory experiments based on ChE 201

#### **ChE 203 Fluid Mechanics**

3 hours per week      250 marks

##### **PART A**

Review of fluid statics and manometry, force on submerged bodies. Concept of shear stress and classification of fluids. Dimensional analysis. Flow of incompressible Newtonian, non-Newtonian and compressible fluid in closed conduits. Flow rate and pressure distribution in manifolds and loops. Frictional losses in pipes and pipe line design. Pumping of liquids. Mixing of liquids.

##### **PART B**

Microscopic balance : conservation of mass and momentum, stress in a fluid, symmetry of stress, deformation. Newtonian fluid and constitutive equation. Navier Stokes equations in different co-ordinate systems. Exact solutions of Navier-Stokes equation. Approximate solution of Navier-Stokes equation : stream function and two dimensional potential flow, creeping flow around a sphere, boundary layer flows. Macroscopic balance and their applications. Turbulence flow. Compressible flow and energy equation. Two-phase gas liquid flow.

#### **ChE 204 Fluid Mechanics Sessional**

3 hours per week      100 marks

Laboratory work based ChE 203

#### **ChE 205 Chemical Engineering Thermodynamics**

2 hours per week      150 marks

##### **PART A**

Scope of thermodynamics, fundamental quantities, secondary quantities. The first law and other basic concepts: Joules experiments, internal energy, the first law of thermodynamics, the thermodynamic state and state function, extensive and intensive properties, enthalpy, steady state flow process, phase rule,

reversible and irreversible processes, heat capacities and specific heat. Volumetric properties of pure fluids: P-V-T behaviour of pure substances, the ideal and non-ideal gas and equations of state, applications of equations of state. Heat effects: heat capacities of gases as a function of temperature, heat capacities of solids and liquids, heat effects accompanying phase changes of pure substances, the standard heat of reaction, effect of temperature on the standard heat of reaction.

##### **PART B**

The second law of thermodynamics : alternative statements of the second law. Heat engine. The thermodynamic and ideal gas temperature scales. The concept of entropy: entropy changes and irreversibility. Lost work. The third law of thermodynamics. Thermodynamic properties of fluids : relationships among the thermodynamic properties, single phase and two phase system, types of thermodynamic diagrams. Conversion of heat into work by power cycles: vapour cycles. The steam power plant. Analysis of the steam power plant: boiler, economiser, superheater, steam turbine. Internal combustion engines, otto engine, diesel engine, gas turbine, jet engines.

#### **ChE 208 Computer Programming and Applications**

2 hours per week      100 marks.

An introductory course in FORTRAN programming and its applications to simple problems in chemical engineering.

#### **ChE 301 Heat Transfer**

2 hours per week      200 marks

##### **PART A**

Modes of heat transfer, mechanism of thermal conduction in solids, liquids and gases, other thermal properties. Steady state heat conduction in one and two dimensions, extended surfaces, transient heat conduction. Numerical and graphical methods of solution in heat conduction. The basic equations of momentum and heat transport, turbulent transport. Some exact and approximate solutions of convection heat transfer.

##### **PART B**

Dimensional analysis, dimensionless correlations for forced and free convection. Heat transfer with phase change : Boiling and evaporation, bubble growth and critical bubble diameter, pool boiling, forced convection boiling, film and

dropwise condensation. Thermal radiation : black body radiation, exchange between infinite and finite surfaces in different enclosures, radiation shields, radiation from gases, flames and solar radiation. Design of heat exchangers: Mean temperature in different flow arrangements, NTU method of heat exchanger calculations, materials of construction and mechanical aspects of design. Design considerations; multiple effect evaporation systems, furnace calculations. Measurement of temperature and thermal properties.

#### **ChE 302 Heat Transfer Sessional**

4 hours every alternate week 50 marks

Laboratory work based on ChE 301

#### **ChE 303 Mass Transfer**

3 hours per week 300 marks

##### **PART A**

Introduction to mass transfer processes. Phase equilibria. Equilibrium stage concept. Solvent extraction: liquid-liquid extraction in single and multiple contact extractor with completely immiscible and partially miscible solvent, use of triangular diagram for stage calculations, batch and continuous leaching and washing of solids. Binary distillation: equilibrium flash and differential distillation, batch and continuous distillation with reflux, use of enthalpy-concentrations diagram for stage calculations. Tray hydraulics and design considerations. Tray efficiency. Multi-component distillation : bubble and dew point calculations for multi-component systems, simplified methods for multicomponent distillation.

##### **PART B**

Basic mass transfer theories; diffusion of gases and liquids, diffusion through stagnant layer and equimolar counter diffusion, mass transfer between gas and liquid phases, two film theory, HTU and NTU concepts. Continuous contact mass transfer: packed and spray column, gas absorption in packed column, continuous liquid-liquid extraction in columns. Simultaneous heat and mass transfer operations: principles of simultaneous heat and mass transfer, humidification-dehumidification processes, use of psychrometric chart, theory of wet-bulb temperature, cooling tower calculations. Drying, theory of drying of solids, types and design of industrial dryers. Ion exchange : principles of ion exchange separation and industrial applications. Crystallization; basic features

and types of equilibrium diagrams, crystallization mechanism, design calculations, types of industrial crystalizer.

#### **ChE 304 Mass Transfer Sessional**

4 hours every alternate week 50 marks

Laboratory work based on ChE 303

#### **ChE 305 Chemical Engineering Thermodynamics II**

2 hours per week 200 marks

##### **PART A**

Solution thermodynamics: relationships among the thermodynamic properties for systems of variable composition, partial molar properties, fugacity and fugacity coefficients, fugacities in ideal solutions, property changes on mixing, activity and activity coefficients, heat effects of mixing processes. Phase equilibria: nature and criteria of equilibrium, the phase rule and the Duhem's theorem, vapour-liquid equilibrium calculations for miscible systems, Gibbs-Duhem equation. Chemical reaction equilibria; the reaction co-ordinate, criteria of equilibrium for chemical reactions, equilibrium constant, effect of temperature on equilibrium constant, evaluation of equilibrium constant, phase rule and Duhem's theorem for reacting systems.

##### **PART B**

Thermodynamics of flow processes: fundamental equations, conservation of mass and energy, mechanical energy balance, maximum velocity in pipe flow, metering and throttling processes, nozzles, compressors, ejectors. Refrigeration and liquefaction: Carnot refrigeration cycle, air-refrigeration cycle, vapour compression cycles, comparison of refrigeration cycles, absorption refrigeration. Heat pump, liquefaction processes. Thermodynamic analysis of processes: ideal work, lost work, thermodynamic analysis of steady flow processes.

#### **ChE 307 Particle Technology**

2 hours per week 200 marks

##### **PART A**

Handling of particulate solids: particle size and screen analysis, pressure in masses of particles, storage of solids. Size reduction : size distribution in comminuted products, energy and power requirements in comminution, size reduction equipment. Fluid-solid momentum transport: drag curve, pressure



drop in packed beds, fluidization and sedimentation, slurry transport and pneumatic conveying, cyclones, two phase flow in packed beds and flooding and loading characteristics.

#### PART B

Fluid-solid separation based on momentum transport : pre-treatment of solid-liquid mixture, theory of coagulation and flocculation, gravity thickening, hydrocyclones, centrifugal sedimentation. Filtration: flow through porous media, filtration operations and basic equations for incompressible and compressible cakes, deep bed, pressure, vacuum and centrifugal filtration, filter media, filter aids, cake washing and dewatering.

#### ChE 308 Particle Technology Sessional

3 hours every alternate week 50 marks

Laboratory work based on ChE 307

#### ChE 309 Principles of Food Preservation and Processing

2 hours per week 200 marks

##### PART A

Food composition: carbohydrates, lipids, proteins, vitamins, minerals, pectic substances in food. Flavour, aroma and natural pigment of food. Enzymes : classification and function of enzymes. Food analysis: nutritive value of food; nutritive value of protein, carbohydrate, vitamins minerals. Effect of cooking and processing on the nutritive value. Food additives.

##### PART B

Fundamentals of microbiology : microbes in food and fermentation industries. Morphology, physiology and genetics of bacteria, moulds, yeasts, fungi, actinomycetes and algae. Principles of serology and immunology. Viruses. Growth and destruction of microorganisms: growth curve. Physical and chemical factors influencing the destruction of microorganisms. Energy metabolism of aerobic and anaerobic microbes. Nitrogen fixation. Microorganism in natural products and their control; source and prevention, general principles of food preservation. Microbiology of atmosphere, water, milk and milk products, fish, fruit, vegetables, meat, poultry products and canned foods. Basic principles of food plant sanitation. Food poisoning.

#### ChE 311 Polymers and Petrochemicals

2 hours per week 200 marks

##### PART A

Introduction to polymeric materials and polymer processing technology, classification of polymeric materials (linear, branched, crosslinked, types of copolymers etc.), molecular weight and its distribution and its measurement, chemical structure, manufacture and technological properties of industrial thermosets and thermoplastics and comparison with other materials (economics, commercial grades, special formulation requirements and service limitations), materials: PE, PP, PVC, PVA, polyimides and other synthetic fibres, PTFE, polycarbonates, epoxy resins, cross-linked plastics etc. product design criteria, technology of processing (extrusion, mixing, molding, calendering, film blowing, GRP techniques).

##### PART B

Introduction, petrochemical feed stock, production of synthesis gas and its utilization in manufacturing ammonia, methanol and oxochemicals, production of acetylene based compounds (polyvinyl acetate, alcohol, higher acetylene), production and utilization of ethylene, production of propylene and its uses, manufacture of butadiene and butadiene rubber, production of aromatics and waxes from petroleum and their uses

#### ChE 313 Glass, Ceramics and Cement Technology

2 hours per week 200 marks

##### PART A

Structural characteristics of ceramic materials, kinetics of high temperature reaction including sintering and vitrification, melting crystallization and glass formations, ceramic phase equilibrium diagrams, non-equilibrium phases. Raw materials, manufacturing processes and chief properties of glass, porcelain, refractories and whitewares.

##### PART B

Glazing and decorating of porcelain and stone wares. Firing methods and kilns for ceramic and whitewares. Furnaces for glass manufacture. Raw materials, manufacturing processes and properties of cement. Heat and mass balance around cement kiln.



**ChE 314 Chemical Process Analysis Sessional**

3 hours per week      100 marks

Process descriptions and calculations of the following industries: Gaseous, liquid, solid & secondary fuels, sulfur compounds (sulfuric acid), nitrogen compounds (ammonia, urea), lime & cement, chloro-alkali industries, airconditioning & refrigeration (humidification-dehumidification), ceramic industry, phosphorus industry (phosphate fertilizer), soap & detergent, sugar industry, pulp & paper industry, fermentation industry, petroleum & petrochemicals.

**ChE 316 Computational Technique in Chemical Engineering Sessional**

2 hours per week      100 marks

Computational techniques in numerical methods of solution of algebraic and transcendental equations, integration and differential equations. Application to chemical engineering design and optimization problems.

**ChE 400 Project/Thesis**

8 hours per week      300 Marks

With the assistance of a teacher the student will select a problem in any field of chemical engineering. The problem must require experimental work and not be merely a paper thesis and must be sufficiently limited in scope so that the student can expect to attain a satisfactory solution in one year of work. The purpose of this course is to make the student responsible for planning and carrying out an engineering project and presenting his work as an acceptable engineering report.

**ChE 401 Chemical Reaction Engineering**

2 hours per week      200 marks

**PART A**

Kinetics of homogeneous reactions, variables affecting rate, elementary and nonelementary reactions, types of reactors, interpretation of laboratory reactor data, design of reactor, multiple reactor systems, recycle reactor, autocatalytic reactions. Temperature and pressure effects, equilibrium calculations, adiabatic operations, non-adiabatic operations, general graphical design procedure,

optimum temperature progression, treatment of multiple reactions, kinetics of polymerization reaction, polymer reactor design.

**PART B**

Kinetics of heterogeneous reactions, mechanism of catalysis, types of catalysts, preparation and properties of catalysts, external heat and mass transport processes, internal heat and mass transport processes. Experimental reactors and treatment of data. Design of packed bed reactors, staged adiabatic packed bed reactors, design of reactors for uncatalyzed heterogeneous reactions.

**ChE 403 Process Control**

2 hours per week      200 Marks

**PART A**

Laplace Transforms, transfer functions for first order systems, physical examples of first order systems, response of first order systems in series, higher order systems, transportation lag. Closed loop systems, controllers and final control elements, block diagrams, closed loop transfer functions, transient response of simple control systems, concept of stability, stability criteria, Routh test for stability.

**PART B**

Frequency response methods, control systems design by frequency response, closed loop frequency by frequency response methods, Nyquist stability criterion. Controller mechanism, measuring instruments, transducers and transmitters. Control of complex processes, experimental dynamics of complex processes. Theoretical analysis of complex processes.

**ChE 404 Reaction Engineering and Process Control Sessional**

3 hours every alternate week      50 marks

Laboratory work based on ChE 401 and ChE 403.

**ChE 405 Materials Science and Corrosion Engineering**

3 hours per week      300 marks

**PART A**

Engineering requirements of material; inter-atomic attractive force; the arrangement of atoms in materials, metallic phases and their properties: ceramic phases and their properties, organic materials (polymers) and their properties, Multiphase materials, equilibrium relationships, phase diagrams,

Fe-C phase diagram. Modification of properties through changes in microstructure, heat treatment.

Corrosion-definition and importance, electrochemical mechanisms, corrosion tendency and electrode potentials, polarization and corrosion rates, passivity, Pourbaix diagrams, behaviour of iron and steel.

#### PART B

Effect of stress, atmospheric corrosion, soil corrosion, oxidation and high temperature corrosion, stray current corrosion, cathodic and anodic protection; metallic, inorganic and organic coating, inhibitors and passivators, boiler corrosion and water treatment. Corrosion resistance of metals and alloys. Stainless steels, copper and copper alloys, aluminum, magnesium, lead, nickel and nickel alloys, Ti, Zr, Ta, Si-Fe and Si-Ni alloys; industrial environments and appropriate materials.

### ChE 407 Process Design

2 hours per week

200 marks

#### PART A

Introduction, process design development. Aspects of design considerations. Energy conservation. Structure of the systems (information flow related to design). Economic design criteria. Optimum design.

#### PART B

Design standards and codes used for chemical processing equipments such as columns, towers, pressure vessels, furnaces, heaters, heat exchangers, compressors etc. Design of process utilities such as, water treatment plants, cooling towers, steam handling and distribution, refrigeration and air-conditioning. Design and costing of process equipments: pumps, compressors, turbines, heat exchangers, absorption and distillation columns. Testing of above equipments as per AIChE, ASTM, API standards for evaluating performances and safety.

### ChE 408 Process Design Sessional

5 hours per week 200 marks

Extensive problem work based on ChE 407. Integrated design of chemical plant and equipment of particular importance in the scheme of national development from the view point of both chemical engineering and economics.

### ChE 409 Economics and Management of Chemical Process industries I

3 hours per week 300 marks

#### PART A

National economic policy, alternative investments. Principles of economic balance. Opportunity cost. Project preparation. Project evaluation: discounted cash flow, IRR, ERR, profitability. Accounting principles: journal, ledger and trial balance. Profit & loss account, balance sheet. Depreciation. Taxes. Accounting for engineering projects. Financial Statement analysis, cost accounting, job costing, process costing and standard costing, preparation of cost estimates. Cost control: break even analysis. Budgeting.

#### PART B

Principles of management: management functions; planning organizing, supervising, motivating and controlling. Managerial skill. Analysis of human and organizational behaviour. Production management; production planning and control. Scheduling: CPM, PERT, production control. Quality control. Queuing and inventory control. Transportation algorithms, optimization techniques, linear programming. Marketing, management; market classification and segmentation, market analysis, product, price and channel decisions. Product promotion. Personnel management; personnel policies, personnel records, recruitment and selection. Training. Grievance handling, Case studies in Chemical Process industries.

### ChE 411 Energy and Environment

2 hours per week 200 marks

#### PART A

Environmental chemistry: Oxides of carbon, nitrogen and sulfur in air, inorganic and organic chemicals, photochemical smog, trace level substance; mercury, lead, detergents, insecticides and oils in water. Population, food supply and selected ecosystems. Population growth and food situation unconventional method of increasing supply of available protein and amino acids, interaction between man and various eco-systems.

#### PART B

Classes of natural resources, resources selected resources and estimated reserves, energy fuels and additional energy resources, energy conversion and consuming devices. Energy planning and management; policy and economics

in relation to various end use sectors, regions, energy conservation, total energy system. Social, legal and economic aspects of environmental degradation.

**ChE 412 Energy and Environment Sessional**

3 hours every alternate week 50 marks

Laboratory work based on ChE 411

**ChE 413 Industrial Pollution Control**

2 hours per week 200 marks

**PART A**

Scope and purpose, source and nature of pollutants in air and water. Air pollution; measuring and estimating emission from sources, meteorological factors, methods of reducing pollutants, physical combustion and catalytic combustion methods; methods of gas cleaning-electrostatic precipitation, filtration, scrubbing, sonic and ultra-sonic agglomeration. Water pollution: Waste water characteristics, Waste water treatment-physical, chemical and biological methods, sludge disposal.

**PART B**

Disposal of toxic wastes. Radiological protection principles. Nuclear fuel cycle and disposal. Pollution control of specific industries: pulp and paper, fertilizer, steel, refinery, metal finishing, tannery, food, pharmaceuticals.

**ChE 414 Pollution Control Sessional**

3 hours every alternate week 50 marks

Laboratory work based on ChE 413

**ChE 415 Fuels and Combustion**

3 hours per week 200 marks

**PART A**

Energy situation and sources in Bangladesh. Classification analysis of fuels, essential properties of fuels, purification and fuels processing, storage and handling of fuels (designing of system and facilities). Energy saving devices.

**PART B**

Design and sizing of burners, combustion chambers (furnaces) and stack for different fuels. Kinetics of combustion. Evaluation of burner and furnace

operations. Sampling and analysis of flue gases. Design and operations of tunnel kiln, rotary kiln, metal smelting furnaces, direct fired heaters. Safety in burner and furnace operations.

**ChE 416 Fuel Testing Sessional**

3 hours every alternate week 50 marks

Laboratory work based on ChE-415

**ChE 417 Natural Gas and petroleum Engineering**

2 hours per week 200 marks

**PART A**

Composition of petroleum reserves, production and consumption of petroleum in various countries, geology and geochemistry, petroleum, prospecting for petroleum, exploration of petroleum, drilling, petroleum production, developing petroleum fields, breakdowns-their prevention and liquidation, secondary methods of petroleum recovery, transportation and storage of petroleum.

**PART B**

Introduction to the natural gas industry, properties of reservoir rock, phase behaviour of natural gas systems, properties of natural gases and volatile hydrocarbon liquids, water-hydrocarbon systems, measurement and computation of vapor-liquid equilibria for complex mixtures, flow and compression calculations, gas-flow measurements, drilling and testing of natural gas wells, steady and unsteady-state flow in reservoirs, development and operation of gas fields, fields-separation and oil-absorption processes, fractional distillation and low-temperature processing, dehydration and sweetening of natural gas, storage of natural gas, transmission to market.

**ChE 419 Transport Phenomena**

2 hours per week 200 marks

**PART A**

Viscosity: thermal conductivity and diffusivity; the mechanism of momentum, energy and mass, velocity distribution in laminar flow, temperature and concentration distribution in solids and laminar flow, the equations of change for isothermal, nonisothermal and multi-component system, velocity and temperature distribution with more than one variable.

#### PART B

Velocity, temperature and concentration distribution in turbulent flow, inter-phase transport and macroscopic balances for isothermal, non-isothermal and multi-component systems, momentum, energy and mass transfer, analogy equations of Reynolds, Prandtl, Von Karman, etc.

#### ChE 421 Mathematical Models in Chemical Engineering

2 hours per week      200 marks

##### PART A

Classification of mathematical models, fundamental features of models, general methods of solution. Application to problems in staged operations, fluid mechanics and heat transfer.

##### PART B

Parameter estimation, design of experiments, optimization techniques, application to problems in chemical reactor design.

#### ChE 423 Biochemical Kinetics and Reactor Design

2 hours per week      200 marks

##### PART A

Introduction of Biochemical Engineering and concept of biological catalysts, nature of micro-organisms, their requirements and classification, industrially important micro-organisms. Basic biochemistry, important bio-chemicals, protein and nucleic acid metabolism. Batch fermentation, yield coefficients for biomass and product formation. Rates of reaction, growth rates, limiting substrate considerations, Monod's equation.

##### PART B

Biological industries and their engineering problems. Stoichiometry of reactions and heat evolution. Oxygen in the cell and medium formulation. Transport phenomena in microbial systems. Design and analysis of biological reactors. Gas-liquid contact and agitation and aeration. Down-stream processing. Separation of cells and recovery of useful end-products.

#### ChE 425 Nuclear Chemical Engineering

2 hours per week      200 marks

##### PART A

General features of nuclear reactors, reactor fuel cycle. Radioactivity, interaction of alpha and beta particles and gamma rays with matter, interaction of neutrons

with matter, the fission process. Diffusion and slowing down of the neutrons, elements of reactor theory. Energy removal.

##### PART B

The fuel cycle and nuclear fuel materials sources of uranium, separation of uranium isotopes, thorium and plutonium, properties of fuel element materials and their metallurgy, reprocessing of irradiated fuel. Separation processes; solvent extraction, ion exchange, volatility separations, pyrometallurgical process. Process waste disposal. Radiation protection and nuclear safeguards.

#### ChE 427 Petrochemicals and Refinery Engineering

2 hours per week      200 marks

##### PART A

Introduction, evaluation of crude oils, refinery products and their uses, analysis of petroleum products. Refining processes : atmospheric and vacuum distillation, thermal cracking, coking, pyrolysis, catalytic cracking, hydrocracking, catalytic reforming, hydrogen treating, isomerization, alkylation, desulfurization. Production of lubricating oil and greases. Bitumen production. Discussion on ERL with emphasis on processing.

##### PART B

Different feed stocks for petrochemicals. Manufacture of acetylene, ethylene, propylene, butadiene, isoprene, styrene, synthesis gas; production of polyethylene, polypropylene, PVC. butadiene rubber, styrene-butadiene rubber, synthetic fibres. fatty alcohols, fatty styrene acids, low-molecular alcohols, phenol, acetone, acetic acid, methanol: manufacture of alkyl aryl sulphonates, alkyl sulphonates, alkyl sulphates, productions of sulphur, sulfuric acid and hydrogen from petroleum materials.

#### ChE 429 Polymer Processing Principles

2 hours per week      200 marks

##### PART A

Introduction to processing principles: mechanical, electrical, thermal and optical properties of polymeric materials with special reference to time-temperature and environmental effects and testing standards. Formulation and compounding; principles and practice, kinetics and chemical engineering processes of polymerization. Degradation and stabilization of polymers.

## PART B

Rheological properties of polymeric melt, solutions and suspension, and their measurements, flow in channels of simple cross-section, basic heat transfer, analysis of the principles of extrusion, injection molding, film blowing, calendering, mixing etc. for sizing equipments, power requirements and understanding of process performance. Processes and operations planning, facilities, layout and maintenance, including health and safety.

### ChE 431 Fertilizer, Pulp and Paper Technology

2 hours per week 200 marks

#### PART A

The world fertilizer market. Fertilizer industries in Bangladesh. Nitrogen fertilizer-ammonia, urea: raw materials, manufacturing processes, design considerations, status of production, waste disposal methods, production and distribution economics, uses. Production and uses of other nitrogen fertilizers. Introduction to pulp and paper industries. Types of raw materials and history. Composition and chemical properties of wood. Preparation of raw material for pulping. Mechanical and semi-chemical pulping. Different processes of chemical pulping. Chemistry of Kraft process.

#### PART B

Phosphate fertilizer- production, marketing and uses: raw materials, manufacturing processes of sulfuric acid and phosphoric acid: production and comparative economics of triple superphosphate, ammonium phosphate and other fertilizers from phosphoric acid. Complex fertilizers: nitrophosphate. Manufacturing process of different potash fertilizers and other uses. Compound fertilizers and their economics.

Digestion of pulp. Chemical recovery and energy balances. Bleaching. Beating and sizing. Paper making. Technical auditing.

### ChE 433 Food and Sugar Technology

2 hours per week 200 marks

#### PART A

Introduction to food technology. Principles of major preservation methods: drying, chemical, thermal, low temperature and freezing, irradiation. Unit operations in food processing and preservation. Fluid flow, heat transfer, concentration by evaporation, drying, separation methods, mixing, size

reduction, sterilization process. Calculations in food engineering. Packaging in food industry.

## PART B

Technology for processing and preservation of specific industries: cereals, fruits, and vegetables, fish, milk, and dairy products, oils and fats. Sugar technology: introduction-composition of cane and juice, manufacturing of raw cane sugar- extraction of juices, purification of juices, treatment of mud water and clarified; juice, evaporation, heating, crystallization. Cane sugar refining : clarification, decolourization, crystallization and finishing. Microbiology in sugar manufacture and refining. Economics of sugar industry.

### ChE 434 Food Engineering Sessional

3 hours every alternate week 50 marks

Laboratory work based on ChE 433.

## DETAILS OF COURSES OFFERED BY THE OTHER DEPARTMENTS FOR THE FIRST YEAR OF CHEMICAL ENGINEERING DEPARTMENT.

### CE 104 Civil Engineering Drawing

3 hours every alternate week 50 marks

For First year EE, ChE, ME, and NAME.

Plan, Elevations and section of one story buildings: Plan, Elevations and sections of Multi storied Residential Buildings: Plan and section of septic tank; Detailed drawing of roof truss; plan, elevation and sections of culvert.

### Chem 103 Physical, Inorganic and Organic Chemistry

3 hours per week 200 marks

For First year ChE

#### PART A

Physical chemistry: The gaseous state: Equation of state, ideal gas equation, kinetic theory of gases, molecular collision, Dalton's Law of partial pressure and Grahams law of diffusion. The liquid state: Structure of liquids, surface tension and viscosity of liquids. Molecular structure and properties of water. Solutions: concentration units, solubility, solubility of gases in liquids, Nernst distribution law and its uses. Thermodynamics-scope and limitation. The first law of the thermodynamics, reversible and irreversible processes. Inorganic chemistry:



Modern concept of atomic structure, periodic classification of elements, critical appreciation of the periodic law and periodic table, general treatment and application of the periodic table. Noble Gases: Discovery, sources, isolation, properties and uses, importance of noble gas elements in the study of chemistry. Organic chemistry; Introduction to organic chemistry and its importance in our daily life. A comprehensive study of (i) Alkanes, (ii) Alkenes and (iii) Alkynes with special reference to nomenclature, methods of preparation, properties, reactions and important uses. Molecular formula and its fundamental importance, empirical formula, determination of molecular formula from percentage composition. Alcohols, Aldehydes and ketones- their structure, nomenclature, industrial sources, preparation, properties and reactions.

#### PART B

Physical chemistry : Changes of state: Vapour pressure of liquid and vapourization, Clausius-Clapeyron equation, vapour pressure of solutions. The phase rule and its application. Colligative properties of dilute solutions. Chemical equilibria. The law of mass action, equilibrium constant and its characteristics, application of the law to homogeneous and heterogeneous reactions. Dissociation of water and pH concept. Ionic equilibria. Inorganic chemistry; Concept of chemical bond, different types of bond and their general treatment. Modern views on acid and bases. Different types of chemical reaction, oxidation-reduction reactions and their applications. Molecular structure and properties of the compounds. Organic chemistry: Aromatic compounds; Benzene and its aromatic character, preparation and reactions. Studies on structure, nomenclature, industrial sources, preparation and properties of alkyl benzene alcohols, aldehydes, ketones, carboxylic acids and esters.

#### Chem 104 Chemistry Sessional

3 hours per week 100 marks

For first year ChE

Volumetric analysis : Acid base titrations, oxidation reduction titrations, estimation of iron in Mohr's salt, iodometric determination of copper, determination of chloride by Volhard's method. Determination of calcium in limestone. Gravimetric analysis: (i) sulphur as  $\text{BaSO}_4$  (ii) Zinc as  $\text{ZnP}_2\text{O}_7$  (iii) Nickel as Ni-dimethyl glyoxime. Detection of sulphur, nitrogen, halogen in

organic compounds. Detection of important functional groups in organic compounds.

#### EEE 105 Electrical Engineering Fundamentals

(Basic Electrical Engineering)

2 hours per week 150 Marks

For First year ChE and MetE

##### PART A

Electrical units and standards; Electrical networks and circuits theorems, introduction to measuring instruments.

##### PART B

Alternating current, RLC series, parallel circuits, magnetic concepts and magnetic circuits.

#### EEE 106 Basic Electrical Engineering Sessional

3 hours every alternate week 50 marks

Laboratory experiments based on EE 105

#### Hum 103 English

2 hours per week 150 marks

For First year ChE.

##### PART A

Precis writing; Comprehension; Commercial correspondence; Tenders; Idioms; Proverbs; Synonyms; Prefixes and Suffixes, and Punctuation.

##### PART B

Paragraph writing; Essay writing; Common mistakes in grammar, Vocabulary; Amplification; Report writing; Analysis and Figures of speech.

#### ME 105 Engineering Mechanics

3 hours per week 200 marks

For First year ChE

##### PART A

Introduction, resultant and component of forces; Freebody diagrams; Friction-belt friction, pivot friction; Non-coplanar forces; Non-coplanar parallel forces; Centroids; Moments of inertia of area and mass.



## PART B

Kinematics of plane motion: Rectilinear motion, Curvilinear motion, Trajectory; Simple Harmonic Motion, Centro, Relative Motion. Kinetics: Newton's laws, Inertia force. Conservation of energy, K.E. of a rotational body, Bodies in plane rolling, work, power. Impulse, conservation of momentum, Impact; Basic mechanisms.

### ME 112 Basic Mechanical Engineering Drawing

3 hours every alternate week 50 marks

Introduction, Scale drawing, Sectional views, Isometric views, Missing Line, Auxiliary view.

### Phy 102 Physics Sessional

3 hours every week 100 marks

Experiments based on Phy 103

### Phy 103 Physics

3 hours per week 200 marks

For First year ChE and MetE

#### PART A

Heat and Thermodynamics

Kinetic Theory of Gases : Deduction of gas laws, Principle of equipartition energy, Conductivity, Viscosity, Diffusivity. Equation of State: Andrew's experiment, Vanderwaals' equation, Critical constants. Transmission of Heat: Conduction, Convection and radiation.

Laws of Thermodynamics: First law of thermodynamics, Internal energy, specific heats of gases, work done by expanding gas. Elasticities of a perfect gas; Second law of thermodynamics, Carnot's Cycle, Efficiency of heat engines, Absolute scale of temperature, Entropy and its physical concept. Maxwell's thermodynamic relations, Surface tension and surface energy, Statistical mechanics.

#### Optics

Combination of Lenses: Equivalent lens and equivalent focal length. Defects of images formed by lenses: Spherical aberration, Astigmatism, Coma, Distortion, Curvature of the Image, Chromatic aberration. Optical Instruments: Compound Microscope, Polarizing Microscope, Resolving power of Microscopes, Camera

and photographic techniques. Theories of Light: Huygen's principle and construction. Interference of Light: Young's double slit experiment. Biprism, Newton's rings. Interferometers, Interference by multiple reflection. Diffraction of Light: Fresnel and Fraunhofer diffraction, Diffraction by single slit, Diffraction by double slit, Diffraction gratings, Polarization: Production and analysis of polarized light; Optical activity, Optics of Crystals.

#### Waves and Oscillations

Oscillations: Simple harmonic motion. Combination of S. H. M. and Lissajous figures, Damped oscillations, Forced oscillations. Resonance, Vibrations of membranes and columns.

Waves: Travelling waves. The principle of Superposition, Wave velocity, Group velocity and phase velocity, Power and intensity in wave motion, Interference of waves, Diffraction of waves, Reflection and transmission of waves at a boundary, Standing waves.

Sound Waves: Audible, Ultrasonic, infrasonic and Supersonic waves; propagation and speed of Longitudinal waves. Travelling Longitudinal waves, Standing Longitudinal waves. Vibrating systems and source of sound, Beats, The Doppler effect, Architectural Acoustics.

#### PART B

#### Structure of Matter and Modern Physics

Atomic Structure: Determination of  $e/m$  of the electron, Determination of charge on the electron-Millikan's oil-drop method. Atoms, ions and molecules, States of matter; Solids, liquids and gases, Interparticle forces. Mass Spectroscopy: Isotropic constitution of elements, Spectroscopic analysis of isotopes, Mass Spectrographs. Quantum Effects: Photo-electric effect, Compton effect. Wave Mechanics: de-Broglie wave, Correspondence principle, Uncertainty principle, Schrodinger's wave equation. Atom Models: Bohr's theory of one electron atom, vector atom model. Relativity: Relative velocity, Galilean-Newtonian transformation, Special theory of relativity-Lorentz-Einstein transformation. Radio-activity: Radio-active decay, Half life, Mean life, Laws of successive disintegration, Radioactive equilibrium The Nucleus: Properties of a Nucleus. Binding energy, Nuclear reactions; Nuclear reactors. Crystallography: Types of bonds, Types of crystals, X-ray diffraction and Bragg's law, Plasticity and crystal defects, Metal, Insulators and semi-conductors, Elementary band theory, Superconductors and plasma.

### Electricity and magnetism

Electrostatics: Charge and matter. Coulomb's law. The electric field. Gauss law, Electric potential, Capacitors and dielectrics.

Current Electricity: Current and resistance. Ohmic and non-ohmic materials. Variation of resistance with temperature, Resistance thermometer; Thermoelectricity-Thermoelectric thermometer.

Electromagnetism: Magnetic fields. Lorentz force, Cyclotron, Ampere's law, Faraday's law, Lenz's law, Inductance-Self and mutual inductance, electric circuits.

Magnetic Properties of Matter: Magnetomotive force, magnetic field intensity, Permeability and susceptibility, Classification of magnetic materials, Magnetization curves of Ferromagnetic materials, Magnetic Circuits, Magnetostriction.

### Math 107 Mathematics Paper 1

2 hours per week 150 marks

For First year ChE and MetE

#### PART A

##### Section A: Differential Calculus

Limit, Continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem. Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainders. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem.

##### Section B : Differential Calculus

Tangent. Normal. Subtangent and subnormal in cartesian and polar co-ordinates, Determination of maximum and minimum values of functions and points of inflexion. Applications. Evaluation of indeterminate forms by L'Hospitals' rule. Curvature. Radius of curvature. Circle of curvature centre of curvature and chord of curvature. Evolute and involute. Asymptotes. Envelopes. Curve tracing.

#### PART B

##### Section A : Co-ordinate Geometry

Change of axes : Transformation of co-ordinates, simplification of equations of curves.

Pair of straight lines : Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Bisectors of the angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circle : Equation of the circle in cartesian and polar co-ordinates. General equation of a circle. Centre and radius of a circle. Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common chord. Chord in terms of its middle point. Orthogonal circles. Radical axis. Radical centre. Properties of radical axes. Coaxial circles and limiting points.

##### Section B : Co-ordinate Geometry

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle point. Parametric co-ordinates. Diameters. conjugate diameters and their properties. Director circles and asymptotes.

### Math 107 Mathematics Paper II

2 hours per week 150 marks

For First year ChE and MetE

#### Section A : Integral Calculus

Definitions of integrations. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals. Its properties and use in summing series. Wallis's formulae.

#### Section B : Integral Calculus

Improper integrals. Beta function and Gamma function. Area under a plane curve in cartesian and polar co-ordinates. Area of the region enclosed by two curves in cartesian and polar coordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

## PART B

### Section A: Ordinary Differential Equations

Degree and order of ordinary differential equation. Formation of differential equation. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant co-efficients. Solutions of homogeneous linear equations. Applications.

### Section B : Matrices, Vectors and Three Dimensional Co-ordinate Geometry

Matrices : Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix. Three dimensional Co-ordinate Geometry: System of co-ordinates. Distance of two points. Section formula. Projection. Direction cosines. Equations of planes and lines. Vectors: Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products. Applications to geometry and mechanics. Linear dependence and independence of vectors.

## DETAILED COURSES OFFERED BY THE OTHER DEPARTMENTS FOR THE SECOND YEAR OF CHEMICAL ENGINEERING DEPARTMENT:

### Chem 201 Inorganic and Organic Chemistry

3 hours per week 250 marks

For Second year ChE

#### PART A

Inorganic chemistry : Advanced concepts of atomic structure, the quantum theory, particle and wave nature of electrons, the uncertainty principle; Schrodinger equation, the Hydrogen atom and physical significance of orbitals. Elaborate study of the different types of bonds and properties related thereof. The valence bond theory and hybridization, molecular orbital theory, Pauli exclusion principle and electron spin, ionization potential electron affinity etc. and size of ion, ionic structure and bond energies, structure and properties. Chemistry of transition elements, chemistry of coordination compounds. Electronic interpretation of co-ordination compounds. Stability of complex compounds. Metal carbides; chemistry of silicates, their characterization and uses. Group chemistry: General treatment of the elements of group IIB, IIIB, VA, VIA, VIE, and VIIIE (iron group).

## PART B

Organic chemistry : Hydrocarbons, thermal and catalytic cracking, alkylation, cyclization and polymerization. Industrial production of important organic compounds. Reactions in organic chemistry and their mechanisms, Chemistry of vitamins, drugs, chemistry of bio-molecules and mass spectres copy.

### Chem 202 Inorganic and Organic Chemistry Sessional

3 hours per week 100 marks

For second year ChE

Inorganic chemistry : Quantitative chemical separation and determination of elements in a mixture of (i) Cu and Zn (ii) Fe and Ca. Analysis of water : Total solid, hardness, dissolved oxygen etc. Analysis of fats and oils, Iodine value saponification value, acid value, R-M value etc. Determination of Cu, Ni, CO, Ca etc. by EDTA titrations using metal ion indicators. Organic chemistry: Determination of melting and boiling points of organic compounds. Preparation of organic compounds using important reactions, preparation of different derivatives such as osazone, oxime, semi-carbazone, halogenation products etc. Detection using TLC and paper chromatography.

### Chem 204 Physical Chemistry Sessional

3 hours every alternate week 50 marks

For second year ChE

Determination of (i) Distribution co-efficient (ii) Degree of association by distribution method (iii) Bouli equilibrium constant of the system  $KI + I_2 = KI_3$ , (iv) Heat of reaction by calorimetry (v) heat of solution from solubility measurements at different temperature, (vi) viscosity and density measurements, viscosity of oil by Saybolit viscometer, (vii) surface tension of solution and (viii) Gibbs adsorption Isotherm. Conductance measurement: Cell constant and eq. conductance. Solubility of sparingly soluble salt, Mohr refraction. Polarometric Measurement of specific rate constant. Determination of molecular weight by cryoscopic method.

### Chem 203 Physical Chemistry

3 hours per week 250 marks

For second year ChE

#### PART A

Thermodynamics : enthalpy, heat capacity, ideal gas expansion and thermochemistry, second law of thermodynamics, free energy and chemical equilibria reaction isochore and isotherm, chemical potential. Third law of

thermodynamics, its necessity, Entropy and molecular disorderness. Activity and activity co-efficients-elementary statistical mechanics.

Phase equilibria : Solid-liquid- vapour equilibria in one component and binary liquid system. Free energy and phase equilibria relationship. solid liquid system of two components with and without compound formation. Chemical kinetics: Order of reaction, determination of order of reactions. Effect of temperature on reaction rates, simple collision theory and absolute reaction rate theory, Reaction in solution and heterogeneous reactions.

Theories and application of catalysis and enzyme catalysis, Physical properties, Refraction, optical activity and dipole moment, their relationship with molecular structure.

#### PART B

Surface phenomena : Adsorption of gases on solid, Langmuir's isotherm Determination of surface area. Adsorption from solution. Freundlich equation and BET equation.

Electro-chemistry : Electrical conduction in solutions, transference number application of conductance measurements. Simple treatment of D.H. theory of strong electrolytes. Types of electrodes and electrode potential, electrochemical cell, Emf measurements, potentiometric titrations, polarization and over potential. Electrochemistry of rust formation.

Theories of indicators and buffers,  $p^H$  measurements: Solid state: Classification crystal system. Braggs equation and its application. Structural determination by X-ray diffraction. Colloids and Macromolecules : General methods of preparation, Classification, properties, stability of colloids, Determination of particle size, determination of size and molecular weight of the macromolecules, photochemistry and spectroscopy: Laws of photochemistry, study of some photochemical reaction, photosensitization and photochemistry of air. Laws of absorption spectroscopy, mechanism of light absorption and emission of ultraviolet and visible spectra of molecules.

#### ME 209 Mechanics of Materials

3 hours per week 250 marks

For Second year ChE

#### PART A

Introduction, Stress, Strain, thermal stress, statically indeterminate axially loaded members, stresses in thin walled cylinders, Riveted and welded joints, The headed Fasteners.

Beams, shear force and bending moment diagrams, relation between S. F. and B. M. , various types of stresses in beams; Flexure formula, deflection of beams, Integration and area moment method.

Reinforced concrete beams and slabs.

#### PART B

Torsion of shafts and springs. Combined stress, principal planes, Mohr's circle, Columns, Euler's formula, Intermediate column formula. Thick walled cylinder and spheres. Power transmission elements.

#### HUM 201 Government And Sociology

2 hours per week 150 marks

For Second year ChE.

Government

#### PART A

Some basic concepts of Government and Policies, Functions. organs and forms of modern state and Government: Socialism; Fascism; L Marxism; U. N. O.

#### PART B

Government and politics of Bangladesh. Some major administrative systems of developed countries. Local self-government.

Sociology

#### PART A

Scope, social evolution and techniques of production, culture and cultivation. Social structure of Bangladesh. Population and world resources. Oriental and Occidental societies. Industrial revolution.

#### PART B

Family-urbanization and Industrialization. Urban Ecology, Co-operative and Socialist movements. Rural sociology.

#### Math 209 Mathematics

3 hours per week 250 marks

For Second year ChE

#### PART A

##### Section A : Multiple integrals and vectors

Jacobians. Multiple integrals with applications. Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of scalar function. Divergence and curl of a vector



function. Physical significance of gradient, divergence and curl. Various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem, Gauss's theorem and their applications. Laplace's equation. Curvilinear co-ordinates. **Section B:** Sets, groups, rings and fields, Infinite series and matrices Sets, Subsets, Basic set operations. Mappings and relations. Definitions of group, ring and field. Convergence and divergence of infinite series. Rank. Elementary transformation of matrix. Solution of linear equations by matrix methods. Vector spaces. Linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of a matrix.

#### PART B

##### Section A : Differential equation

Singular solutions and their physical interpretations. The homogeneous linear equations. Simultaneous linear equations with constant co-efficients. Solutions of differential equations of high order (i) when dependent variables are absent, (ii) when independent variables are absent: Solution of differential equations by the method based on the factorization of the operators. Solution in series by Frobenius methods. Bessel's and Legendre's differential equations and their properties.

##### Section B : Laplace transforms

Definition of Laplace transforms. Elementary transformations and properties. Application of Laplace transforms for determining the solutions of differential equation. Evaluation of improper integrals by Laplace transforms.

DETAILED COURSES OFFERED BY THE OTHER DEPARTMENTS FOR THE THIRD YEAR OF CHEMICAL ENGINEERING DEPARTMENT.

#### EEE 232 Electrical and Electronic Technology Sessional

3 hours every alternate week 50 marks

Laboratory experiments based on EEE 231

#### Chem 302 Instrumental method

3 hours per week 100 marks

For third year ChE

Data treatment and reporting of analytical results. Application of statistical methods and linear regression analysis. Error analysis. Conductometric

titration. Preparation of calomel and silver chloride electrode. Emf measurements, sign, single electrode potential, potentiometric titration of redox system,  $p^H$  titration and determination of  $p^H$  value. Calibration of refractometer, spectroscopies, determination of metal ions solution. Electrogravimetric and polarographic determinations. Turbidimetric determination of sulfate in a water sample. Measurement of heat of combustion.

#### EEE 231 Electrical and Electronic Technology

3 hours per week 300 Marks

For third year ChE and MetE

##### PART A

Balanced three-phase circuit analysis and power measurement, single phase transformer-equivalent circuit and laboratory testing. Introduction to three-phase transformer.

D. C. Generator- principle, types, performances and characteristics, D. C. motor-principle, types of motors, performances, speed control, starters and characteristics. A. C. machines-three phase induction motor-principles, equivalent circuit. Introduction to synchronous machines and fractional horse power motor.

##### PART B

Vacuum tubes, Semiconductor diode, transistors-characteristics, equivalent circuits, self-biasing circuits, emitter follower amplifiers, push-pull amplifier. Introduction to silicon controlled rectifier and its application; Oscilloscope. Transducers; Strain, temperature, pressure, speed and torque measurements.

#### Math 301 Mathematics

2 hours per week 200 marks

For Third year ChE

##### PART A

##### Section A : Fourier Series and Harmonic Analysis

Fourier series. Convergence of Fourier series. Fourier analysis. Fourier integral. Introduction to Laplace equation in cartesian, cylindrical and spherical co-ordinates. Cylindrical harmonics, spherical harmonics. Potential of a ring. Potential about a spherical surface. General properties harmonic functions.

##### Section B : Partial Differential Equations

Partial differential equations. Wave equations. Particular solution with boundary and initial conditions;

## PART B

### Section A : Complex Variables

Complex number system, General functions of a complex variable Limit and continuity of a function, complex variable and related theorems. Elementary functions. Complex differentiation and the Cauchy-Reimann equation Mapping by elementary functions.

### Section B : Complex Variables

Line integral of a complex function. Cauchy's integral theorem. Cauchy integral formula, Liouville's theorem. Taylor's theorem and Laurent's theorem. Convergence. Singular points. Residue, Cauchy's residue theorem. Evaluation of residues. Contour integration, conformal mapping.

### Math 303 Mathematics

2 hours per week 200 marks

For Third year ChE

## PART A

### Section A : Numerical Analysis

Interpolation. Simple difference. Simple difference table, Newton's formula for forward interpolation Newton's formula for backward interpolation. Divided differences. Tables of divided difference. Relation between divided differences and simple differences. Newton's general interpolation formula. Lagrange's interpolation formula. Inverse interpolation by Lagrange's formula and by successive approximations. Numerical differentiation of Newton's forward and backward formula. Numerical integration. General Quadrature formula for equidistant ordinates. Trapezoidal rule. Simpson's rule. Weddle's rule. Calculation of errors. Relative study of the three rules. Gauss's quadrature formula. Legendre, polynomials. Newton-Cote's formula. Principle of least squares. Curve fitting.

### Section B : Statistics

Frequency distribution, Mean. Median. Mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moment, Skewness and Kurtosis. Elementary probability theory and discontinuous probability distributions, e.g. binomial, Poisson and Negative Binomial.

## PART B

### Section A : Numerical Analysis

Solution of algebraic and transcendental equations by graphical method. Regula-falsi method. Newton-Raphson method, geometrical significance. Convergence of iteration and Newton-Raphson methods. Newton-Raphson method and iteration method for the solution of simultaneous equation. Solution of ordinary first order differential equations by Picard's method and Euler's method. Runge-Kutta's method for solving differential equations. Numerical solution of partial differential equations.

### Section B : Statistics

Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation, hypothesis testing and Regression analysis.

### HUM 309 Economics and Development Economics

2 hours per week 200 marks

For third year ChE

## PART A

Micro-economics and Macro-economics. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Some basic concepts-demand, supply and their elasticities. Equilibrium Consumer's equilibrium-indifference curve analysis, producer's equilibrium-isoquant. Production-Factors of production, Production function, Forms of productivity, Rational region of production, profit maximization. Equilibrium of firm, the short run and the Long run. Fixed cost and variable cost. The concept of optimization, least cost input combination. Internal and external economies and diseconomies. Economics of development planning, basic concepts-saving, investment, GNP, NNP, GDP, per capita income. Inflation, Policy instruments of development-Monetary policy, fiscal policy and trade policy-their relative applicability in Bangladesh. Some planning tools capital output ratio, input-output analysis.

## PART B

Economics of underdevelopment Interdependence of developed and underdeveloped economics. Necessity of economic development; underdeveloped economics-characteristics, vicious circle of poverty. The meaning of economic development. The stages of economic growth.



Determinants of economic growth. Economic factor, Non-economic factor, strategy of economic development. Big push, balanced and unbalanced growth. Investment criteria. Role of Government in economic development. Economic planning, planned and unplanned economic plan, features of a plan; Forms of planning-Total and partial, structural and functional, centralised and decentralised; Planning by direction and planning of inducement. Financing of economic plan, taxation, borrowing; deficit financing, objectives of planning in Bangladesh. First Five year plan of Bangladesh. Two year plan and second five year plan of Bangladesh. Nature and features of Bangladesh economic development. Development problems related to agriculture, industry and population of Bangladesh.

#### POSTGRADUATE COURSES :

#### TRANSPORT PROCESS AND REACTION ENGINEERING

##### **ChE 6101 Transport Phenomena**

Concepts of unified treatment of transport process. Theories of viscosity, thermal conductivity and diffusivity. Generalised expressions for transport fluxes. Multicomponent equations of change. Analytical and approximate solutions of equations of change in momentum, heat and mass transfer processes.

##### **ChE 6102 Advanced Thermodynamics**

Review of thermodynamic principles. Estimation of thermodynamic properties, ideal and non-ideal solution, phase equilibria, reacting mixtures.

##### **ChE 6103 Fluid Mechanics**

Viscosity and the mechanism of momentum transport. Kinematics of fluid in motion. Stress in a fluid and the equations of motion of a fluid. Analytical solutions of Newtonian and non-Newtonian fluids in simple geometries. Ordering and approximations in fluid flow, creeping flow, boundary layer flow. Introduction to perturbation and numerical solutions of fluid mechanical problems.

##### **ChE 6104 Heat Transfer**

Thermal conductivity and the mechanism of energy transport. The basic equations of momentum and energy transport. Analytical and numerical

solutions of unsteady state and steady state heat conduction problems. Analytical solution of Laminar forced convection heat transfer problems for Newtonian and non-Newtonian fluids. Thermal boundary layer. Turbulent heat transport. Heat transfer with boiling and condensation. Design of heat exchangers.

##### **ChE 6105 Mass Transfer**

Diffusivity and mechanisms of mass transport. The equations of change for multicomponent system. Steady and unsteady state diffusion in stagnant medium. Convective mass transfer in laminar and turbulent flows. Interphase transport and mass transfer at high mass flux.

##### **ChE 6106 Kinetics and Catalysis**

Definitions and concepts. The chemical basis of catalysis, classification of catalysts, adsorption and adsorption isotherms, multilayer adsorption theory and the BET equation, kinetics of heterogeneous reactions, model discrimination and parameter estimation, structure of heterogeneous catalysts. Catalyst design, preparation and characterization. Role of transport processes in heterogeneous catalysis, catalyst deactivation, gas-liquid reactions, non-catalytic gas-solid reaction, homogeneous catalysis. Examples of industrial heterogeneous catalytic reactions.

##### **ChE 6107 Advanced Chemical Reactor Design**

Study of the factors involved in the design and operation of Chemical reactors for both homogeneous and heterogeneous systems, batch reactors, continuous flow stirred tank reactors, tubular reactors, multibed adiabatic reactors and cold shot converters. Determination of optimal temperature gradients and yields, catalysts effectiveness factors, optimal control with decaying catalysts, reactor optimization problems in local industries.

##### **ChE 6108 Equilibrium Stage Processes**

Review of underlying principles of equilibrium stage processes, multicomponent distillation. Calculation of stages by short cut methods using Fenske, Underwood and Gilliland correlation, graphical methods, computer aided methods. Azeotropic and extractive distillation. Multicomponent absorption for dilute and concentrated solutions, nonisothermal absorption. Mass transfer accompanied by irreversible and reversible reactions.

**ChE 6109 Non-Newtonian Fluid Flow and Heat Transfer**

Classification of non-Newtonian fluids. Experimental characterization principles and methods. Flow in simple geometry in laminar, transition and turbulent regimes. Drag reduction. Mixing. Heat transfer. Flow in packed/porous media.

**PROCESS ENGINEERING AND TECHNOLOGY****ChE 6201 Advanced Plant Design**

Review of process plant design. Technical specification. Design basis, process licencing, engineering studies, Codes and standards, review and approval of engineering documents. Engineering procurement, cost estimation. Plant start-up and commissioning, performance guarantee. Optimization techniques. Principles of computer aided design.

**ChE 6202 Polymer Science for Chemical Engineers**

Characterization, rheology and other properties of polymers. Polymerization principles and kinetics. Commercial polymers and their applications. Polymer degradation and stabilization. Technology of polymer processing, design of polymer processing plants.

**ChE 6203 Nuclear Chemical Engineering**

Nuclear reactors and nuclear fuel cycles. Nuclear radiation and interaction with matter, elements of reactor physics. Separation processes in the nuclear industry. Reprocessing and waste management. Reactor safety and assessment of accident, risk.

**ChE 6204 Electrochemical Engineering**

Introduction to the electrochemical systems. Equilibrium potential, theory of overvoltages, irreversible electrode kinetics, ionic transfer, mass transfer at electrode surfaces. Application in the areas of corrosion, batteries, fuel cells, chemical synthesis, molten electrolyte, electrowinning, and electrorefining processes. Electrochemical reactor design.

**ChE 6205 Corrosion Science and Engineering**

Electrochemical thermodynamics and kinetics. Theory of overvoltage, kinetics of dissolution processes. Mixed potentials and exchange current, depolarizers and theories of passivation. Pourbaix's diagrams, principles and applications.

Oxidation and high temperature metal-gas reactions. Defect structures. Mechanical influences, stress corrosion and fatigue. Velocity effects. Corrosion rate measurements. Tafel extrapolation and linear polarization. Statistical considerations.

**ChE 6206 Corrosion Protection systems**

Principles of protection, passivation and inhibition. Various protection systems, material selection, alteration of environment, design, coating inhibitors and passivators. Electrochemical systems, cathodic and anodic protection, design and applications. Economics of protection, multiple systems. Corrosion testing and practical applications.

**ChE 6207 Ion Exchange**

Structure and properties of ion exchangers. Preparation of ion exchangers, ion exchange capacity, equilibria of ion exchange and thermodynamic models of equilibria. Ion exchange in concentrated solutions. Ion exchange column calculation. Water treatment by ion exchange. Ion exchange membranes.

**ChE 6208 Adsorption and Diffusion in Porous Media**

Fundamentals of adsorption, pore structure, surface area measurement, diffusion in porous media. Adsorption processes and chromatography. Chemical aspects of heterogeneous catalysis. Simultaneous diffusion and reaction in a porous catalyst. Heat transfer effects in adsorption.

**ChE 6209 Fluidization and its Applications**

Fluid-particle interaction, hydrodynamics of fluidization. Typical gas and liquid fluidized beds. Stability of fluidized beds. Bubble dynamics. Fluidized bed reactor design. Industrial Applications of fluidized beds.

**ChE 6210 Industrial Safety**

Introduction to occupational health and hygiene. Industrial safety legislation. Toxicity and TLV, explosion and flammability. Hazard identification and precautions. Dow F and E index, Mont-Dow index, hazard operability studies. Hazard analysis, safety check lists. Working environment requirements. Safety problems to specific processing plants including nuclear installation.

## COMPUTER APPLICATION AND PROCESS CONTROL

**ChE 6301 Advanced Numerical Methods in Chemical Engineering**  
Review of numerical techniques. Application of the methods of weighted residuals, orthogonal collocation and finite element methods to solution of problems in transport processes and reaction engineering.

### **ChE 6302 Process Dynamics**

A study of the dynamic behaviour of lumped and distributed system, dynamic model building and analysis. Interpretation of frequency and time response of linear systems. State-space methods, approximations to models and responses, stability analysis, and the behaviour of nonlinear systems. Applications to heat exchangers, tubular reactors and fixed bed sorption processes.

### **ChE 6303 Process Control**

A survey of selected advanced topics of control as applied to chemical processes, mathematical modeling, parameter estimation and process identification, multivariable control, optimal and adaptive control. Real time, digital control.

### **ChE 6304 Computer Aided Process Design**

Use of computer to solve large scale problems in chemical process plant design and simulation. Review of existing computer aided process design packages (CAD). Comparative advantages and disadvantages of sequential and equation based flowsheet simulation. Introduction to process structure and organization. Selected topics in recycle convergence acceleration, ordering of computations, tearing techniques and optimization as applied to process design. Simulation and optimization of some realistic chemical engineering systems using a CAD package.

### **ChE 6305 Optimization Techniques in Chemical Engineering**

Study of optimization algorithms and their application to chemical engineering problems. Linear and nonlinear programming. Optimum search methods, geometric programming.

## ENERGY AND ENVIRONMENTAL ENGINEERING

### **ChE 6401 Fuels and Combustion Science**

Review of the basic concepts of flame propagation and stabilization in premixed laminar and turbulent flames. Theory of laminar and turbulent diffusion flames. Burning velocity. Flame structure, quenching and flame stabilization. Flame propagation, explosion and detonation. Dynamics of the thermal requirements of ignition, extinction, combustion. Combustion aerodynamics. Burning gaseous and liquid fuel. Single droplet burning, burning of sprays. Solid fuel combustion, kinetics of microheterogeneous processes. Combustion in fluidized beds. Principles of burner and combustion chamber design.

### **ChE 6402 Combustion Engineering and Technology**

The role of combustion in process engineering, power generation and manufacturing. Energy audit. Available heat in relation to batch and continuous processes. Waste heat recovery. Principles of operation, performance and mechanical design of the main types of burners and furnaces. Reduction of pollutant emission by combustion modifications. Measurement and control in flames. Combustion noise and oscillation. Combination of physical and mathematical modeling for predicting furnace performance. Economy in the use of energy.

### **ChE 6403 Energy Management and Modeling**

Energy auditing, energy conservation schemes, energy conversion, representation of energy consumption in the industry. Costing techniques, financial appraisal and profitability, investment decisions. Energy utilization and conversion systems. Thermal energy and electrical energy systems. Waste heat recovery. Energy modeling.

### **ChE 6404 Industrial Furnaces**

Physical, chemical and thermal properties of refractories and other high temperature insulating materials. Design principles of industrial furnaces, petroleum heaters, different types of reformers, converters and regenerators. Analysis of industrial furnaces and fired heaters used in chemical process plants. Specification of fuels for furnaces. Instrumentation and control of furnaces.

**ChE 6405 Water Pollution and Control**

Water quality standards and wastewater characterizations. Sources and nature of water pollution. Physical, chemical and biological methods of waste treatment. Disposal of highly toxic wastes. Oil spills and clean-up methods. Soil reclamation. Process control and monitoring standards. Cost analysis. Legislation. Pollution control of pulp and paper, fertilizer, refinery, steel and metal finishing, food and pharmaceutical industries.

**ChE 6406 Air Pollution and Control**

Nature and properties of the atmosphere. Pollutants, sources, methods of control. Stack gas clean-up from industrial plants, stack design, automobile exhausts, monitoring. Air quality standards. Legislation.

**FOOD AND BIOCHEMICAL ENGINEERING****ChE 6501 Chemistry and Microbiology of Food**

Chemistry and biochemistry of food products. Compositions and nutritive values of foods. Microbiology of food. Physiology and genetics of bacteria, moulds, yeasts, fungi, viruses and algae. Growth and destruction of microorganisms. Microbial spoilage of food. Food poisoning.

**ChE 6502 Food Processing and Preservation**

Food preservation principles. Unit operations and unit processes in food processing. Effects of processing on food products. Evaluation of different processing techniques. Design of food processing equipment and plants. Plant effluent treatment and waste management.

**ChE 6503 Food Technology**

An in depth study of different food processing industries with special reference to processing of cereal, vegetable, fruit, milk, fish, edible oils and production of fermented food products and sugar technology.

**ChE 6504 Fermentation Technology**

Morphology and physiology of industrial microorganisms. Separation, identification and quantitative estimation of microorganisms. Fermentation process kinetics. Rheological properties of biological fluids. Design, operation and control of industrial fermentors. Application of fermentation technology in industries.

**ChE 6505 Biochemical Engineering**

The application of chemical engineering principles of mass, momentum and energy transport as well as reaction kinetics to biochemical reaction systems. Design of biochemical systems based on transport process and chemical reaction principles. Study of different phases of some common biochemical systems.

**ChE 6506 Quality Control in Food and Biochemical Industries**

Food legislation. Principles of quality control. Chemical, physical and organoleptic methods for examination of foods and biochemical products. Laboratory control methods for processing plants. Detection of pathogens in food. Plant sanitation and quality assurance program in food and biochemical manufacture.

**PETROLEUM AND NATURAL GAS ENGINEERING****ChE 6601 Introduction to Petroleum Engineering**

An overview of hydrocarbon energy resources of Bangladesh. Origin and chemistry of petroleum. Classification of hydrocarbon deposits and their genesis. The nature of hydrocarbons. Physical properties of source rocks and their characterization. Geophysical exploration of hydrocarbons.

**ChE 6602 Petroleum Reservoir Fluids**

Composition and nature of petroleum reservoir fluids. Phase reservoir behavior of multicomponent hydrocarbons and hydrocarbon-nonhydrocarbon systems. Production of equilibrium ratios. Rock and fluid property correlations.

**ChE 6603 Oil Well Drilling and Completion**

Elements of rock mechanics. Drilling fluids and their properties. Flow of drilling fluids. Drilling methods and equipment. Well test methods and evaluation of wells. Cementing and well completion. Safety requirements for petroleum exploration and development.

**ChE 6604 Petroleum Production Technology**

An overview of well completion. Theory of reservoir fluid flow, flow measurement and control. Primary and secondary recovery. Fluid separation and treatment. Design and operation of gathering lines and production facilities. Well testing and recompletion. Oil and gas regulations.



### **ChE 6605 Well Logging and Formation Evaluation**

Background of well logging and its purposes. Different types of well logging, their principles and applications. Physical properties of the porous media, fluid saturations and chemical composition of the saturating fluids. Interpretation and use of the information of logging in reservoir engineering.

### **ChE 6606 Reservoir Engineering.**

Characteristics of reservoir materials. Fluid flow through porous media. Methods of analysis and estimation of reservoir. Reservoir simulation. Practical aspects related to the development and use of reservoir models.

### **ChE 6607 Natural Gas Engineering**

A review of the physical and chemical properties of natural gas, phase behavior, vapor-liquid equilibrium data and computation, water-hydrocarbon systems, flow of gas-liquid mixtures, engineering principles used in the production of natural gas and its associated liquids. A detailed review of design and operations criteria encountered in the production, well head treatment of natural gas, producing and testing of gas wells, dew point control, LPG recovery, sulfur recovery, environmental control problems in natural gas processing, gas sweetening.

### **ChE 6608 Transmission and Distribution of Natural Gas**

Review of theories of fluid flow. Load gathering for distribution system planning. Flow calculations, layout and sizing of distribution piping systems. Network analysis. Construction and maintenance of distribution systems, economics of distribution. Design problems on distribution systems.

## **Department of Chemistry**

### **UNDERGRADUATE COURSES**

#### **Chem 101 Chemistry**

3 hours per week      200 marks

For first year CE, EEE, MetE, ME, CSE and NAME

#### **PART A**

Inorganic chemistry: The structure of atom, Particles constituting the atomic model. Isotope Wave nature of electrons and shape of the orbitals. Periodic table: Classification of elements, Mendeleeff's periodic table, critical studies on periodic table with its usefulness and limitations. Physical chemistry: Properties of gases and equation of state, Aqueous solution: Types of solution, factors influencing the solubility of a substance, the Le-Chatelier's principle, mechanism of dissolution, evolution and absorption of heat, Different units of concentration, problems involving acid base titrations. Solution of gases in liquids. Distribution of solute between two immiscible solvent, application of distribution law. Properties of dilute solution. Vapour pressure, Raoult's Law, its application, elevation of boiling point, depression of freezing point and osmotic pressure. Colloids and properties of Colloidal system. Stoichiometry: Empirical and molecular formulas, ionic equations, solution of problems.

#### **PART B**

Inorganic chemistry: Noble Gases: Occurrence, discovery, isolation, general properties, and uses Importance of noble gas elements in the study of chemistry; Chemical bond: Different types of chemical bond, general properties of ionic and covalent compounds. Modern approach of covalent bond. Modern concepts of acids and bases. Different types of chemical reactions. Physical chemistry: Kinetics and chemical equilibria; Rate of a reaction, factors determining the rate. Law of mass action, evaluation and characteristics of equilibrium constant of a reaction. Ionisation of water and concept of pH *Thermo-chemistry*: Types of energy, enthalpy, heat of reaction, heat of combustion, heat of formation and heat of neutralisation. Experimental determination of thermal changes during chemical reaction. Electrochemistry: Electrolytes, mechanism of electrolytic conduction, transport number and electrolytic conductance.

### Chem 102 Chemistry Sessional

3 hours per week 100 marks,

For First year EEE, MetE, ME, CSE and NAME

Introduction and scope of analytical chemistry, Elementary; concepts of quantitative analysis; Volumetric and gravimetric analysis. Chemical balance, evaluation of analytical data. Report writing. Experiments; Preparation of standard solutions of Sodium carbonate, Sodium oxalate, Oxalic acid, Potassium dichromate etc., Standardization of sodium hydroxide, hydrochloric acid, sodium thiosulphate, potassium permanganate etc. Determination of total alkalinity of soda ash, Determination of acetic acid content of vinegar. Determination of copper in copper sulfate solution. Determination of Fe in Mohr's salt and calculation of purity of Mohr's salt. Determination of iron in an ore. Determination of calcium. Determination of chloride by Mohr method. Determination of bleaching powder by iodometry. Determination of sulfur by gravimetric method. Determination of Aluminium as Aluminium oxide.

### Chem 102 Chemistry Sessional

3 hours every alternate week 50 marks

For First year CE

Introduction and scope of analytical chemistry, elementary concepts of quantitative analysis; volumetric and gravimetric analysis. Chemical balance, evaluation of analytical data. Report writing.

Experiments: Preparation of standard solutions of sodium carbonate sodium oxalate, oxalic acid, potassium dichromate etc., Standardization of sodium hydroxide, hydrochloric acid, sodium thiosulphate, potassium permanganate etc. Estimation of (i) Cu in copper sulphate, (ii) Fe in Mohr's salt and calculation of purity of Mohr's Salt (iii) sulphur by gravimetric method. Determination of chloride in tap water.

### Chem 103 Physical, Inorganic and Organic Chemistry

3 hours per week 200 marks

For First year ChE

#### PART A

Physical chemistry: The gaseous state: Equation of state, ideal gas equation, kinetic theory of gases, molecular collision, Dalton's Law of partial pressure and Graham's law of diffusion. The liquid state: Structure of liquids, surface tension and viscosity of liquids. Molecular structure and properties of water. Solutions:

concentration units, solubility, solubility of gases in liquids. Nernst distribution law and its uses. Thermodynamics, scope and limitation. The first law of thermodynamics, reversible and irreversible processes. Inorganic chemistry: Modern concept of atomic structure, periodic classification of elements, critical appreciation of the periodic law and periodic table, general treatment and application of the periodic table. Noble Gases: Discovery, sources isolation, properties and uses, importance of noble gas elements in the study of chemistry. Organic chemistry: introduction to organic chemistry and its importance in our daily life. A comprehensive study of (i) Alkanes, (ii) Alkenes and (iii) Alkynes with special reference to nomenclature, methods of preparation, properties, reactions and important uses. Molecular formula and its fundamental importance, empirical formula, determination of molecular formula from percentage composition. Alcohols, Aldehydes and ketones- their structure, nomenclature, industrial sources, preparation, properties and reactions.

#### PART B

Physical chemistry: Changes of state: Vapour pressure of liquid. Clausius - Clapeyron equation, vapour pressure of solutions. The phase rule and its application. Colligative properties of dilute solutions. Chemical equilibria; The law of mass action, equilibrium constant and its characteristics, application of the law to homogeneous and heterogeneous reaction. Dissociation of water and pH concept. Ionic equilibria. Inorganic Chemistry: Concept of chemical bond, different types of bond and their general treatment. Modern views on acids and bases. Different types of chemical reaction, oxidation-reduction reactions and their applications. Molecular structure and properties of the compounds. Organic chemistry; Aromatic compounds; Benzene and its aromatic character, preparation, and reactions. Studies on structure, nomenclature industrial sources, preparation and properties of alkyl benzene, alcohols, aldehydes, ketones, carboxylic acids and esters.

### Chem 104 Chemistry Sessional

3 hours per week 100 marks

For first year ChE

Volumetric analysis: Acid base titrations. oxidation reduction titrations, estimation of iron in Mohr's salt, iodometric determination of copper, determination of chloride by Volhards method. Determination of calcium in lime stone, Gravimetric analysis: (i) Sulfphur as  $\text{BaSO}_4$  (ii) Zinc as  $\text{ZnP}_2\text{O}_7$  (iii)



Nickel as Ni-dimethyl glyoxime, Detection of sulphur, nitrogen, halogen in organic compounds. Detection of important functional groups in organic compounds.

### **Chem 201 Inorganic and Organic Chemistry**

3 hours per week      250 marks

For Second year ChE

#### **PART A**

Inorganic chemistry: Advanced concepts of atomic structure, the quantum theory, particle and wave nature of electrons, the uncertainty principle; Schrodinger equation, the Hydrogen atom and physical significance of orbitals. Elaborate study of the different types of bonds and properties related thereof. The valence bond theory and hybridization, molecular orbital theory. Pauli exclusion principle and electron spin, ionisation potential, electron affinity etc. and size of ion, ionic structure and bond energies structure and properties.

Chemistry of transition elements, chemistry of coordination compounds. Electronic interpretation of co-ordination compounds. Stability of complex compounds. Metal carbides; chemistry of silicates, their characterization and uses. Group chemistry: General treatment of the elements of group IIB, IIIB, VA, VIA VIE and VIIIE (iron group).

#### **PART B**

Organic chemistry: Hydrocarbons, thermal and catalytic cracking, alkylation, cyclization and polymerization. Industrial production of important organic compounds, Reactions in organic chemistry and their mechanisms. Chemistry of vitamins, drugs, chemistry of bio-molecules and mass spectroscopy and structure.

### **Chem 202 Inorganic and Organic Chemistry Sessional**

3 hours per week      100 marks

For second year ChE

Inorganic chemistry: Quantitative chemical separation and determination of elements in a mixture of (i) Cu and Zn (ii) Fe and Ca. Analysis of water: Total solid hardness, dissolved oxygen etc. Analysis of fats and oils, iodine value, saponification value, acid, value, R. M value etc. Determination of Cu, Ni, Co, Ca etc. by EDTA titrations using metal ion indicators. Organic chemistry: Determination of melting and boiling points of organic compounds, Preparation

Determination of melting and boiling points of organic compounds, Preparation of organic compounds using important reactions, preparation of different derivatives such as osazone, oxime, semi carbazone, halogenation products etc. Detection using TLC and paper chromatography.

### **Chem 203 Physical Chemistry**

3 hours per week      250 marks

For second year ChE

#### **PART A**

Thermodynamics: enthalpy, heat capacity, ideal gas expansion and thermochemistry, second law of thermodynamics, free energy and chemical equilibria, reaction isochore and isotherm, chemical potential. Third law of thermodynamics its necessity. Entropy and molecular disorderness. Activity and activity co-efficients Elementary statistical mechanics.

Phase equilibria: Solid-liquid-vapour equilibria in one component and binary liquid system. Free energy and phase equilibria relationship. solid liquid system of two components with and without compound formation. Chemical kinetics: Order of reaction, solution of different types of rate equations, determination of order of reactions, Effect of temperature on reaction rates, simple collision theory and absolute reaction rate theory. Reaction in solution and heterogeneous reactions.

Theories and application of catalysis and enzyme catalysis. Physical properties. Refraction, optical activity and dipole moment, their relationship with molecular structure.

#### **PART B**

Surface phenomena: Adsorption of gases on solid, Langmuir's isotherm. Determination of surface area. Adsorption from solution. Freundlich equation and BET equation.

Electro-chemistry: Electrical conduction in solutions, transference number application of conductance measurements. Simple treatment of D. H theory of strong electrolytes. Types of electrodes and electrode potential, electrochemical cells Emf measurements, potentiometric titrations, polarization and over potential. Electrochemistry of rust formation.

Theories of indicators and buffers,  $p^H$  measurements: Solid state: Classification crystal system. Bragg's equation and its application. Structural determination by

X-ray diffraction. Colloids and Macromolecules: General methods of preparation, classification, properties, stability of colloids. Determination of particle size, and molecular weight of the macromolecules, Photochemistry and spectroscopy: Laws of photochemistry, study of some photochemical reaction, photosensitization and photochemistry of air. Laws of absorption spectroscopy, mechanism of light absorption and emission of ultraviolet and visible spectra of molecules.

#### **Chem 204 Physical Chemistry Sessional**

3 hours every alternate week 50 marks

For second year ChE

Determination of (i) Distribution co-efficient (ii) Degree of association by distribution method (iii) Equilibrium constant of the system  $KI + I_2 = KI_3$  (iv) Heat of reaction by calorimetry, (v) heat of solution from solubility measurements at different temperature. (vi) viscosity and density measurements, viscosity of oil by Saybol viscometer, (vii) surface tension of solution Conductance measurement: Cell constant and eq. conductance. Solubility of sparingly soluble salt. Polarometric Measurement of specific rate constant. Determination of molecular weight by cryoscopic method and viscometry.

#### **Chem 205 : Corrosion and Chemistry of Nonmetallic Engineering Materials,**

2 hours per week 150 marks

For second year ME

##### **PART A**

Glass: composition in most commonly used varieties, classification of commercial glasses, raw materials and manufacturing process, special glasses and application of glasses in chemical industries. Ceramics and refractories: Various products of ceramic industries, raw materials in making common ceramic products, fundamentals of ceramic chemistry. Types of white wares and manufacture of porcelain. Refractory materials, properties, manufacture and classification of refractories.

Corrosion: Nature and forms of corrosion, electrochemical mechanism of corrosion, types of corrosion and influence of different factors on corrosion. Paints, varnishes and metallic coatings; Functions of raw materials, solvents and diluents preparation, paints and varnish removers, coatings on metal surface, methods used in applying coatings, various metal coatings.

##### **PART B**

Carbon : Different properties of carbon, structural properties of carbon and graphite and their applications. Nonfabricated industrial carbons-their manufacture and uses. Some specific applications of carbons. Plastics and synthetic fibers: Fundamental characteristics of plastic materials, classification, raw materials and manufacture of plastics, some typical examples of plastics and their uses. Various types of fibers, Raw materials and manufacturing process of synthetic fibers and their applications. Timber: Wood-its classification, properties, uses and preservation of timber. Rubber: Sources of natural rubber, chemical treatment of latex. Raw materials of synthetic rubber, their sources and properties. Lubricants: Principles of lubrications treatments for refining lubricating oil obtained from crude oil. Properties and uses of different lubricants. Petroleum fuels-origin, composition, classification and refining of petroleum, uses of petroleum products.

#### **Chem 207 Physical Chemistry**

2 hours per week 150 marks

For second year MetE

##### **PART A**

Electrochemistry: Electrical conduction in solution. Faraday's law, ions in aqueous solution and ion activity, transference number, application of conductance measurement. Simple treatment of Debye-Huckel theory of strong electrolytes. Gibbs free-energy function, Gibbs-Helmholtz equation, chemical and electrochemical potential. Electrochemical cells, types of electrodes and electrode potential. Sign convention. Temperature-emf relation and Nernst equation, types of electrochemical cells and emf measurements, potentiometric titrations, polarisation and over potential. Principles of electrodeposition. Theories of indicators, buffers. Henderson equation, PH measurements and glass electrode. Surface phenomena; Adsorption of gases on solids, Langmuir's isotherm, adsorption from solution. Free energy concept & chemical potential. Free energy equilibrium relation.

##### **PART B**

Chemical kinetics; order of reaction, homogeneous reactions of first; second, zero and fractional order. Determination of order of reactions, rate equation of complex reactions, rate-temperature relation. Arrhenius equation. Transition

and collision theory of reaction rate. Reaction in solution and kinetics of solid gas reactions. Catalysis, theory and some important catalytic reactions.

Photo-chemistry and spectroscopy: Introduction; nature of electromagnetic radiation. Laws of photochemistry, quantum yields. Photochemical reactions and photochemistry of air. Matter-energy interaction. Laws of absorption spectroscopy, Mechanism of light adsorption, UV-Visible spectra of molecules, Beer-lambert relation and its application.

Colloids: General methods of preparation. Classification, properties, stability of colloids, Determination of particle size, electro-kinetic phenomena. Solution of macromolecules, molecular weight distribution and determination.

#### **Chem 302 Instrumental method of analysis**

3 hours per week      100 marks

For third year ChE

Data treatment and reporting of analytical results. Application of statistical methods and linear regression analysis. Error analysis. Conductometric titration. Preparation of calomel and silver chloride electrode. Emf measurements, potentiometric titration of redox system, pH titration and determination of pH value. Calibration of refractometer, determination of metal ions in solution. Electrogravimetry and polarography. Turbidimetric determination of sulfate in a water sample. Measurement of heat of combustion. Spectrophotometric determination of metal ions in solution.

#### **Post-Graduate Courses**

Ph. D. Thesis      45 Credit.

Chem 6000      M. Phil. Thesis      30 Credit.

#### **Organic Chemistry:**

**Chem 6001 Chemistry of Natural Products**      3 Credit

Terpenes: Chemistry of important terpenes from various group e.g. Humulene, Germacrone etc. Alkaloids, structure and synthesis of some important alkaloids. Steroids: Synthesis, spectral properties, Configuration and reactions of steroids, hormones, growth regulators; biosynthesis of sterols.

#### **Chem 6002 Chemistry of Biomolecules**

3 Credit

Amino acids: Structure and bio-synthesis of proteins; purines; Nucleic acids and nucleoproteins. Fundamental role of nucleic acids in life processes, structures of DNA and RNA and their functions, Lipids and phospholipids.

#### **Chem 6003 Organic Reagents in Synthesis**

3 Credit

Use of some of the more important organic and inorganic reagents in organic synthesis; Exercises in the synthesis of C-C; C-O, C-X, C-N, C-S and C-P bonds; Exercises in the synthesis of complex molecules of nature.

#### **Chem 6004 Carbohydrate Chemistry**

3 Credit

Configurational assignments and conformational analysis of mono and disaccharides. Use of optical methods including Hudson's rule of isorotations and Lactone rule. Reactions of Sugars including their actions with acids and bases. Esters, ethers and acetals of sugars. Anhydro-sugar, branched chain sugar, unsaturated sugar, deoxy sugar and polyamine sugar. Polysaccharides: Structural investigation and group analysis Barry and Smith degradation; molecular weight determination etc. Amylose and amylopectin, cellulose, hemicellulose, glycogen and inulin. Sulphated polysaccharides and marine algal polysaccharides.

#### **Chem 6005 Spectroscopy and Structure of Organic Molecules**

3 Credit

UV Spectroscopy: Principle of measurement, Electron excitation, Simple chromophore groups. conjugated systems and Aromatic systems. IR spectroscopy: Vibration spectra, factors affecting IR frequencies and applications.

NMR spectroscopy: Introduction, Nuclear overhauser effect, Shift reagents. Dynamic polarisation. Interpretation of the spectral data.

Mass spectrometry: Theory; spectrometer and application to structure determination of organic molecules. Application of all the spectroscopic methods in following the progress of reactions by diagnostic appearance and disappearance of functional groups in organic compounds and also in characterising the products. Application of spectroscopy in the elucidation of the structure of organic compounds.

#### **Chem 6006 Advanced Organic Reaction Mechanism**

3 Credit

Structure and bonds in organic molecules, Localised and nonlocalised bonds in terms of molecular orbital theory; Orbital symmetry and chemical reactions, electrocyclic, cycloaddition and sigmatropic reactions, Free radical reactions;

mechanism of free radical reactions in substitution, addition, rearrangement and oxidation reactions. Photochemical reactions; isomerization, molecular rearrangement and Barton reaction.

**Chem 6007 Advanced stereochemistry 3 Credit**

(i) symmetry elements; point groups; (ii) optical activity - its origin, atomic and conformation asymmetry; (iii) Variation of optical activity with wave length. Optical rotatory dispersion and circular dichroism curves and their application, in determining the configuration and conformation of different compounds. (iv) conformational analysis, Reactivity of alicyclic, cyclic, fused and bridged ring systems. Curtin Hammet principle and its application in determining the course of reaction in different compounds. (v) Tricovalent Carbon; (vi) Optical activity due to atoms other than carbon.

**Chem 6008 Kinetics and Energetics of Organic Reactions 3 Credit**

(i) Thermodynamic considerations and study of energetics of organic reactions; Kinetics of organic reactions; Consecutive reactions, the steady state approximation, parallel reactions, entropy of activation in conjunction with energy of activation particularly in reactions leading to cyclisation. (iii) Variation in kinetics in acid and base catalysed reactions, microscopic reversibility, correlation of reaction rates and equilibria; (iv) Solvent effects; (v) Isotopic effects; (vi) Linear free energy relationship; (vii) Application of the above concepts to substitution, addition and elimination reactions.

**Chem 6009 Organo-metallic Chemistry 3 Credit**

Nature of carbon metal bonding systems, structures and reactions of organometallic compounds. Organometallic reagents in organic synthesis. A general introduction to the types and nature of carbon metal bonding systems. Structures and reactions of:

- The alkali metal organometallic with special reference to organolithium.
- The alkaline earth metal compounds with special reference to organomagnesium reagents.
- The main group (iv) organometallics with special reference to organosilicon compounds.
- Organic compounds of transition metals: Reactions, structure, nature and stability etc. of complexes.
- A brief study of organophosphorus, antimony and bismuth compounds.

**Chem 6010 Chemistry of Heterocyclic Compounds 3 Credit**

Types of heteroatomic structures, criterion of heteroaromaticity; concept of abundance and deficiency. Reactivity of heteroatoms, role of heterocycle and heteroatoms as substituent and conductor of electronic effect. Chemistry of three, four and five membered heterocycles, condensed five membered heterocycles, five-membered ring heterocycles with more than one heteroatom. Pyridine, quinoline and isoquinoline compounds. Addition to the cyano group to form heterocycles, tautomerism in purines, hydroxythiophene and hydroxy furan systems. Synthesis of heterocycles involving cycloaddition reactions, heterocycles of biological interest.

**Chem 6011 Biogenesis and Biosynthesis of Natural Product 3Credit**

Introduction to primary and secondary metabolites, precursors. Methods used in study of Biosynthesis, chemical speculation, seasonal variation, organisms with blocked biosynthesis pathways, feeding experiments, measurement of the efficiency of precursors and studies with enzymes, feed back and other regulatory mechanisms.

Acetongenins-construction of acetate hypothesis, biosynthesis of saturated, unsaturated, fatty acids, polyacetylenes and aromatic polyketides. Isoprenoids-biosynthesis of mevalonate, the biological isoprene unit, alkylation of non-isoprenoids, alkylation polymerization of isoprenoids, tail to tail linkages and cyclization of poly isoprene chains to mono, sesqui, di-and tri-terpenes etc. Modifying reactions of triterpenes and steroids.

Shikimic metabolites (Phenyl propanoids)- simple cinnamic acid derivatives, flavonoids, coumarins, rotenoid, tropolones lignins etc. Alkaloids and other amino acid derivatives, alkaloids based on aliphatic amino acids; based on aromatic amino-acids, alkaloids derived from tryptophene, other amino acid derivatives and peptide derivatives. Methods precursor incorporation experiments in Fungi, biosynthesis in cell free systems and biosynthesis in mutant organism.

**Chem 6012 Spectra of Organic Compounds 3 Credit**

Introduction to electromagnetic spectrum, ultraviolet spectroscopy, electronic transition, simple chromophoric groups, conjugated systems, aromatic systems, use of UV spectra in structure determinations. Infrared spectroscopy, molecular vibrations and their interaction with Infrared radiation, interpretation of IR spectra.



Nuclear magnetic resonance spectroscopy, magnetic properties of nuclei, the chemical shift, spin-spin interactions, nuclear magnetic double resonance, interpretation of the spectra of organic molecules. Mass spectroscopy, the production analysis of positive ions, molecular ion, application of isotopic abundance measurements, fragmentation modes of mass spectra of some representative compounds. The effect of stereochemistry on the above spectra will be discussed in each case.

#### **Chem 6013 Organic Synthesis**

**3 Credit**

Formation of carbon-carbon single bond via reactions of enolate anions, enamine reactions, bishio carbonions, 1,4-addition of organometallic compound of lithium dialkyl and diaryl cuprates, carbenes and carbenoids and photocyclisation.

Formation of C=C bonds via elimination, oxidative decomposition reactions. Thermal and photosensitised Diel's Alder reaction, its mechanism and stereochemistry, the "One" synthesis.

Oxidation reaction: Selective oxidation of hydrocarbons, olefines, alcohols, Baeyer villigre, photosensitised oxidation of olefines. Reduction reactions: Selective catalytic hydrogenations dissolving metal reductions, hydride transfer reductions.

Examples stereospecific synthesis, synthesis of naturally occurring compounds.

#### **Chem 6014 Stereochemistry and Reactivity of Organic Compounds**

**3 Credit**

Structure and symmetry point groups, stereoismorphism, optical isomerism racemic modification, diastereomers, torsional isomerism, allotropisomers absolute configuration, conformational analysis, conformation and reactivity, stereochemistry of ring systems, fused rings allenes, macromolecules of tricovalent carbon. Optical rotatory dispersion, circular dichroism and their application.

Stereospecific and stereoselective synthesis. Stereochemistry and mechanism of reactions.

#### **Chem 6015 Chromatography Principle and Application**

**3 Credit**

Fundamental types of chromatography: Liquid partition chromatography, thin layer and reversed phase partition chromatography: Chemical constitution and Rf value. Adsorption Chromatography, Gas liquid Chromatography, Column

#### **Chem 6015 Chromatography Principle and Application**

**3 Credit**

Fundamental types of chromatography: Liquid partition chromatography, thin layer and reversed phase partition chromatography: Chemical constitution and Rf value. Adsorption Chromatography, Gas liquid Chromatography, Column efficiency and resolution, Various types of detectors, preparative, programmed temperature Gas Chromatography, Exclusion chromatography, gel permeation and ion Exclusion techniques, ion exchange chromatography. Exchange equilibria plate theory, applications, electrophoresis and electrochromatography, mechanisation and automation of column chromatography. Solutions of different problems by chromatographic methods.

#### **Chem 6016 Advanced Topics in Chemistry**

**3 Credit**

Physical and Inorganic Chemistry

#### **Chem 6101 Chemistry of Coordination Compounds**

**3 Credit**

Theories of Coordination: Valence bond theory, Crystal field theory, Ligand field theory and molecular orbital theory, Detailed study of different types of complexes.

Stability constant of complexes: Different methods of determination of stability constant, application of stability constants in different fields e.g. life sciences, medicine, pollution, electrochemistry, analytical chemistry, geochemistry etc.

#### **Chem 6102 Modern Methods of Chemical Analysis**

**3 Credit**

Application of electroanalytical methods in chemical analysis Application of UV/visibleIR spectrophotometry, Flamephotometry, Atomic absorption spectroscopy, turbidimetry, nephelometry, optical rotatory dispersion/circular dichroism, NMR, Mass spectrometry, DTA and TGA in chemical analysis. Principles of Gas Chromatography and its applications.

#### **Chem 6103 Corrosion Science**

**3 Credit**

Thermodynamics of corrosion; kinetics of hydrogen evolution and oxygen reduction reaction; hydrogen overvoltage, electrode kinetics, pourbaix diagram, Theories of homogeneous corrosion and local cell reaction; corrosion in acidic, neutral and alkaline media. Role of inhibitors and alloying elements. Principles governing cathodic protection. Mechanism of atmospheric oxidation of metals and alloys. Study of selected systems of industrial importance.

**Chem 6104 Studies on Crystal and Molecular Structure by Diffraction Methods** **3 Credit**

Classification of Crystals, Crystal shapes, Lattices and Unit cells, Crystal planes, Methods used in Crystal structure studies. Principles and application of electron microscopy, electron diffraction, X-ray diffraction and neutron diffraction. Advanced methods of X-ray data collection. Patterson functions, image seeking functions and their use in structure analysis:

**Chem 6105 Advanced Electrochemistry** **3 Credit**

Activity and activity coefficient, activities of electrolytes. The Debye-Huckel Theory. Extension of the Debye-Huckel treatment, weak Electrolytes and the Debye-Huckel Theory.

Electrolysis and polarization: Electromotive Force and cells, Thermodynamic data from cell e.m.f.; Polarization, deposition potential, determination of anode and cathode potentials, decomposition voltage of aqueous solution.

Processes at electrodes. Theories of overvoltage, mechanism of anodic and cathodic age. Rate of Growth of overvoltage. The deposition and corrosion of metals. Physical nature of electrodeposition. Separation of metals by electrolysis Electrochemical passivity and theories of passivity.

**Chem 6106 Chemistry of Polymer** **3 Credit**

Polymers: Polymerization reactions, kinetics of polymerization reactions, characterization: Solubility Chart for identification of Polymer, specific Chemical tests for various polymers, thermal behaviour of Polymers; DTA and TGA studies. Mechanical behaviour of polymers, Viscoelastic studies, size and shape of macromolecules, internal frictions, swelling phenomenon and Crosslink density. Molecular weight determination using viscometry, Osmometry, light scattering, ultracentrifuge and Gel permeation chromatography. Methods to study tacticity, stereoregularity and crystallinity, Electrical resistivity and dielectric behaviour.

**Chem 6107 Chemical Kinetics and Solution Thermodynamics** **3 Credit**

(a) Order of reaction and practical measurement of reaction rate. Kinetics and mechanism of complex reactions. Effect of temperature on reaction rate (i) The

(b) Analysis of the different laws of thermodynamics and its application to chemical systems, properties of Gibbs function. Thermodynamics of solution and partial molal quantities. Thermodynamics of mixing.

**Chem 6108 chemistry of Pollution** **3 Credit**

Chemical equilibrium principles applied to the chemistry of natural and polluted water and to the chemistry of water treatment. Analytical methods applied in the control of water and air pollution. Principles of chemical separations involving adsorption, ion-exchange chromatography, solvent extraction methods. Fundamental concepts of adsorption, ion-exchange chromatography, solvent extraction methods. Fundamental concepts of adsorption and emission spectroscopy.

Industrial toxins and their toxicology, classification and analysis of inorganic and organic toxins. Radiation hazards. Air pollution and analysis. Social and economic aspects of pollution.



## Department of Mathematics

### UNDERGRADUATE COURSES

#### Math 101 Mathematics Paper I

2 hours per week      150 marks

For First year ME and NAME

#### PART A

##### Section A : Differential Calculus

Limit. Continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem. Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainder. Cauchy's form of remainder. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem.

##### Section B : Differential Calculus

Tangent. Normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of maximum and minimum values of functions and points of inflexion. Applications, Evaluation of indeterminate forms by L' Hospitals' rule. Curvature, radius of curvature, circle of curvature, centre of curvature and chord of curvature. Evolute and involute. Asymptotes. Envelopes. Curve tracing.

#### PART B

##### Section A : Co-ordinate Geometry

Change of axes: Transformation of co-ordinates, simplification of equation of curves.

Pair of straight lines : Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Bisectors of the angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circle : Equation of the circle, in cartesian and polar co-ordinates. General equation of a circle. Centre and radius of a circle. Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common

chord. Chord in terms of its middle point. Orthogonal circles. Radical axis. Radical centre. Properties of radical axes. Coaxial circles and limiting points.

**Section B : Co-ordinate Geometry**

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle point. Parametric co-ordinates. Diameters, conjugate diameters and their properties. Director circles and asymptotes.

**Math 101 Mathematics Paper II**

2 hours per week 150 marks

For First year ME and NAME

**PART A**

**Section A : Integral Calculus**

Definitions of integrations. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae.

**Section B : Integral Calculus**

Improper integral. Beta function and Gamma function. Area under a plane curve in cartesian and polar co-ordinates. Area of the region enclosed by two curves in cartesian and polar co-ordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

**PART B**

**Section A : Ordinary Differential Equations**

Degree and Order of ordinary differential equation. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant co-efficients. Solutions of homogeneous linear equations. Applications.

**Section B : Matrices, Vectors and three dimensional Co-ordinate Geometry**

Matrices : Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix.

Three dimensional Co-ordinate Geometry : System of co-ordinates. Distance of two points. Section formula. Projection. Direction cosines. Equations of planes and lines.

Vectors : Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products. Applications to geometry and mechanics. Linear dependence and independence of vectors.

**Math 103 Mathematics Paper I**

2 hours per week 150 marks

For First year CE

**PART A**

**Section A : Differential Calculus**

Limit. Continuity and Differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem, Rolle's theorem. Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainder. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem.

**Section B : Differential Calculus**

Tangent. Normal. Subtangent and subnormal in cartesian, and polar co-ordinates. Determination of maximum and minimum values of functions and points of inflexion. Applications. Evaluation of indeterminate forms by L'Hospital's rule. Curvature, radius of curvature, circle of curvature, centre of curvature and chord of curvature. Evolute and involute. Asymptotes. Envelopes. Curve tracing.

**PART B**

**Section A: Co-ordinate Geometry**

Change of axes : Transformation of co-ordinates, simplification of equations of curves,

Pair of straight lines : Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Bisectors of the angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circles : Equation of the circle in cartesian and polar co-ordinates. General equation of a circle. Centre and radius of a circle. Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common

chord. Chord in terms of its middle point. Orthogonal circles. Radical axis. Radical centre. Properties of radical axes. Coaxial circles and limiting points.

#### Section B : Co-ordinate Geometry

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates. Tangents and normals. Pair of tangents. Chord of contact. chord in terms of its middle point. Parametric co-ordinates. Diameters, conjugate diameters and their properties. Director circles and asymptotes.

### Math 103 Mathematics Paper II

2 hours per week 150 marks

For First year CE

#### PART A

##### Section A: Integral calculus

Definition of integrations. Integration by the method of substitution. integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae.

##### Section B: Integral calculus

Improper integrals. Beta function and Gamma function. Area under a plane curve in cartesian and polar co-ordinates. Area of the region enclosed by two curves in cartesian and polar co-ordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations. Intrinsic equations. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

#### PART B

##### Section A: Ordinary Differential Equation

Degree and order of ordinary differential equation. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher order with constant co-efficients. Solutions of homogeneous linear equations. Applications.

##### Section B: Matrices, Vectors and three dimensional Co-ordinate Geometry

Matrices : Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix.

Three dimensional Co-ordinate Geometry : System of co-ordinates. Distance of two points. Section formula. Projection. Direction cosines. Equations of planes and lines.

Vectors : Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products, Applications to geometry and mechanics. Linear dependence and independence of vectors.

### Math 105 Mathematics Paper I

2 hours per week 150 marks

For First year EEE and CSE

#### PART A

##### Section A: Differential Calculus

Limit. Continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem. Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainders. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem.

##### Section B: Differential Calculus

Tangent. Normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of maximum and minimum values of functions and points of inflexion. Applications. Evaluation of indeterminate forms by L'Hospitals rule. Curvature, radius of curvature, circle of curvature, centre of curvature and chord of curvature. Evolute and involute. Asymptotes. Envelopes. Curve tracing.

#### PART B

##### Section A: Co-ordinate Geometry

Change of axes: Transformation of co-ordinates, simplification of equations of curves.

Pair of straight lines: Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circle : Equation of the circle in cartesian and polar co-ordinates. General equation of a circle. Centre and radius of a circle. Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common

chord. Chord in terms of its middle point. Orthogonal circles. Radical axis. Radical centre. Properties of radical axes. Coaxial circles and limiting points.

#### Section B: Co-ordinate Geometry

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle point. Parametric co-ordinates. Diameters. Conjugate diameters and their properties. Director circles and asymptotes.

### Math 105 Mathematics Paper II

2 hours per week 150 marks

For First year EEE and CSE

#### PART A

##### Section A: Integral Calculus

Definitions of integrations. Integration by the method of substitution. Integration by parts. Standard integrals. Intergration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae.

##### Section B: Integral Calculus

Improper integrals. Beta function and Gamma fuction. Area under a plane curve in cartesian and polar co-ordinates. Area of the region enclosed by two curves in cartesian and polar co-ordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations. intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

#### PART B

##### Section A: Ordinary Differential Equations

Degree and Order of ordinary differential equation. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant co-efficients. Solutions of homogeneous linear equations. Applications.

##### Section B: Matrices, Vectors and Three dimensional Co-ordinate Geometry

Matrices: Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix.

Three dimensional Co-ordinate Geometry : System of co-ordinates. Distance of two points. Section Formula. Projection. Direction cosines. Equations of planes and lines.

Vectors : Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products. Applications to geometry and mechanics. Linear dependence and independence of vectors.

### Math 107 Mathematics Paper I

2 hours per week 150 marks

For First year ChE and MetE

#### PART A

##### Section A: Differential Calculus

Limit. Continuity and Differentiability. Differentiation of explicit and implicit functions and parametric equations. Significance of derivatives. Differentials. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem. Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainders. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem.

##### Section B : Differential Calculus

Tangent. Normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of maximum and minimum values of functions and points of inflexion. Applications. Evaluation of indeterminate forms by L'Hospitals' rule. Curvature. Radius of curvature. Circle of curvature, centre of curvature and chord of curvature. Evolute and Involute. Asymptotes. Envelopes. Curve tracing.

#### PART B

##### Section A : Co-ordinate Geometry

Change of axes: Transformation of co-ordinates, simplification of equations of curves.

Pair of straight lines: Conditions under which general equations of the second degree may represent a pair of straight lines. Homogeneous equations of second degree. Angle between the pair of lines. Bisectors of the angle between the pair of lines. Pair of lines joining the origin to the point of intersection of two given curves.

Circle: Equation of the circle in cartesian and polar co-ordinates. General equation of a circle. Centre and radius of a circle. Tangents and normals. Condition of tangency of a line. Pair of tangents. Length of tangents. Common chord. Chord in terms of its middle point. Orthogonal circles. Radical axis. Radical centre. Properties of radical axes. Coaxial circles and limiting points.

#### Section B : Co-ordinate Geometry

Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle point. Parametric co-ordinates. Diameters, conjugate diameters and their properties. Director circles and asymptotes.

### Math 107 Mathematics Paper II

2 hours per week 150 marks

For First year ChE and MetE

#### Section A : Integral Calculus

Definitions of integrations. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae.

#### Section B : Integral Calculus

Improper integrals. Beta function and Gamma function. Area under a plane curve in cartesian and polar co-ordinates. Area of the region enclosed by two curves in cartesian and polar co-ordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

#### PART B

##### Section A : Ordinary Differential Equations

Degree and Order of ordinary differential equation. Formation of differential equation. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant co-efficients. Solutions of homogeneous linear equations. Applications.

##### Section B : Matrices, Vectors and Three dimensional Co-ordinate Geometry

Matrices : Definition of matrix. Equality of two matrices. Addition, subtraction and multiplication of matrices. Transpose of a matrix and inverse of a matrix.

Three dimensional Co-ordinate Geometry : System of co-ordinates. Distance of two points. Section formula. Projection. Direction cosines. Equations of planes and lines.

Vectors : Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Triple product and multiple products. Applications to geometry and mechanics. Linear dependence and independence of vectors.

### Math 122 Mathematics

2 hours per week 200 marks

For First year Arch

#### PART A

##### Section A : Differential Calculus

Limit. Continuity. Differentiation. Successive and partial differentiations with allied theorems. Rolle's theorem. Mean value theorems for one variable. Expansion of functions by Taylor's series and Maclaurin's series. Tangents and normals. Maxima and minima for functions of one variable.

##### Section B : Integral Calculus

Integration by various methods. Definite integrals. Area bounded by plane curve. Trapezoidal rule, Simpson's rule and Weddle's rule.

#### PART B

##### Section A : Ordinary Differential Equations

Formation of differential equations. Solution of equations of first order by various methods. Solution of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equations. Applications.

##### Section B : Solid Geometry

System of co-ordinates. Distance between two points. Section formulae. Direction cosines. Equations of planes and straight lines. Shortest distance between two given straight lines. Standard equations of sphere and ellipsoid. Tangent planes.

### Math 201 Mathematics

3 hours per week 250 marks

For Second year ME

#### PART A

##### Section A : Vector calculus and Multiple integrals

Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient of a scalar function.



Divergence and curl of vector function. Physical significance of gradient, divergence and curl. Various formulae. Multiple integrals. Divergence theorem. Stoke's theorem. Green's theorem. Gauss's theorem and their applications.

#### Section B : Matrices

Rank and elementary transformations of matrix. Solution of linear equations by matrix methods. Vector spaces. Linear dependence and independence of vectors. Quadratic forms. Matric polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of matrix.

#### PART B

##### Section A : Laplace's transforms

Definition of Laplace's transforms. Elementary transformation and properties. Convolution. Solution of differential equation by Laplace's transforms. Evaluation of integrals by Laplace's transforms.

##### Section B : Differential equations

Convergence and divergence of infinite series. Solution of differential equations of higher order when the dependent and independent variables are absent. Solution of Euler's linear homogeneous differential equations. Solution of differential equation by the method based on factorization of operators. Solution of differential equations by the method of Frobenius. Solution of Bessel's and Legendre's differential equations with properties.

#### Math 203 Mathematics

3 hours per week 250 marks

For Second year CE

#### PART A

##### Section A : Matrices and Differential equations

Rank and elementary transformation of a matrix. Linear dependence independence of vectors. Solution of linear equations by matrix method. Solution of differential equations of higher order when the dependent and independent variables are absent. Solution of differential equation by the method based on factorization of the operators.

##### Section B : Vector calculus

Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of scalar function. Divergence and curl of a vector function. Physical significance of gradient.

divergence and curl. Various formulae. Integral forms of gradient. Divergence theorem. Stoke's theorem. Green's theorem. Gauss's theorem and their applications. Laplace's equation.

#### PART B

##### Section A : Differential equations and Laplace transforms

Solution of differential equation by the method of Frobenius. Definition of Laplace transform. Elementary transformations and properties. Convolution. Solution of differential equations by Laplace transforms. Evaluation of improper integrals by Laplace transforms.

##### Section B : Differential equations and spherical trigonometry.

Solution of Bessel's and Legendre's equation with properties. Spherical triangle. Polar triangle. Properties of spherical triangles. Relations between the sides and angles of a spherical triangle. Properties of a right angled triangle. Solution of triangles.

#### Math 205 Mathematics Paper I

2 hours per week 150 marks

For Second year EEE

#### PART A

##### Section A : Matrices

Rank and elementary transformations of a matrix. Linear dependence and independence of vectors. Solution of linear equations by matrix method. Vector space, Quadratic forms. Matric polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of matrix.

##### Section B : Ordinary Differential equations and Fourier series.

Solution of differential equations of the higher order when the dependent and independent variables are absent. Solution of differential equation by the method based on the factorization of the operators. Fourier series.

#### PART B

##### Section A : Frobenius Method, Bessel's and Legendre's Differential Equations

Solution of differential equations by Frobenius method. Solution of Bessel's and Legendre's equations. Properties of the solutions and expansion of functions in terms of them.



Section B : Partial Differential Equations

Partial differential equations. Wave equations. Particular solutions with boundary and initial conditions.

**Math 205 Mathematics Paper II**

2 hours per week 150 marks

For Second year EEE

**PART A**

Section A : Vector Calculus

Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of a scalar function. Divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Various formulae. Integral forms of gradient, divergence and curl. Divergence theorem.

Section B : Multiple Integrals and Vector Calculus

Jacobians. Multiple integrals with applications. Stoke's theorem, Green's theorem and Gauss's theorem.

**PART B**

Section A : Complex Variables

Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence.

Section B : Complex Variables

Line integral of a complex function. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's & Laurent's theorems. Singular points. Residue, Cauchy's residue theorem. Evaluation of residues. Contour integration. Conformal mapping.

**Math 209 Mathematics**

4 hours per week 300 marks

For Second year ChE

**PART A**

Section A: Multiple integrals and vectors

Jacobians. Multiple integrals with applications. Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and

volume integrals. Gradient of scalar function. Divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem, Gauss's theorem and their applications. Laplace's equation. Curvilinear co-ordinates.

Section B: Sets, groups, rings and fields, Infinite series and matrices

Sets. Subsets. Basic set operations. Mappings and relations. Definitions of group, ring and field. Convergence and divergence of infinite series. Rank. Elementary transformations of matrix. Solution of linear equations by matrix methods. Vector spaces. Linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of a matrix.

**PART B**

Section A : Differential equation

Singular solutions and their physical interpretations. The homogeneous linear equations. Simultaneous linear equations with constant co-efficients. Solutions of differential equations of higher order (i) when dependent variables are absent, (ii) when independent variables are absent. Solution of differential equations by the method based on the factorization of the operators. Solution in series by Frobenius methods. Bessel's and Legendre's differential equations and their properties.

Section B : Laplace transforms

Definition of Laplace transforms. Elementary transformations and properties. Application of Laplace transforms for determining the solutions of differential equation. Evaluation of improper integrals by Laplace transforms.

**Math 211 Mathematics**

3 hours per week 250 marks

For Second year MetE

**PART A**

Matrices : Rank and elementary transformation of matrix. Solution of linear equations by matrix methods. Vector spaces. Linear dependence and independence of vectors. Quadratic forms. Matrix polynomial. Determination of characteristic roots and vectors.

Solid Geometry : Angle between lines and planes, distance from a point to a plane, condition of perpendicularity and parallelism of planes and straight lines, perpendicular distance from a point to a straight line, coplanar lines, shortest distance between two given straight lines and volume of a tetrahedron,

Vector calculus : Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient, divergence and curl of a vector function. Physical significance of gradient, divergence and curl, various formulae. Divergence theorem, Stoke's theorem, Green's theorem, Gauss's theorem and their applications.

#### PART B

Differential equation : Solution of differential equation of higher order when the dependent and the independent variables are absent. Solution of Euler's linear homogeneous differential equation. Solution of the differential equation by the method based on factorization of the operator.

Convergence and divergence of infinite series. Solution of differential equation by the method of Frobenius. Solution of Bessel and Legendre equations with properties. Laplace's transform : Definition of Laplace's transform. Elementary transformation and properties. Convolution. Solution of differential equation by Laplace's transforms. Evaluation of improper integrals by Laplace's transform. Fourier series expansion.

#### Math 213

3 hours per week 250 marks

For second year NAME

##### PART A

##### SECTION A : Matrices

Rank and elementary transformation of matrix. Solution of linear equations by matrix methods. Vector spaces, linear dependence and independence of vectors. Quadratic forms. Matrix polynomials, Determination of characteristic roots and vectors. Null space and nullity of matrix. Characteristic subspace of matrix.

##### SECTION B : Vector Calculus

Differentiation and integration of vectors together with elementary applications, Definitions of line, surface and volume integrals. Gradient of a scalar function.

Divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Various formulae. Stoke's theorem, Green's theorem, Gauss's theorem and their applications.

#### PART B

##### SECTION A: Statistics

Frequency distribution. Mean, Median, Mode and other measures of central tendency. Standard deviation and other measure of dispersion. Moments, Skewness and Kurtosis. Elementary probability distribution e.g. Binomial, Poisson and negative Binomial. Continuous Probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

##### SECTION B : Differential Equation.

Solution of differential equations of higher order when the dependent and independent variables are absent. Solution of Euler's linear homogeneous equation. Solution of differential equation by the methods based on factorization of the operator. Solution of differential equations by the method of Frobenius. Solution of Bessel and Legendre's equation with properties.

#### Math 215 Mathematics

3 hours per week 250 marks

for Second year CSE.

##### PART A

##### Statistics:

Frequency distribution, Mean, Median, Mode and other measure of central tendency. Standard deviation and other measures of dispersion, Moments, Skewness and kurtosis Random variables and Expectation.

Elementary probability theory. Discontinuous probability distribution e.g. Binomial, Poisson and negative-binomial, the geometric and hypergeometric. Continuous probability distribution e. g. normal and exponential. Elementary sampling theory, confidence interval; Tests of hypothesis.

##### Complex Variable:

Complex number, Argand diagram, power and roots, Function of complex variables, Mapping of  $1/z$ ,  $z^n$ ,  $z^{1/2}$ ,  $e^z$  etc. Linear and bilinear transformation. Limits, continuity and Differentiation formulas, Cauchy-Riemann equations and conformal transformations.

## PART B

### Matrices :

Rank and elementary transformations of a matrix. Solution of linear equation by matrix methods. Vector spaces, linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of matrix.

### Vector Calculus :

Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of a scalar function. Divergence and curl of a vector function.

### Section B

Physical significance of gradient, divergence and curl. Various formulae.

### Partial Differential Equation:

Solution of differential equations with variable co-efficient. Solution of first order partial differential equations. Solution of partial differential equation with constant and variable co-efficient, Applications.

## Math 301 mathematics

2 hours per week      200 marks

For Third year ChE

### PART A

#### Section A : Fourier Series and Harmonic Analysis

Fourier series. Convergence of Fourier series. Fourier analysis. Fourier integral. Introduction to Laplace equation in cartesian, cylindrical and spherical coordinates. Cylindrical harmonics, spherical harmonics. Potential of a ring. Potential about a spherical surface. General properties of harmonic functions.

#### Section B : Partial Differential Equations

Partial differential equations. Wave equations. Particular solution with boundary and initial conditions.

### PART B

#### Section A : Complex Variables

Complex number system. General functions of a complex variable. Limits and continuity of a function, complex variable and related theorems. Elementary

functions. Complex differentiation and the Cauchy-Reimann equations. Mapping by elementary functions.

### Section B : complex Variables

Line integral of a complex function. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's theorem and Laurent's theorem. Convergence. Singular points. Residue. Cauchy's residue theorem. Evaluation of residues. Contour integration, conformal mapping.

## Math 302 Mathematics Sessional

3 hours every alternate week      50 marks

For Third year MetE

### PART A

Flow diagram, FORTRAN language with applications, e.g. solution of system of linear equations. Matrix addition, subtraction, multiplication and inversion.

### PART B

Curve fitting by least squares. Differentiation, integration and solution of differential equation by numerical methods.

## Math 303 Mathematics

2 hours per week      200 marks

For Third year ChE

### PART A

#### Section A : Numerical Analysis

Interpolation. Simple difference. Simple difference table. Newton's formula for forward interpolation. Newton's formula for backward interpolation. Divided differences. Tables of divided difference. Relation between divided differences and simple differences. Newton's general interpolation formula. Lagrange's interpolation formula. Inverse interpolation by Lagrange's formula and by successive approximations. Numerical differentiation of Newton's forward and backward formula. Numerical integration. General quadrature formula for equidistant ordinates. Trapezoidal rule. Simpson's rule. Weddle's rule. Calculation of errors. Relative study of the three rules. Gauss's quadrature formula. Legendre, polynomials. Newton-Cotes's formula. Principle of least squares. Curve fitting.

#### Section B : Statistics

Frequency distribution. Mean. Median. Mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moment. Skewness and Kurtosis. Elementary probability theory and discontinuous probability distributions, e.g. binomial, Poisson and Negative Binomial.

#### PART B

##### Section A : Numerical Analysis

Solution of algebraic and transcendental equations by graphical method. Regula-Falsi method. Newton-Raphson method, geometrical significance. Convergence of iteration and Newton-Raphson methods. Newton-Raphson method and iteration method for the solution of simultaneous equation. Solution of ordinary first order differential equations by Picard's method and Euler's method. Runge-Kutta's method for solving differential equations.

##### Section B : Statistics

Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation, hypothesis testing and regression analysis.

#### Math 305 Mathematics

3 hours per week 300 marks

For Third year CE

#### PART A

##### Section A : Solid geometry

System of Co-ordinates. Distance between two points, Section formula. Projection. Direction Cosines. Equations of planes and lines. Angle between lines and planes. Distance from a point to a plane. Condition of perpendicularity and parallelism of planes and straight lines. Perpendicular distance from a point to a straight line. Co-planar lines. Shortest distance between two given straight lines. Volume of a tetrahedron. Standard equation of conicoids. Sphere, ellipsoid, hyperboloid of one sheet, hyperboloid of two sheets. Elliptic paraboloid. Hyperbolic paraboloid, Cone, Cylinder. Tangent planes. Normal lines. Condition of tangency.

##### Section B : Statistics

Frequency distribution. Mean. Median. Mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments.

Skewness and Kurtosis. Elementary probability theory and discontinuous probability distributions, e.g. binomial, Poisson, and negative binomials. Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

#### PART B

##### Section A : Fourier series and Harmonic Analysis

Fourier series. Convergence of Fourier series. Fourier analysis. Fourier integral. Introduction to Laplace equation in cartesian, cylindrical and spherical coordinates. Cylindrical harmonics. Spherical harmonics. Potential of a ring. Potential about a spherical surface. General properties of harmonic functions.

##### Section B : Partial Differential Equations

Partial differential equations. Wave equations. Particular solution with boundary and initial conditions.

#### Math 307 Mathematics

3 hours per week 300 marks

For Third year ME and NAME

#### PART A

Section A : Fourier series, Partial differential equations and Harmonic Analysis. Fourier series. Convergence of Fourier series, Fourier analysis. Fourier integral. Introduction to Laplace equation in cartesian, cylindrical and spherical coordinates. Cylindrical harmonics. Spherical harmonics. Potential of a ring. Potential about a spherical surface. General properties of harmonic functions. Partial differential equation. Wave equations. Particular solution with boundary and initial conditions.

##### Section B : Numerical Analysis

Solution of algebraic and transcendental equations by graphical method. Regula falsi method. Newton-Raphson method. iteration method. Geometrical significance of Newton-Raphson method and iteration method. Convergence of iteration and Newton-Raphson methods. Newton-Raphson method and iteration method for the solution of simultaneous equations. Graeffe's root-squaring method for the solution of algebraic equations. Solution of ordinary first order differential equations by Picard's method and Euler's method. Runge-Kutta's method for solving differential equations.

## PART B

### Section B : Complex Variables

Complex Number System. General function of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and Cauchy-Riemann equations. Infinite series. convergence and uniform convergence. Line integral, complex function. Cauchy's integral theorem. Singular points. Residue. Cauchy's residue theorem. Evaluation of residues. Contour integration, conformal mapping.

### Section B : Numerical analysis

Interpolation. Simple differences. Simple difference tables. Newton's formula for forward interpolation. Newton's formula for backward interpolation. Divided differences. Tables of divided differences. Relation between divided difference and simple differences. Newton's general interpolation formula. Lagrange's interpolation formula. Inverse interpolation by Lagrange's formula and by successive approximations. Numerical integration. General quadrature formula for equidistant ordinates, Trapezoidal rule. Simpson's rule. Weddle's rule. Relative study of the three rules. Gauss's quadrature formula. Legendre's polynomials. Newton-Cotes's formula. Principle of least squares. Curve fitting.

## Math 309 Mathematics

2 hours per week 200 marks

For third year EEE

## PART A

### Section A : Laplace transforms and differential equation

Definition of Laplace transform. Elementary transformations and properties. Convolution. Solution of differential equations by Laplace transforms. Evaluation of improper integrals by Laplace transforms. Differential equations. Wave equations. Particular solution with boundary and initial conditions.

### Section B : Fourier series and harmonic Analysis

Fourier series. Convergence of Fourier series. Fourier integral. Introduction to Laplace's equation in cartesian, cylindrical and spherical co-ordinates. Cylindrical Harmonics. Spherical harmonics. Potential of a ring. Potential about a spherical surface. General properties of Harmonic functions.

## PART B

### Section A : Statistics

Frequency distribution. Mean. Median. Mode and other measure of central tendency. Standard deviation and other measures of dispersion. Moments. Skewness and Kurtosis. Elementary probability theory and discontinuous probability distributions, e.g. binomial, Poisson and negative binomial.

### Section B : Statistics

Continuous probability distributions, e.g. normal and exponential. Characteristic of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

## Math 315 Mathematics

2 hours per week 200 marks

for THIRD year CSE

## PART A

### Statistics

Analysis of variance, Two-factor factorial experiments. Stochastic processes and queuing : Discrete-time Markov Chains, Continuous-time markov chains. The Birth-death process in queuing. Queuing models.

### Laplace's Transform :

Definition of Laplace's transforms, Elementary transformations and properties, Convolution. Solution of differential equations by Laplace's transforms. Evolution of improper integrals by Laplace transforms.

## PART B

### Fourier Series :

Fourier series expansion, Complex form of Fourier series, Fourier Integral theories, Fourier transforms and Applications.

### Harmonic Analysis :

Laplace's equation in cartesian, polar, Cylindrical and spherical co-ordinates. Solutions of Laplace's equation in different, co-ordinates. Application of spherical Harmonic in determining gravitational potential due to a ring and potential about Spherical surface kept at prescribed potential.



## M. PHIL . COURSE IN APPLIED MATHEMATICS

Math 6000 Thesis

### **Math 6101 Special Functions and Integral Transforms I 3 credits**

The porobability integral and related functions; application to the theory of heat conduction and to the theory of vibration. Generating function of the Hermite and Laguerre polynomials, recurrence relations, the differential and the integral equation satisfied by the polynomials. Integral representations, orthogonality and Laguerre polynomials. Hypergoemetric functions, its linear and quadratic transformations. The confluent hypergeometric function, its integral and asymptotic representation. Representation of various functions in terms of Hypergeometric and the confluent Hypergeometric functions. Hermite functions. Mathieus functions and the Dirac Delta function. The Minkui ski Temple Theory of generalized function. Schwartz's theory of distribution.

### **Math 6102 Special Functions and Intergral Transforms II 3 credits**

Greens' function and its applications. Fourier integral theorem and Fourier transform. Multiple Fourier transforms. Fourier transforms of radially symmetric functions. The solutions of integral equations of convolution type. Use of Fourier transforms in solving Laplace's equation, diffusion equation and wave equation. The double Laplace transform, the iterated Laplace transform, the Stieltjes transform, the Hilbert transform, the Bilateral Laplace transform, the Mellin transform and the Hankel transform. The Perseval relation for Hankel transform and the relation between Fourier and Hankel tranforms. Use of Hankel transforms in solving partial differential equations.

### **Math 6201 Fluid Dynamics I 3 credits**

Eulerian and Lagrangian method of description of fluid; Analytic approach of deformations; Derivation of equations of conservation of mass, momentum and energy. Basic equations in different co-ordinate system, boundary conditions. Irrotational and rotational flows. Bernoulli's equation and some applications. Two dimensional irrotational incompressible flows with circulation; sources and sinks; Vortex motion. Combination of basic flows, mapping of flows in complex coordinates, Aerofoil theory, Schwartz-Christofel theory, Navier Stokes equations. Gravity waves, one dimensional compressible flows. sound waves, shock waves; Two dimensional irroational flows. hypersonic flows; viscous compressible fluid flows. Incompressible fluid flow between two parallel plates;

flow through a circular pipe and annulus. Flow between a plane and a cone; flow through convergent and divergent channel, flow in the vicinity of a stagnation point; unsteady flows.

### **Math 6202 Fluid Dynamics II 3 credits**

Small Reynold's number flows; flows over a sphere; flow over a cylinder, through porous media, lubrication theory.

Boundary layer theory; properties of Navier-Stokes equations; two dimensional boundary layer equations; displacement, momentum and energy thickness for two dimensional flows. Von-Mises transformation. Similarity solutions of boundary layer equations. Boundary layer flow over a flat plate, boundary layer flow with pressure gradient; Approximate solutions of boundary layer equations, including Von-Karman's method. Stability theory; Basic concepts of stability theory; Stability of Couett's flow; Stability of flow between two parallel plates; Rayleigh Taylor instability; Kelvin-Helmholtz instability.

Turbulence: Reynolds stresses and basic equations for turbulent flows; Prandtl mixing length theory; some simple turbulent flows; homogeneous turbulence. Non Newtonian Fluid Flows: Riener -Rivlin Fluids, power law fluids; flows in Ellis fluids; flow in Bingham plastics, Visco-Elastic Flows, General visco elastic fluid flows.

### **Math 6301 Similarity Analysis 3 credits**

Principle and illustrations of dimensional analysis, systematic calculation of dimensionless products, algebraic theory of dimensional analysis, different procedures, (Rayleigh, Buckingham pie-theorem, stepwise, echelon, proportionalities etc.) for the determination of dimensionless groups and its behaviour for some boundary value problems: Method of similitude and introduction to fractional analysis of overall equations, a free parameter method for similarity solution applied to two dimensional boundary layer flows, method of separation of variables, similarity requirements for three dimensional, axisymmetric velocity and thermal boundary layer laminar flows (both steady and unsteady), group theory method, absorption of parameters and natural co-ordinates in similarity variables, reduction of independent variables, similarity and natural co-ordinates in linearised compressible flow, supersonic and transonic similarity rules. Karman similarity criteria for turbulent shear layers.

**Math 6302 Perturbation and Approximation Theory** **3 credits**

The nature of perturbation theory, some regular perturbation problems, the technique of perturbation theory, some singular perturbation problems in aerofoil theory, the method of matched asymptotic expansion, the method of strained co-ordinates in viscous flow at high Reynolds number, some inviscid single perturbation problems, aspect of perturbation theory. New classes of information by approximation theory, classification of problems and difficulties in approximation theory, analysis of the condition for approximation theory.

**Math 6401 Optimization Techniques I** **3 Credits**

Introduction; Classical methods with single and multivariables. Linear programming; Graphical method with mathematical definitions and theorems; Solution of a system of linear simultaneous equations; Pivotal reduction of a general system of equations, simple method with theoretical development. Transportation problem. Non-Linear programming; One dimensional problems by elimination and interpolation methods; Unconstrained techniques direct search and descent methods; constrained techniques and indirect methods.

**Math 6402 Optimization Techniques II** **3 Credits**

Geometrical programming; Dynamic programming; Stochastic programming; Game theory; CPM and PERT; Calculus of variations.

**Math 6501 Advanced Quantum Mechanics I** **3 Credits**

Basic development of quantum mechanics: Experimental background, Old quantum theory. Uncertainty and complementarity, Principle of superposition, Dynamical variables and observables, Representations of the quantum conditions, Development of Schrodinger equation. Approximate methods for stationary and time dependent Schrodinger equation. Perturbation theory, the Born approximation. The Variation method, Inelastic collisions, Adiabatic and sudden approximation. Theory of radiation: Connection between bosons and oscillators, Emission and absorption of Bosons, Application to photons, the Interaction energy between photon and an atom. Emission, absorption and scattering of radiations, Assembly of fermions.

**Math 6502 Advanced Quantum Mechanics II** **3 Credits**

Relativistic theory of the electron: Relativistic treatment of a particle, the Wave equation for the electron, Invariance under Lorentz transformation, the Motion of a free electron, Existence of the spin, the Fine-structure of the energy levels of Hydrogen, Theory of positrons.

Quantum Electrodynamics: The Electromagnetic field in the absence of matter, Relativistic form of the quantum conditions, the Schrodinger dynamic variables, the Supplementary conditions, Electron and positron, Difficulties of the theory.

## Department of Metallurgical Engineering

### UNDERGRADUATE COURSES

#### **Met E 101 Fundamental Metallurgy**

2 hours per week      150 marks

##### **PART A**

Definition of metallurgy, historical development and the role of metallurgy in relation to other area of science of and technology. Definition of common metallurgical terms: minerals, ores, metals; gangue, flux, slag, calcining, roasting, sintering, briquetting, etc. Mechanical properties of metals: hardness, ductility, toughness, plasticity, fatigue, creep etc. Forming of metals: casting, forging, rolling, extrusion, etc. Joining of metals: soldering, brazing and welding. Fundamental principles of extraction of ferrous and non-ferrous metals from ores.

##### **PART B**

The atom, the periodic table of elements, quantum numbers and energy levels: the ionic bond, the covalent bond and the metallic bond. Brief survey of physical and chemical properties of metallic elements and alloys. Thermal, electrical, optical, magnetic and nuclear properties. The crystalline structure of metals, Miller indices etc. Binary phase diagrams including the Fe-Fe<sub>3</sub>C equilibrium diagram. Measurement of high temperatures: thermometers, indicating colours, indicating cones, thermocouples, optical and radiation pyrometers, temperature corrections.

#### **Met E 201 Materials Science**

2 hours per week      150 marks

##### **PART A**

The states of matter: change of state, thermodynamic considerations, mechanisms of solidification, nucleation and growth. Crystal imperfections, The electronic structure and the physical properties of metals. Mechanisms of deformation, slip and twinning. Slip planes and slip directions. Edge and screw dislocations, the Burgers' vector, Sources of dislocation: glide and climb, dislocation theory of strain hardening.

##### **PART B**

X-ray diffraction, forbidden reflections, Debye-Scherrer technique, Laue technique, Rotating crystal method. Applications of X-ray diffraction to

metallurgy: phase diagram determination, structural and chemical analysis etc. Electron and neutron diffraction. Fick's laws of diffusion, diffusion mechanisms: volume, surface and grain boundary diffusion; Diffusion phenomena in metallurgical processes.

### **Met E 203 Geology and Mineralogy**

2 hours per week      150 marks

#### **PART A**

Rocks and their classification: Igneous rocks, sedimentary rocks, metamorphic rocks, and their subdivisions. Earth quakes, volcanoes and volcanic products. The Earth's interior. Mountains and related land forms. A general view of earth denudation by weather, rivers, glaciers and sea; Transportation, deposition and consolidation of debris. The geological age and the relation of rocks to their ages.

#### **PART B**

Occurrence and association of minerals; rock-forming minerals, veins and vein minerals, gem minerals, ornamental minerals. Ore minerals of iron, copper, zinc, tin, aluminium, antimony, etc. Physical properties like cleavage, parting and fracture hardness, tenacity, specific gravity, properties depending upon light, Electrical and magnetic properties.

### **MetE 204 Metallurgical Analysis and Assaying**

3 hours per week      100 marks

Determination of the common metals in solutions of their simple salts. Analysis of non-ferrous alloys such as brass, bronze, bearing metals, etc. for the determination of copper, lead, tin, zinc and antimony. Estimation of graphitic carbon in cast iron. Determination of total carbon, silicon, manganese, Sulfur and phosphorus in plain carbon steels, pig iron and cast iron.

### **MetE 205 Metallic Materials**

2 hours per week      150 marks

For second year ME

#### **PART A**

Definitions of industrially significant properties including malleability, ductility, toughness, fatigue resistance; mechanical and non-destructive tests applicable to metals. Binary phase diagrams, their origin and interpretation, relation between structures and properties of metals and alloys in equilibrium. Definition

of common metallurgical terms: metallurgy, metals, minerals, ores, calcination, roasting, sintering, smelting, slag, flux, etc. Alloys, furnace and refractories. Pig-iron: Preparation and uses: Wrought iron: preparation and uses: Cast-irons: preparation, types, effects of impurities on cast-irons, production of nodular and malleable cast-irons. Steels: Cement, Crucible, Bessemer, Open-hearth steels, etc.: Preparation and uses. Distinction between plain carbon and alloy steels: Alloying elements. Different types of alloy steels, characteristics of tool steels. Bearing metals, properties, types, Light alloys, types of light alloys-properties and uses. Common metals and their alloys.

#### **PART B**

Crystal structure of metals and alloy phases: Method of study of crystalline structure, solidification as a process of crystallisation and growth. Effects of temperature on mechanical properties of metals, diffusion and precipitation processes, age hardening. Importance of electronic factors, crystal structure and defect structure in determining properties and application of metallic materials. Heat-treatment: different types of heat-treatment, effects, furnaces and control of temperatures: Surface hardening-purposes, methods of surface hardening, case hardening etc. Oxidation and corrosion, types of corrosion, mechanism, the effect of metallurgical variables on corrosion, protection against corrosion. Powder Metallurgy-metal powders, characteristics, welding of powders, sintering, shrinkage, hot pressing.

### **MetE 206 Metallic Materials Sessional**

3 hours every alternate week      50 marks

For Second year ME

#### **PART A**

Preparation of micro specimen for study by grinding, polishing, and etching. Study of the metallurgical microscope. Recognition of various ferrous and non-ferrous materials by metallographic study-Photo-micrography, Micro and macro-study of castings and forgings, examination of cold worked and annealed metals.

#### **PART B**

Practical study on the heat-treatment of steels, Furnaces, controlled atmospheres, measurement and control of temperatures, quenching baths, tempering facilities. Conducting of normalising, annealing, case-carburising and hardening and tempering operations of steel specimens, followed by metallographic examination of the pieces so treated.

**MetE 207 Fuels and Refractories**

3 hours per week      250 marks,

**PART A**

Fuels : Definition and classification of fuels, Solid Fuels : Origin of coal, transformation of vegetal matter into coal. Different types of coal by rank with their calorific values and uses, Petrographic constituents of coal, sources of mineral matter in coal. Methods for analysis of coal: the ultimate and the proximate analyses of coal, significance of the ultimate and the proximate analyses. Carbonization of coal at high and low temperatures. Manufacture of coke, recovery of by-products. Pulverized coal and briquettes.

Liquid fuels: Distillation products of petroleum. Composition, characterisation, properties and blending of fuel oil. The knocking characteristics of motor fuel. Some other liquid fuels.

Gaseous fuels. Natural gas and its prospects in Bangladesh, Manufacture of gaseous fuels like producer gas, water gas, coal gas, etc, their composition, calorific values and uses. Combustion problems and stoichiometric calculations.

**PART B**

Refractories: Definition and classification of refractory material and their application. Physical and chemical requirements of refractory materials such as expansion, contraction, specific heat, corrosivity, permeability, thermal and electrical conductivity. Raw materials and production of silica bricks, firebricks, magnesite bricks, chrome bricks, graphite bricks and other synthetic refractories.

**Met E 208 Fuels and Refractories Sessional**

3 hours every alternate week      50 marks

Determination of moisture, volatile matter, fixed carbon and ash in coal/coke. Measurement of true and apparent specific gravity of coal, coke and refractory bricks and calculation of percentage porosity. Determination of the higher and lower heating values of coal/coke. Determination of sulphur in coal/coke by the Escha method and by the bomb calorimeter method. Determination of carbon, hydrogen and nitrogen in coal/coke. Determination of fusion point, strength, thermal conductivity, thermal expansion, spalling resistance, corrosivity etc. of some common refractories.

**MetE 209 Shipbuilding Materials**

3 hours per week      250 marks

For Second year NAME

**PART A**

Place of metals as materials of construction. Definitions of familiar metallurgical terms: metallurgy, metal, minerals, ores, gangue, flux, slag, calcination, roasting, briquetting, etc. Definitions of industrially significant properties of metallic materials including malleability, hardness, toughness, fatigue, creep, yield point, elastic limit, etc. Metallurgy in foundry: Pig iron: production and uses. Wrought iron: production, properties and uses. Cast irons: Production, types, properties and uses. Effect of metalloids on Cast Iron Steels: Production, properties, uses of carbon steels. Metal casting processes, casting defects and remedies. Measurement and control of temperature.

Powder metallurgy: Importance of powder metallurgy in tool making industries, technique of making metallic powders, effect of powder metallurgy in the field of ceramics.

Phase rule and phase diagrams of Industrial alloys: Structure and properties of metals and alloys. Manufacture, types, properties and uses of nonferrous alloys like Brass, bronze, bearing metals, soldering and brazing alloys, etc. Theories of corrosion and methods of its prevention. Protective metallic, inorganic coatings and organic coatings including paints for marine atmosphere.

**PART B**

Ferrous alloys : Plain carbon steels, alloy steels, tool steels, stainless steels, heat resisting and creep-resisting steels.

Metal working processes: Hot working and cold working. Rolling, forging, extrusion, tube drawing and wire drawing and sheet metal forming, etc.

Heat-treatment of metals and alloys: The Iron and iron-carbide thermal equilibrium diagram. Annealing, Normalizing, Quenching and Tempering. The T-T-T. diagram, Austempering and Martempering.

Case Hardening of steel: Carburizing, Cyaniding, Nitriding etc, Cement, ferro-cement, timber, rubber, glass, plastics and lubricants.

**MetE 210 Shipbuilding Materials Sessional**

3 hours per week      100 marks

For Second year NAME.

**PART A**

Recognition of various metallic materials: Study of the metallurgical microscope and preparation of macro and micro specimen by grinding, polishing and



etching. Micro-study of various ferrous and non-ferrous materials. Photo-micrography, macro and micro-study of cold worked and annealed metals.

#### **PART B**

Practical study of heat-treatment of steels: Conducting of annealing, normalizing, tempering, and hardening by quenching and carburizing of steel specimen, followed by metallographic examination of the pieces so treated. Making of brass, bronze and bearing metals and study of micro-structure of heat-treated brass and bronze.

Metallography of melted and heat-treated specimens of steel and nonferrous alloys. Study of physical properties of different heat-treated metals and their alloys.

#### **MetE 212 Furnace Design and Drawing**

3 hours every alternate week 50 marks

Design of different types of metallurgical furnaces: Pit-furnace, the Foundry-Cupola, Converters, Open-hearth furnace and Electric furnaces, Kilns.

#### **MetE 213 Engineering Materials**

3 hours per week 250 marks

##### **PART A**

Fine Ceramics : Raw materials, preparation of ceramic mixture, molding, drying and firing the ware, glazing the ware, Porcelain : its raw materials and uses. Earthenware and semiporcelain-products for sanitary purpose, Glazed earthen ware tiles. Structural ceramics: Raw materials, classification of products: wall, roofing and facing materials, stone tiles and stone ware. Glass: Compositions and properties of glasses, reactions in glass making, glass furnaces, annealing of glasses, coloured glass and special glasses.

Plastics : Structural characteristics of plastics materials, condensation and polymerization, types of plastics, production of plastics materials, production of finished plastics products, uses and properties. Rubber: Sources of raw materials, types and properties.

##### **PART B**

Corrosion : Mechanism of corrosion, types of corrosion, corrosion kinetics, hydrogen evolution corrosion reaction, the corrosion of alloys, oxidation resistance, atmospheric corrosion, methods of investigation. Corrosion and heat resistant alloys and their classifications, uses of corrosion-resistant alloys

in modern high temperature appliances such as gas-turbines, atomic reactors etc. Characteristic features of corrosion behaviour of the principal classes of alloys, Corrosion behaviour of metals and alloys at high temperature. The protection of metals cathodic and anodic protection, inhibition, metallic coatings, organic and inorganic coatings.

#### **MetE 216 Materials Testing Sessional**

3 hours every alternate week 50 marks

General discussion and problems on stress, strain and mechanical properties of materials. Tensile, static bending and impact tests on some common metals and alloys. Determination of hardness by Rockwell, Brinell and Microhardness testing machines. Determination of wear in some common metals and alloys. Determination of creep damage in common metals. Fatigue testing of metals. Non-destructive testing methods.

#### **MethE 218 Fundamental Metallurgy Sessional**

3 hours per week 100 marks

Physical study of ores, minerals and metals. Comparative study of hardness of some pure metals and alloys, study of Moh's scale. Preparation of micro-specimen and study of metallurgical microscope. Study of microstructures of wrought iron, white, gray and malleable cast iron. Study of plain carbon steels and estimation of strength, ductility and hardness from structure. Preparation of some alloys like brass, solder, white metals, etc. Casting of some simple parts. Study on heating and cooling curves and study on microstructure of the alloy. Study of corrosion in different environments.

#### **MetE 301 Elements of Mining Engineering**

2 hours per week 200 marks

##### **PART A**

General information on rocks and minerals, prospecting for mineral deposits and proving it.

Mine workings: Mining work and mining machineries.

Mining Shafts: Sinking vertical shafts by conventional methods, special methods of shaft sinking.

Opening up the deposit: effects of under-ground work on the surface. Open casts or quarries.

## PART B

New methods of working coal deposits under-ground. Methods of working ore deposits. Methods of mining other deposits. Mine transport: Basis of design of transport, rail-free transport systems, rail transport, hoisting, surface equipment of the mine, the organization of mine transport. Mine drainage. Mine ventilation and lighting. Fires and mine rescue.

## MetE 303 Metallurgical Operations and Control

3 hours per week      300 marks

### PART A

Fundamental metallurgical operations and related problems. Basic concepts of thermochemistry: Heat of formation, heat of reaction, heat of solution, Hess's law, heat of reaction at high temperature. Application to metallurgical problems. The iron blast furnace : Calculations involving reduction of the oxides and theoretical coke consumption, maximum theoretical temperature in the iron blast furnace. The cupola and related problems. The bessemer, open hearth and electric steel processes: Calculation of amounts and compositions of the slag and gas formed, control of temperature and composition in the Bessemer process. Smelting and converting of copper.

Calculation of charge and products of the open hearth process. Electric steel making, electric furnace efficiency and power requirements.

### PART B

Production of blast and draft: Power requirement for blast, volume of air and calculation of gas velocity, chimney, draft and chimney head. Calculation of charges for smelting: Charge make-up for a desired slag composition. Method of available flux. The summated lime and algebraic methods, the cut and try method.

Heat balance : Items of heat supply and heat distribution. Heat balance of the iron blast furnace, thermal efficiency of iron blast furnace. Heat balance of the Bessemer converter and open hearth furnace.

## MetE 305 Metallurgical Thermodynamics

2 hours per week      200 marks

### PART A

Review of the first and second laws of thermodynamics. Some thermodynamic relationships involving entropy. The driving force behind a chemical reaction,

free energy, chemical equilibrium constant and the chemical stability of the compounds, the van't Hoff isotherm and the Clausius-clapeyron equation. The third law of thermodynamics: Change of entropy at absolute zero, verification of third law.

### PART B

Solutions : Raoult's law, deviations from Raoult's law, activities, Henry's law and dilute solutions, experimental determination of activities, interaction coefficient, free-energy of mixing, regular solutions, partial molar quantities. Applications of thermodynamic principles to metallurgy: Solidification, grain-growth, phase diagrams and phase transformation, extraction and refining of metals etc.

## MetE 307 Ore-dressing and Extractive Metallurgy

3 hours per week      300 marks

### PART A

Ore-dressing : Aims and advantages of separating valuable minerals, Comminution, screening and classifying. Beneficiation: Gravity based concentration, froth-flotation, magnetic and electro-static separation. Evaluation of ore-dressing methods. Preparation of flow-sheets and specification of beneficiation plant.

### PART B

Extractive metallurgy : Principles of extraction of metals from different types of ore. Different methods in extractive metallurgy. Pyrometallurgy: Roasting, drying, calcining, sintering, smelting methods and furnaces, Hydro-metallurgy: Leaching, types of leaching, leaching solution and leaching curves. Electro-metallurgy: Chemical principles, chemical affinity, mechanism of electrolysis, aqueous electrolytic bath, igneous electrolytic bath, the Gibbs Helmholtz equation, factors affecting electrolytic resistance, equipments and applications of electrolysis. Extraction of copper, aluminium, zinc, lead and tin.

## MetE 309 Foundry Technology

3 hours per week      300 marks

### PART A

Pattern design and layout. Moulding, patterns, shrinkage allowance for various ferrous and non-ferrous castings, Moulding sand and their origin, grading, selection and uses. The preparation of moulding sands : green, dry and loam

sands. The phenomena of solidification, crystallisation, segregation, shrinkage, etc. Designs of runners and risers. Casting defects and remedies. Special casting methods: Die-casting, centrifugal casting, precision casting, continuous casting, etc.

#### **PART B**

Iron founding: The foundry cupola : its design, construction, maintenance and operation. Different grades of cast iron: White, grey, chilled, malleable, nodular, alloy cast iron etc. The effects of carbon, maganese, silicon, phosphorous, sulphur, etc. on cast iron.

Steel Founding: Ingot castings, types, defects and remedies.

Non-ferrous casting: Casting of common non-ferrous metals and alloys, their defects and remedies.

#### **MetE 310 Foundry Technology Sessional**

3 hours per week      100 marks

Foundry sand testing. Preparation of moulding sand for ferrous and nonferrous castings etc. Study and construction of patterns, cores and moulds for various castings.

Casting of ferrous and non-ferrous metals and alloys. Metallographic study of various castings, their solidification and crystallisation including dendrite formation and coring.

#### **MetE 312 Chemical Analysis of Metals and Minerals**

3 hours per week      100 marks

The determination of the common alloying elements such as manganese, nickel, chromium, vanadium, tungsten, molybdenum etc. in alloy steels/ ferro-alloys. Analysis of aluminium alloys. Analysis of ore-minerals of common ferrous metals. Analysis of refractory bricks/slugs for the determination of silica, alumina, magnesia, lime, iron oxide etc. Spectrophotometric analysis, atomic absorption and x-ray fluorescence, mobile nitrogen analysis, carbon determination by combustion method, etc.

#### **MetE 400 Project and Thesis**

6 hours per week      200 marks

(For each academic session the Departmental Board of Studies will draw up a list of available projects and announce whether these are to be undertaken by

individual students or by a group of students). The projects will be from the following areas:

Metallurgical plant design and layout: Projects may concern design and construction of equipments like centrifugal casting machine, gas-fired melting and heat-treating furnace, automatically controlled muffle furnaces etc.

Design and manufacturing process studies: An item comprising several parts will be examined to determine the mode of manufacture and to investigate possible lines of improvement. This includes studies in powder metallurgy, different methods of casting ferrous and non-ferrous metals and alloys, making of emery papers and refractory materials from local deposits etc.

Study of metallurgical phenomena of industrial interest. Investigations will be conducted on the effects of different factors in a certain process e.g. case-hardening, heat-treatment of metals and alloys including alloy-steel, tool-steels, study of structure/property relationship in steels etc., studies on the prevention of corrosion by alloying, electro-plating; coating and other surface treatment, development of devices for the measurement and control of temperature etc.

#### **MetE 401 Ferrous Production Metallurgy**

2 hours per week      200 marks

##### **PART A**

Production of pig-iron: The functions of the balst furnace, disposition of the metalloids by the furance, factors influencing furnace output, modern trends in blast furnace practice. Production of wrought iron: The puddling and the Aston-Byers processes. Production of Steel: Pneumatic processes, oxygen steelmaking processes, open-hearth and electric steelmaking processes.

##### **PART B**

Production of alloy steels: Sainless steels, tool steels and die steels, Degassing of steel: Vacuum and other degassing processes. Solidification of steel. Direct reduction of iron. Production of ferroalloys.

#### **MetE 403 Metallic Alloys Paper I**

2 hours per week      200 marks

##### **PART A**

Phase diagrams and their relationship with different alloy systems. The copper, aluminium and nickel base alloys. Age hardenable alloys.

##### **PART B**

High temperature alloys. Oxidation and heat resistant alloys. Magnet alloys, low expansion and high expansion alloys. Corrosion resistant alloys, thermocouple alloys: Super alloys.

**MetE 403 Metallic Alloys Paper II**

2 hours per week    200 marks

**PART A**

Introduction to tool materials, plain carbon tool steels, low alloy tool steels, the high-strength low-alloy (HSLA) steels. The individual effects of alloying elements in steels, e.g. silicon, chromium, nickel, tungsten, manganese, vanadium etc.

**PART B**

High alloy steels: manganese, tool and die steels, high tungsten and high chromium tool and die steels, austenitic manganese steels, high speed tool steels, sintered carbide tool materials.

**MetE 405 Metal Technology**

3 hours per week    300 marks

**PART A**

Mechanical properties of metallic materials. Theory of plasticity and elasticity. Relationship between elastic modulus, Poisson's ratio, stress strain diagram, complex stresses etc. Technological theories applicable to various metal working processes. Fracture of metals and alloys. Creep and fatigue: mechanisms, effects of variables.

**PART B**

Metallurgical effects of mechanical working on metals. Cold and hot working operations. Recrystallization and grain growth. Details of rolling, forging, extrusion etc. their advantages, disadvantages and uses. Metallurgy of welding, brazing and soldering.

Powder Metallurgy: Production of metallic powders and making of different types of tool and their special uses and properties.

**MetE 407 Physical Metallurgy**

3 hours per week    300 marks

**PART A**

Heat-treatment: Annealing, normalising, hardening, tempering, recovery and recrystallisation. Hydrogen in steels and heat-treatment for its removal. T-T-T and C-C-T diagrams and their applications, austempering, martempering, ausforming, etc. Hardenability and ruling section, Jominy test, variables that determine the hardenability in steels. The effect of composition and rate of

cooling on the structure of cast irons, the microstructure of cast-irons. Heat-treatment of common non-ferrous metals and alloys.

Ternary alloys : Composition triangle and space models. isothermal sections of solid solutions, eutectic and other types of ternary diagram, pseudo-binary and their vertical sections. Some industrially important ternary systems. Limitation of phase rule approach.

Precipitation hardening Nucleation of precipitates. Theories of hardening Additional factors in precipitation hardening.

**PART B**

Case-hardening: Reactions of metals and alloys with gases. Carburising nitriding, cyaniding, boriding, phosphiding, metallizing, anodizing, etc. Surface hardening: Flame, induction, electrolytic bath hardening, etc. Structural constituents of steel and their effects: Formation of ferrite, pearlite, bainite and martensite: their various morphologies and their effect on properties: structure-property relationship of plain carbon steels. Introduction to grain refined steels, factors affecting strength and toughness of HSLA structural steels, theories of grain size control and precipitation strengthening, transformation characteristics, controlled rolling, design of high strength low-alloy structural steels.

Ferritic, martensitic and austenitic stainless steels, their structure-property relationships.

**MetE 408 Metallography and Heat-treatment Sessional**

4½ hours per week    150 marks

**PART A**

Study of micro-structure of heat-treated steels annealed, normalized, quenched, tempered, carburized and nitrided.

Micro-structure of hot worked, cold worked and welded steels, Study of relationship of structure with mechanical properties (like yield strength, tensile strength, hardness and impact resistance etc.).

**PART B**

Micro-study of nonferrous alloys; the lead-antimony bearing alloys, the brasses, the bronzes, copper-nickel alloys, copper-aluminium alloys. Micro-study of

special cast irons. Micro-structure of alloy tool-steels and study of their heat treated structures. Macro and micro-photographic studies of metals and alloys.

#### **MetE 410 Metallurgical Problems Sessional**

$1\frac{1}{2}$  hours per week    50 marks

Case study of castings, refractories, furnaces, heat-treatment, fabrication, failures, metal finishing and related industrial problems.

#### **MetE 431 Foundry Engineering**

2 hours per week    200 marks

##### **PART A**

Riser design : Riser curves for steel. Naval Research Laboratory method of riser calculation, feeding distance; other effects of complex sections and designs, effects of chills, application of riser principles to complex casting, risers for gray cast iron, brass, aluminium and magnesium. Gating design: Law of continuity, Bernoulli's vertical gating aspiration effects, prevention of aspiration, bottom gating systems. function of horizontal gating system; plate-like castings, complex chunky castings, stack mold.

##### **PART B**

Metal fluidity: Measurement of fluidity, the sand mold, fluidity spiral, typical fluidity curve, effect of metal chemistry, application of fluidity data to casting problems. Stress-strain relationships in castings during coolings and heat treatment, sand casting design. Mechanism and rate of solidification of metals and alloys, the solidification of actual castings, the effects of mold material and alloy composition upon freezing pattern. Casting defects. Important design features to eliminate defects, Physical and metallurgical properties of cast metals. Cleaning: finishing and inspection of the cast product. Design for economic molding.

#### **MetE 433 Corrosion for Metallurgical Engineers**

2 hours per week    200 marks

##### **PART A**

Review of corrosion mechanisms. Oxide classes, electrical conductivity of oxides, variation from stoichiometric composition. Effect of metallurgical variables upon the corrosion of metals and alloys. Passivity. Pourbaix diagram.

Isothermal oxidation. Factors determining the mode of steady-state corrosion behaviour of heat-resistant alloys, transient oxidation characteristics. Cyclic oxidation and its characteristics, effect of thermal cycling upon the corrosion kinetics. Phenomena of break-away oxidation and healing, factors affecting the re-formation of healing layers, Mechanism of loss of protective scales from corrosion-resistant alloy surfaces, causes of spallation of the external protective scales from alloy surfaces.

##### **PART B**

Corrosion attack and failures : localized corrosion, stress corrosion cracking, corrosion fatigue, liquid metal embrittlement and other forms.

Internal oxidation: mechanism of internal oxidation, factors affecting internal oxidation, growth and formation of internal protective scales. Effect of temperature fluctuation, frequency and duration of cycles, alloy content, alloy depletion, environment, etc, upon the corrosion behaviour of metals and alloys. The effect of thermal and mechanical stresses: effect of cold-working and surface finish upon the corrosion kinetics of metals and alloys. Effect of reactive alloy-additions upon the corrosion-mechanism, bulk alloy additions, mechanical incorporation of dispersed oxide particles, pre-oxidation. Effect of pre-oxidized dispersed oxide particles. Inwardly growing and outwardly -growing protective layers. Effect of reversing the corrosion mechanism upon the growth rate and stability of the protective layer. Effect of dispersed oxide particles upon the mode of oxidation and scale adhesion.

#### **Met E 435 Welding Technology**

2 hours per week    200 marks

##### **PART A**

Welding science, chemistry applied to welding, fluxes used in welding, types of electrodes used.

Gas and Arc Welding processes: Additional welding processes like thermit welding, electron beam welding, and laser welding. Metallurgical effects in the weld metal: Gas-metal reactions, hydrogen embrittlement, dilution and uniformity of weld joints, weld pool solidification, weld cracking. Microstructural effects in the parent metal: HAZ and solidified weld metal, precipitation and embrittlement, contraction and residual stresses. Welding problems with cast irons, aluminium, aluminium alloys and special steels, like microalloyed steels, austenitic and high alloy steels.



## PART B

Solid phase welding: Cohesion and strength of metals, surface deformation, surface films, recrystallisation and diffusion. Solid phase welding processes like diffusion bonding, cold pressure welding, friction welding etc.

Inspection and testing of welds: Inspection during and after welding, non-destructive and metallographic tests. The behaviour of welds in service: Crack propagation, corrosion of welds, remedial measures.

### Met E 437 Powder Metallurgy

2 hours per week      200 marks

#### PART A

Scope of powder metallurgy, Production of metal powder: Deposition from gas, electrolytic deposition, reduction of oxides and atomisation. Mechanical methods of comminution: Pulverising, stamping etc. Characterisation of metal powders.

Testing and examination of metal powder: Particle size, loading weight, flow factor, working density etc. Types of binder and their characteristics.

The processes : Mixing, compacting, pre-sintering and sintering of metal powders. Effects of size and shape of metal powders, applied pressure, temperature etc. on sintering.

#### PART B

Manufacture of hard metal alloys by sintering : Cold and hot pressing. Finishing operations: Machining, sizing, protective coatings etc. Heat treatment of the sintered product: Annealing, quenching, age-hardening and case-hardening by carburizing, cyaniding, nitriding. Prospects for future development.

### Met E 439 Metal Finishing

2 hours per week      200 marks

#### PART A

Purpose and classification of surface treatments. Hot-dipped coatings: surface preparation. Metallurgy of galvanising, tinning,terneplate, aluminising etc.

Electroplated coatings: surface preparation. Plating of some common metals and alloys like copper, zinc,nickel, chromium, brass etc. Electroless plated coatings.

## PART B

Impregnated Coatings: metallurgy of chromising, siliconising, calorising, Sherardizing etc. Sprayed, faced and clad coatings.

Metallurgical effects of surface preparation by shot blasting and shot peening. Non-metallic coatings. Testing and quality control.

### Met E 441 Non-Ferrous Production Metallurgy

2 hours per week      200 marks

#### PART A

Details of the extraction of antimony, nickel and magnesium : their ores and individual dressings, treatment of the concentrates, extraction of the crude metals, their pyrometallurgical and eletro- refining. The extraction of gold: sources of gold, extraction of gold from its ores, the amalgamation, the chlorination and the cynide processes, melting and refining of gold bullion.

#### PART B

Extraction of cadmium, bismuth, arsenic, cobalt, mercury, chromium, vanadium, tungsten, molybdenum and titanium.

Silver ores of silver, different processes for the extraction and refining of silver.

Recovery of metals of the platinum group from anode slimes of copper cells, lead baths, nickkel cells, and from gold and silver slimes.

### Met E 443 Refractory materials and Ceramics

2 hours per week      200 marks

#### PART A

Application and classification of refractory materials. Raw materials for refractories, mining and preliminary treatment of refractory raw materials. The moulding methods, drying and firing of clay and other refractory materials. Refractory mortars, concretes and coatings. Insulating materials. Kilns for burning refractories. Manufacture of chamotte bricks, high alumina products, dinas, magnesite, chromite and refractories containing zirconium etc. Refractories in the iron and steel, non-ferrous and other industries.

#### PART B

Mechanism of refractory failures. Factors influencing the load bearing capacity and spalling resistance of refractories. Heat transmission by refractories. Testing and quality control. Ceramics, raw materials, preparation of ceramic mixture, moulding, drying and firing the ware, glazing of the ware; ceramic

stains, polishing and decoration. Properties of ceramics. Porcelains, their types and uses in electrical engineering. Raw materials for production of electric insulators and other semi-porcelains for sanitary purpose. Glazing materials, their composition and properties.

#### POSTGRADUATE COURSES

##### **Met E 6003 Electron Microscopy** 3 credits

Transmission Electron Microscopy; Image formation and selected area diffraction, Orientation relationship, Trace analysis and other diffraction phenomena; Interpretation of micrographs.

Scanning Electron Microscopy: Principles of operation, the performance of the SEM, contrast mechanism. Electron probe micro-Analysis; X-Ray Spectrometry; Electron-specimen interaction; Micro-Analysis of thin specimen.

##### **Met E 6004 X-Ray Metallography** 3 credits

Production and detection of X-ray; X-ray fluorescence spectroscopy; Interaction of X-rays with crystals; Single crystal diffraction pattern; Powder diffractometry; Measurement of preferred orientations, stresses, particle sizes, lattice parameters etc.

##### **Met E 6005 Experimental Techniques in Metallurgy** 3 credits

Generation and maintenance of high temperatures. Controlled atmospheres. Pressure and rates of gas flow. Vacuum techniques. Analysis and properties of liquid metals and slags. Analysis of reduction and dissociation of oxides. Metallographic analysis of non-metallic inclusions in metals. Quantitative metallography. Thermogravimetric analysis and differential thermal analysis.

##### **Met E 6101 Advanced Metal physics** 3 credits

Statistical mechanics: Fundamentals for quantum mechanics Thermodynamics of solids: Free energy and phase equilibria; Order-disorder phenomena; Nucleation and growth theory, recovery, recrystallisation. Crystal imperfections. Atomic mechanism involved in deformation of metals, alloys, and non-metallic solids. Detailed relationship between structure and properties of metals. Free electron theory: Band theory of solids, thermal and electrical conductivity of solids. Surface emission, cohesion and other characteristics of metals. Theory of magnetism and magnetic properties of metals and alloys.

##### **Met E 6102 Machine Tool Materials and Heat-treatment** 3 credits

The composition, structure, heat treatment and selection of tool steels. An analytical study of the machine tools, cutting tool and work piece system and the metal cutting parameters which influence the system performance. Engineering considerations involved in the design of special tools for economical mass production. Study of tool steels namely water hardening tool steel, shock resistant tool steel, heat resistant tool steel, high speed tool steel etc. Powder metallurgy and synthetic tool steels.

##### **Met E 6103 Advanced Physical Metallurgy** 3 credits

Vacancies in metals and alloys. Static and dynamic aspects of recovery and recrystallisation. Classification of phase transformations. Classical nucleation theories, solidification, solid-state nucleation, phenomenon of precipitate growth. Martensitic transformation. Strengthening mechanisms in solids. Some aspects of dislocations, interaction between dislocations, vacancies and voids. Some general aspects of diffusional creep; the nucleation of cavities and crack formation.

##### **Met E 6104 Theory of Dislocation** 3 credits

A review of crystallinity and its defects. Prismatic and imperfect dislocations. Elastic properties of dislocation. Forces on dislocation. Multiplication of dislocations, pile up etc. Velocity of dislocations. Dislocation reactions and locking. Dislocation particle interaction and strengthening of crystals.

##### **Met E 6105 Crystallography** 3 credits

Crystal structures; Co-ordinates of positions in unit cells; Transformations of indices; Matrices in crystallography; Zones and zone axes; Symmetry classes and point groups; Glide planes and screw axes; Reciprocal lattices; Vector operations with crystal structures; Stereographic projection, properties of stereographic projections; Ewaldsphere; defects in crystals.

##### **Met E 6106 Diffusion in Solids** 3 credits

Diffusion equations and their solutions under different conditions; Atomic theory of diffusion; Diffusion in dilute solutions; Diffusion in a concentration gradient; Diffusion in non-metals and electrolysis of solids.

**Met E 6107 Failure Mechanism and Analysis** **3 credits**

Theoretical strength of solids. Mechanism and behaviour of brittle and ductile fracture. Methods of investigation of failures. Precautionary measures against failures.

**Met E 6108- Physical Metallurgy of Steels** **3 credits**

Kinetics, growth morphologies and crystallographic orientation relationships of the formation of ferrite, pearlite and bainite; Strengthening mechanisms in steels; High-strength low-alloy structural steels, their structure and property relationship; Development of fracture-tough steel; Bainitic steels and their strengthening mechanisms; Ultra-high strength and Maraging steels, their thermo-mechanical treatments and structure-property relationships; Development of stainless steels, their formability, heat treatment and structure-property relationships; Heat treatment of large steel forgings; Carburisation of alloy steels and their heat treatment.

**Met E 6201 Advanced Metal Technology** **3 credits**

Analysis of the general state of stress and strain in solids. Elements of theory of elasticity and plasticity and their application in the field of metal forming. Residual stresses. Mechanisms of fatigue and creep. Yielding at fracture. Applications of the powder metallurgy process. The metallurgical aspects of forging and calculation of energy consumption. Relation between structure and hot workability of alloys.

**Met E 6202 Surface Treatments** **3 credits**

Surface finishing: Electro and electroless depositions; Diffusion, non-metallic, oxide and conversion coatings. Testing and economic assesment of protective systems. Surface Hardening: Mechanisms of hardening; Advances in thermochemical treatments; Economic assesment.

**Met E 6203 Advaced Foundry Engineering** **3 credits**

Review of moulding materials for ferrous and non-ferrous metals and alloys. Developments in gating systems and variables influencing fluidity. The design and efficiency of feeder head. Economic, technical and metallurgical characteristics of casting design. Crystallisation and development of cast-structure. Application of vibro-treatment and magnetohydrodynamics(MHD) in

solidification. Modification and grain refinement of freezing alloys by inoculants etc. Preventive measures and rectification of casting defects and quality control.

**Met E 6204 Metallurgy of Welding** **3 credits**

Review of welding technology: The theory of metal joining techniques. Mass and heat flow in welding. Weldment structures, Metallurgical effects in the weld metal. Heat-affected zones. Microstructural changes. Precipitation and embrittlement. Contraction and residual stress. Analysis and development of welding processes. Welding problems with common metals and alloys.

**Met E 6205 Furnace Technology** **3 credits**

Design of modern iron and steel making furnaces; Industrial furnaces for heat treatment; Control of furnace atmosphere; Furnace efficiency, power requirements and heat balance; Furnace management and overall safety precautions etc.

**Met E 6206 Fuel Technology** **3 credits**

Introduction to combustion theories. Combustion reaction, dissociation, vaporization and ignition; Determination of combustion efficiency, Heating values and their variables; Physical and chemical properties of fuels; Application of thermodynamic principles and chemistry of combustion reactions, study at an advanced level of important reactions of aliphatic and aromatic compounds. Stereoism and the relation of structure of chemical reactions. Combustion applications to heating equipments. Internal combustion engines and propulsion systems. Fluid dynamics of reacting systems. Ignition, propagation and stability of flames. Detonation; Self-ignition properties of fuels. Fundamental relationships, combustion, ignition and flame fronts.

**Met E 6207 Metal Technology**  
**For Physics Dept.** **2 credits**

Structure and properties of metals and alloys, forming of metals. Casting of metals, Metal working, metal joining, and powder metallurgy; Heat treatment of metals; Surface treatments of metals.

**Met E 6301 Advanced Extractive Metallurgy****3 credits**

A detailed study of current practice in the preparation of metals using pyrometallurgical and hydrometallurgical processes. Thermo chemical properties in metallurgical systems and analysis of metallurgical processes. Interface reaction in metallurgical systems. Heterogeneous reaction in solid, liquid and gaseous solutions.

**Met E.6302 Metallurgical Thermodynamics****3 credits**

Thermodynamics necessary to understand a large portion of metallurgical phenomena. An atomistic and macroscopic thermodynamic approach to the various properties of solids. Statistical thermodynamics with applications to metallurgical systems. The principles and laws of thermochemistry and thermodynamics. Thermodynamic functions, phase equilibria, heat effects and equilibrium reactions. Solutions and electrolytic cells.

**Met E 6303 Theory of Metallurgical processes****3 credits**

Review of thermodynamic principles. Survey of the development of the theory of metallurgy. Classification of metallurgical processes. Major reactions in the production of elemental metals. Theory of the refining of metals through liquation, fractional recrystallisation and distillation.

**Met E 6304 Advanced Ferrous Production Metallurgy****3 credits**

Review of blast furnace practice. Changes of coke reactivity. Blast furnace zones with respect to materials constitution. Thermodynamics of pig iron production, open-hearth, electric and other steel making processes, automatic furnace operation, economics.

**Met E 6401 Industrial Alloys****3 credits**

Hardenability, tempering and properties of alloyed steels; Physical and extractive metallurgy of light metals and their alloys; Thermodynamics of alloys based on iron; Study of high permeability magnetic alloys of nickel and cobalt; Solid solutions and age hardening alloys; Electronic structure and characteristic properties of solid solutions and other alloy phases; Industrial alloys based on copper, zinc, nickel, cadmium etc. and their physical and mechanical properties.

**Met.E 6402 Composite Materials****3 credits**

Theory of composite materials; Constituent type; Fibre particulate; Laminar and Flake composites; Production Techniques of composites; Property factors; Stress analysis; Dynamic behaviour; Thermal and environmental problems; Experimental modeling of composites; Applications of composite materials.

**Met E 6403 Refractory Materials****3 credits**

Raw materials and properties; Reaction between refractories and slags; Behaviour of refractories specially at elevated temperature; Mechanism of dissolution of crystals and glass in melts; Diffusion process and sintering in solid; Ceramic materials and their structure and properties; Fabrication and application to high temperature and special services; Diffusion and gas permeability of ceramics; Reaction sintering and pyrolytic deposition; Fabrication study of pure nitride; oxide, carbide and clay based ceramics; Constitution and drying behaviour of clay and refractory materials; Interaction between gases and clean metal surfaces; Vapour deposition of ceramic film; Imperfections and texture in ceramics and glasses. Effect of temperature and time.

**Met E 6404 High Temperature Oxidation of Metals and alloys****3 credits**

Oxidation mechanisms; Heating and subscale formation; Compositional changes and effect of variables; Stresses in growing oxide scales; Stress generation and thermal cycling; Stress calculations; Effect of process variables upon the direction and intensity of scale-forming reactions; Surface preparation and scale adhesion; Development of the convoluted oxide morphology; Effect of reactive metal additions; Factors affecting scale adhesion; High temperature scale formation in rolling and forging mills; Characteristics of scales formed in high-speed steels, stainless steels and austenitic manganese steels; Stabilization of protective scales; Comparative characteristics of pre-oxidized and pre-nitrided particles in protective scales.

**Met E. 6405 Nuclear Materials****3 credits**

Metallurgy of special reactor materials: Uranium, thorium, zirconium, beryllium; Solid nuclear fuels; Reactor structural materials: Moderators and Shielding materials and their fabrication; Control of materials; Effects of radiation on structural materials; Corrosion problems in reactor technology.

## Department of Physics

### UNDERGRADUATE COURSES

Phy 101 Physics

3 hours per week 200 marks

For First year CE, EEE, ME and NAME

#### PART A

##### Heat and Thermodynamics

Kinetic theory of gases : deduction of gas laws, principle of equipartition of energy. Equation of State : Andrew's experiment, Vander Waals equation, Critical constants. Transmission of Heat : Conduction, Convection and Radiation.

Laws of Thermodynamic : First law of thermodynamics, Internal energy, specific heats of gases, work done by expanding gas, elasticities of a perfect gas; Second law of thermodynamics, Carnot's cycle, efficiency of heat engines, Absolute scale of temperature. Entropy and its physical concept, Maxwell's thermodynamic relations, statistical mechanics.

##### Optics

Combination of Lenses : Equivalent lens and equivalent focal length, Defects of images formed by lenses : Spherical aberration, astigmatism, Coma, distortion, curvature of the image, chromatic aberration. Theories of Light : Huygen's principle and construction. Interference of light : Young's double slit experiment, biprism, Newton's rings, interferometers, interference by multiple reflection. Diffraction of light : Fresnel and Fraunhofer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings. Polarization : Production and analysis of polarized light, optical activity. Optics of Crystals.

##### Waves and Oscillations

Oscillations : Simple harmonic motion, Combination of S. H. M. and Lissajous figures, Damped Oscillations, Forced Oscillations, Resonance, Vibrations of membranes and columns.

Waves : Travelling waves, the principle of superposition, Wave velocity, group velocity and phase velocity, power and intensity in wave motion, interference of waves, diffraction of waves, Reflection and transmission of waves at a boundary, standing waves.



Sound Waves : Audible, Ultrasonic infrasonic and Supersonic waves; Propagation and speed of longitudinal waves, travelling longitudinal waves, Standing longitudinal waves, Vibrating systems and sources of sound, beats The Doppler effect.

Architectural Acoustics : Reverberation, Noise insulation and reduction, Sound absorption, Sound distribution, Room acoustics, Recording.

#### PART B

##### Properties of Matter

Atomic Structure of Matter : Atoms, ions and molecules, States of matter; Solids, Liquids and gases, Interparticle Forces. Elasticity : Stress Strain, Elastic constants. Viscosity: Critical velocity and Reynold's number, Poiseuille equation Stoke's law. Hydrodynamics : Equation of continuity, Bernoulli's equation and its Applications. Surface Tension : Surface effects, free surface energy, Molecular Theory of surface tension, excess-pressure theorem, contact angle, capillarity. Crystallography : Types of bonds, Types of Crystals, X-ray diffraction and Bragg's law, Plasticity and crystal defects, metals Insulators and semiconductor, elementary band theory, Superconductors and plasma.

##### Modern Physics

Relativity: Michelson Morley experiment, Lorentz-Einstein transformation, Mass energy relation. Quantum effect : Photo electric effect, Compton effect. Wave Mechanics : de-Broglie wave, Correspondence principle, Uncertainty principle, Schrodinger's wave equation. Atom model : Bohr's theory of one electron atoms, vector atom model. Radio-activity : Radio active decay, Half life, mean life, laws of successive disintegration, radioactive equilibrium. The Nucleus Properties of a Nuclear-binding energy, Nuclear reactions-nuclear reactors.

##### Electricity and magnetism

Electrostatics : Charge and matter, Coulomb's law, the electric field, Gauss's law, electric potential, capacitors and dielectrics.

Current Electricity : Current and resistance, Ohmic and non-ohmic material, variation of resistance with temperature-Resistance thermometer; Thermoelectricity-thermoelectric thermometer.

Electromagnetism : Magnetic fields, Ampere's law, Faraday's law, Lenz's law, Inductance-Self and mutual inductance.

Magnetic Properties of matter : Magnetomotive force, magnetic field intensity, Permeability and susceptibility, classification of magnetic material, magnetization curves of Ferromagnetic materials, magnetic circuits, magnetostriction.

#### Phy 102 Physics Sessional

3 hours every alternate week 50 marks

Experiments based on Phy 101

#### Phy 103 Physics

3 hours per week 200 marks

For First year ChE and MetE

#### PART A

##### Heat and Thermodynamics

Kinetic Theory of Gases : Deduction of gas laws, Principle of equipartition of energy, Conductivity, Viscosity, Diffusivity. Equation of State : Andrew's experiment, VanderWaals equation, Critical constants. Transmission of Heat : Conduction, Convection and radiation.

Laws of Thermodynamics : First law of thermodynamics, Internal energy, specific heats of gases work done by expanding gas. Elasticities of a perfect gas; Second law of thermodynamics, Carnot's Cycle, Efficiency of heat engines, absolute scale of temperature, Entropy and its physical concept. Maxwell's thermodynamic-relations, Surface tension and surface energy, Statistical mechanics.

##### Optics

Combination of Lenses : Equivalent lens and equivalent focal length. Defects of images formed by lenses : Spherical aberration, Astigmatism, Coma, Distortion, Curvature of the Image, Chromatic aberration. Optical Instruments : Compound Microscope, Polarizing Microscope, resolving power of Microscopes, Camera and photographic techniques. Theories of Light : Huygen's principle and construction. Interference of Light : Young's double slit experiment. Biprism. Newton's rings. Interferometers: Interference by multiple reflection. Diffraction of Light : Fresnel and Fraunhofer diffraction, Diffraction by single slit, Diffraction by double slit, Diffraction gratings. Polarisation : Production and analysis of polarized light, Optical activity, Optics of crystals.

##### Waves and Oscillations

Oscillations : Simple harmonic motion. Combination of S. H. M. and Lissajous figures, Damped oscillations, Forced oscillations. Resonance, Vibrations of membranes and columns.

Waves : Travelling waves. The principle of Superposition, Wave velocity, Group velocity and phase velocity, Power and intensity in wave motion, Interference of waves, Diffraction of waves Reflection and transmission of Waves at a boundary, Standing waves.

Sound Waves : Audible, Ultrasonic, Infrasonic and Supersonic waves; propagation and speed of Longitudinal waves, Travelling Longitudinal waves, Standing Longitudinal waves. Vibrating systems and source of sound, Beats, The Doppler effect, Architectural Acoustics.

#### PART B

##### Structure of Matter and Modern Physics

Atomic Structure : Determination of  $e/m$  of the electron, Determination of charge of the electron-Millikan's oil-drop method. Atoms, ions and molecules, States of matter; Solids. Liquids and gases, Interparticle forces. Mass Spectroscopy : Isotropic constitution of elements, Spectroscopic analysis of Isotopes, Mass Spectrographs. Quantum Effects : Photo-electric effect, Compton effect. Wave Mechanics : de-Broglie wave, Correspondence principle, Uncertainty principle, Schrodinger's wave equation. Atom Models : Bohr's theory of one electron atom, vector atom model. Relativity : Relative velocity, Galilean-Newtonian transformation, Special theory of relativity, Lorentz-Einstein transformation. Radio-activity : Radio-active decay, Half-life, Mean life, Laws of successive disintegration, Radioactive equilibrium The Nucleus : Properties of a Nucleus-Binding energy, Nuclear reactions; Nuclear reactors. Crystallography : Types of bonds, Types of crystals, X-ray diffraction and Bragg's law, Plasticity and crystal defects, Metals, Insulators and semi-conductors, Elementary band theory, Superconductors and plasma.

##### Electricity and magnetism

Electrostatics : Charge and matter. Coulomb's law. The electric field. Gauss' law. Electric potential, Capacitors and dielectrics.

Current Electricity : Current and resistance. Ohmic and non-ohmic materials. Variation of resistance with temperature, Resistance thermometer; Thermoelectricity Thermoelectric thermometer.

Electromagnetism : Magnetic fields. Lorentz force. Cyclotron, Ampere's law, Faraday's law, Lenz's law Inductance-Self and mutual inductance, electric circuits.

Magnetic Properties of Matter : Magnetomotive force, Magnetic field intensity, Permeability and susceptibility, Classification of magnetic materials, Magnetization curves of Ferromagnetic materials, Magnetic Circuits, Magnetostriction.

#### Phy 123 Physics

2 hours per week 150 marks

For First year Arch

#### PART A

##### Heat

Conductivity : Introduction, Definition of thermal conductivity, thermal diffusivity, Ingen Hausz's method for comparing the conductivities of different metals, determination of thermal conductivity of metals by Searle's method, determination of thermal conductivity of bad conductors by Lees Method, Underground temperature-age of the earth.

Convection : Definition. Newton's law of cooling. Domestic and Industrial application-Ventilation, domestic hot water supply and central heating.

Radiation : Introduction, blackbody. Instruments for detecting and measuring thermal radiation-Leslie's differential air thermometer, thermopile, Emission and absorption of radiation, Prevost theory of exchange.

Humidity : Definition, Absolute humidity. Dew point, the control of humidity.

##### Sound

Wave motion : Periodic motion, vibratory motion, Simple harmonic motion, meaning of (a) amplitude (b) Period (c) Frequency (d) Phase (e) Phase difference and Epoch, Equation of simple harmonic motion, velocity, acceleration. Kinetic and potential energies of a particle executing simple harmonic motion.

Sound Waves : Progressive and Stationary Waves, interference and beats. Doppler's principle, reflection, refraction, absorption and diffraction of sound. Sound insulation in building. Decibel and other units. Musical scale.

Architectural acoustics : Analytical treatment of reverberation-Growth of intensity and decay of intensity.

#### PART B

##### Light

Nature of Light : Theories regarding the nature of light, corpuscular theory and wave theory, Huygen's principle.

Interference of Light : Meaning of the term and the condition of interference, Width of fringes produced by two co-herent sources, formation of interference fringes by Fresnel Biprism and determination of the wavelength of monochromatic light, explanation of the formation of Newton's ring and their application.

Diffraction : Meaning and its difference with interference, Fraunhofer and Fresnel diffraction.

Polarization of light : Meaning of polarization, Double refraction and Nicol's prism, specific rotation, the polarimeter, illumination and Photometry : Luminous intensity, illumination and practical illumination, their units and measurement, phosphorescence, erent sources, principles of lighting, illumination of home, street, factory etc. architectural Lighting systems, flood lighting.

### **Electricity**

Current and Resistance : Electric current and e.m.f. Ohm's law, Kirchhoff's law, analysis of simple circuits. Magnetic field and Ampere's law : Ampere's law for magnetic field of a current, force on a current element due to magnetic field, magnetic fields of simple circuits. Faraday's law and Inductance : Faraday's law of electromagnetic induction, self and mutual inductance. Alternating current : Alternating current circuits, electronic instruments.

### **Modern Physics**

Atomic Structure : Bohr's model of hydrogen atom, atomic spectra. Radio-activity : Radioactivity, law of exponential decay, half life, mean life, Law of successive disintegration. Relativity : Theory of special relativity, postulates, variation of mass with velocity, mass-energy relation. The Nucleus : Binding energy, Fission and Fusion processes, Atomic Reactor. Gravity : Laws of gravity, escape velocity.

### **Department of Physics**

#### **POST- GRADUATE COURSES**

##### **Phy 6001 Quantum Mechanics**

**2 credit hours**

General formation of wave mechanics, Eigen value problems, Perturbation theory for non-degenerate case and degenerate case, Scattering theory, Angular momentum, Relativistic wave equations, Representations, Transformations and symmetries.

##### **Phy 6002 Low Temperature Physics & Vacuum Techniques**

**2 Credit hours**

Production of low temperature, Low temperature measurement, Cryostat design, Heat transfer, Temperature control, Adiabatic demagnetization, Vacuum techniques, Low temperature hazards, Superconductivity.

##### **Phy 6003 Radiation Bio-Physics**

**4 credit hours**

The nucleus, Ionizing radiations, Radioactivity, Background radiation, Natural and artificial radioactivity, Cosmic rays- fallout, alpha, beta, gamma radiation, Neutron emitters, Units of radioactivity and radiation doses, Earlier units, S. I. units. Maximum permissible levels of radioactivity and radiation doses, Interaction of radiation with matter, Radiation detection, Radiation dosimetry, Radiation effects in homogeneous independent systems, Chemical effects of radiation, Biological effects of radiation (radiation effects in living beings particularly man), Radiation health protection.

##### **Phy 6004 Medical Physics**

**4 Credit hours**

Introduction, Interaction of particulate radiation, X-rays and gamma radiations with living beings, Radiation fields within a patient-X-rays, Teletherapy and high energy X-rays, Radiation intensity, Exposure dose, Therapy with moving sources of radiation, X-ray apparatus, Construction and maintenance, Implant radiation therapy, Measurement of internal radio activity with an external detector, Radiology and radiographic techniques, Photographic action of radiation, Characteristic curves of photographic materials, Density, Contrast, Speed and Sharpness, Roentgenography, Radiologic diagnosis, Seintography, Image modification, Image intensification, Quality of radiologic image, Contrast media, Grid, Streography, Kymography, Tomography, Medical application of radiolysis in diagnosis and therapy, Whole body counter, gamma camera, External and internal sources of radiation, International radiation protection recommendations.

##### **Phy 6005 Solid State Physics ( General)**

**4 credit hour**

Basic-many-body theory, Lattice dynamics and electron-phonon interaction, Thermal behaviour of solids, Basic electron -transport theory, Semiconductors, Materials and devices, Thin films, Space groups, Basic properties of superfluids, properties of amorphous solids.

**Phy 6006 X-ray****4 credit hours**

Geometrical theory of diffraction by space lattice, Intensity of reflection of X-rays by crystals, Classification of diffraction methods, Analysis of amorphous solids, Crystal texture.

**Phy 6007 Optical Crystallography****4 credit hours**

The optical properties of crystals, The polarizing-microscopy, The microscopic examination of crystals, Preparation, mounting and manipulation of the material, Theories of bonding.

**Phy 6008 Magnetism-1 (General)****4 credit hours**

The Characteristic properties of magnetically ordered solids, Theoretical models of ordered magnetic solids, Energies of interaction, Interpretation of exchange effects, Exchange interaction in solids, Wave function and energies of N-electron systems, Spin wave excitation, Magnetic resonance, NMR, EPR, AFR.

**Phy 6009 Magnetism (Special)****4 credit hours**

The concept of magnetic domains, Magnetic anisotropy, Mechanism of magnetostriction, Mechanism of technical magnetisation, Law of approach of saturation, Magnetic annealing, Galvanomagnetic effect, Magneto thermal effect, Magneto mechanical effect, Techniques of investigating internal magnetic structure, Engineering application of magnetic materials.

**Phy 6010 Physics of Deformed Solids****4 credit hours**

Stress and strain in metals, Elasticity and plasticity, Creep and fatigue, Imperfection in metals, Theory of dislocation, Dislocation in the field of metal forming.

**Met. E. 6301 Met 7- Metal Technology****2 credit hours**

Structure and properties of metals and alloys, Forming of metals, Casting, Metal working, Metal joining, Power metallurgy, Heat treatment of metal surface, Treatments of metals.

**Phy 6011 Thermodynamics of Solids****2 credit hours**

Properties at  $0^{\circ}\text{K}$ , Gruneisen relation, Heat capacities of crystals, Thermodynamics of phase transformation and chemical reactions,

Thermodynamic properties of alloy systems, Equilibrium between phases of variable composition, Free energy of binary systems, Thermodynamics of surface and interfaces, Thermodynamics of defects in solids.

**Phy 6012 Nuclear Physics****4 credit hours**

Atomic structures; Emission of characteristic and continuous X-rays, The nucleus; Radioactive decay, Fundamental particles and their properties, Properties of nuclear radiation, Interaction of radiation with matter, Nuclear models, Nuclear reactions, Artificial radioactivity, Activation analysis, Radiation detection, Accelerators, Fission and fusion.

**Phy 6013 Nuclear Reaction-I****3 credit hours**

Compound nucleus; Compound nucleus and statistical theory, Breit-Wigner dispersion formula, Level density, Angular distribution, Energy spectra, Optical model, Kapur-Peierls dispersion formula-giant-resonance, Lane, Thomas and Wigner model, Isobaric spin, Isobaric analogue states and analogue resonance.

**Phy 6014 Nuclear Reaction-II****3 credit hours**

Direct reaction, Inelastic scattering, Stripping and pick-up reaction, Butler theory, Blair's inelastic diffraction model, The DWBA theory, Strong absorption model, Analysis of experimental results, Assignments of J values of nuclear levels.

**Phy 6015 Nuclear Model-I****3 credit hours**

Shell model : Introduction ; Infinite square well-potential, Harmonic oscillator potential, Radial density distribution, Magic numbers and spin orbit potential, Single particle model, Independent particle model, L-S and j-j coupling, Transformation between L-S and j-j coupling, Co-efficient of fractional parentage.

**Phy 6016 Nuclear Model II****3 credit hours**

Collective model: Collective oscillation and the liquid drop model, Models of even-even nuclei (with and without axial symmetry) — Odd A and odd-odd nuclei-energy spectrum and wave function, Collective vibrational excitation, Coupling between modes of excitation, Core excitation, Optical model: Introduction, development, form factor, shape of the potential well.



**Phy 6017 Basic Atmospheric Physics 3 credit hours**

Structure and composition of the atmosphere. Atmospheric parameters, Physical

properties of atmospheric gases, Solar and terrestrial radiation. Radiative transfer, Heat balance of the terrestrial atmosphere, Thermodynamics of the atmosphere, T- diagram. Elements of cloud physics, Cloud formation and precipitation, Atmospheric ozone, Atmospheric instruments, Meteorological analysis, Synoptic chart, Air masses, Fronts etc., Analysis of 500, 300 and 200 mb charts, Combined analysis using conventional data and satellite imageries.

**Phy 6018 Dynamical and Tropical Meteorology 3 credit hours**

Geophysical fluid dynamics, Navier, Stoke's equation, Rotating and stratified flow. Scale analysis, Hydrostatic approximation, Geopotential, Coriolis force, Geostrophic, Cyclostrophic, Gradient and thermal wind, Vorticity and circulation theorems, Proudman-Taylor theorem, Boussinesq approximation, Atmospheric turbulence, Atmospheric waves, Barotropic and baroclinic instabilities, General circulation of the Atmosphere, Numerical weather Forecasting, Quasi geostrophic approximation, Barotropic vorticity equation, Primitive equation, Multilayered, Tropical cyclones, Norwesters and tornadoes. Monsoons, Dynamical climatology Physics of upper atmosphere, Geomagnetism, Neutral atmosphere, Ionosphere and magnetosphere.

**Phy 6019 Monsoon Meteorology and Modeling 4 credit hours**

Survey of tropical disturbance, Monsoon climatology, Zonally averaged tropical circulation, Meridional and zonal asymmetries, Radiative process in the tropics, Tropical cloud physics. Tropical boundary layer, Parameterization of tropical cloud, Kue and Arakawa- Schubert parameterization schemes, Tropical cyclone theories, Monsoon modelling, Monsoon depressions and Monsoon rainfall.

**Phy 6020 Reactor Physics 4 credit hours**

Interactions of neutrons with matter, Cross-sections for neutron reactions, Thermal neutron cross-sections, Nuclear fission, Energy release in fission, Neutron multiplication, Nuclear chain reaction, Steady state reactor theory. Criticality condition, Homogeneous and heterogeneous reactor, Coolant, Non-steady nuclear reactor, Types of nuclear reactors-power reactor, research reactor, fast reactor, breeder reactor, etc., Reactor shieldings, Reactor waste, Protection and reactor safeguards.

**Phy 6021 Radiation Protection 2 credit hours**

Radiation hazards, Hazard assessment, Environmental radiation monitoring, Emergency measures, Occupational hazards, Maximum permissible dose level- I. C. R. P., External radiation control, Radiation protection regulation, Transport of radioactive material.

**Phy 6022 Experimental Techniques in Solid State Physics.**

**4 credit hours**

Resonance techniques, Electron spin resonance(E.S.R.), Ferromagnetic resonance (FMR) & Nuclear magnetic resonance (N.M.R.), Magneto- elastic Properties, Measurements of electrical conductivity, D.C. & A.C. conductivity, Dielectric constants as a function of temperature & frequency, Magnet design & measurements of magnetic field, magnetization (Faraday, V.S.M. Force & SQUID method), Permeability & susceptibility, Observation of magnetic domains, Optical & electron microscopy, Thermal analysis: Differential thermal analysis (DTA) & Thermo-gravimetric analysis (TGA), Thin films: Growth, monitoring & measurements, Production, control & measurements of high & low temperature, Sample preparation & identification : Different techniques of preparation of single crystals & alloys, Magnetic & non magnetic annealing, Neutron diffraction technique for determination of crystal structures, Auto-control of experiments & data acquisition.



## **Faculty of Mechanical Engineering**

### **Department of Industrial and Production Engineering**

#### **UNDERGRADUATE COURSES**

IPE 205 Production Processes

2 Hours Per Week 150 Marks

For Second Year ME

##### **PART - A**

Classification of Production processes, a tabular representation. Introduction to tolerances and allowances, fasteners and gears. Casting: Sand casting and pattern, Core metal pouring. Classification and description of different methods of casting. Elementary principles of die, centrifugal, shell mould, plastic mould, coining process, metal mould and precision investment casting and their relative merits and demerits, casting design and casting defects.

Chipless metal forming processes: Hot and cold working processes-rolling, cold drawing forging and forming, shearing, bending (e.g. plate, angle), drawing, stretching, squeezing press.

##### **PART - B**

Chipless metal forming process: Welding-gas, arc and thermit welding; resistance welding; special welding processes (laser, shielded submerged); gas and arc cutting; metal spraying; surfacing hard facing; brazing and soldering. Metal removing processes. Chip formation and tool design> definition and geometry of a cutting tool; mechanism of chip formation and importance of such factors as tool; mechanism of chip formation and importance of such factors as tool geometry, physical properties of material friction; chip length and chip breakers.

##### **IPE 206 Production Processes Sessional**

2 Hours every alternate week 50 marks.

Experiments and solution of problems based on IPE 205

### **IPE 305 Production Processes**

2 hours per week 200 marks

For third year ME

#### **PART A**

Synthetic materials and their procession techniques, Introduction to polymer, definition of plastics; mechanical, thermal, electrical and optical properties of plastics and their testings. Compounding extrusion, injection moulding, compression moulding (SMC); blow moulding, vacuum forming; hand lay up of fiber glass and others.

Theory of metal cutting: Study and analysis of various processes such as turning, drilling boring, shaping, planning etc.

#### **PART B**

Study and analysis of various machining processes such as milling, sawing and filing etc. Manufactures of screws, threads and involute gear. Finishing operations; reaming honing, super finishing and grinding. Non-precision finishing operation; buffing, power brushing, shot and sand blasting.

Modern machining processes: Electro-chemical machining, elector-discharge machining, plasma machining and LASER electron beam and ultra-sonic machining. Plastic machining: Manufacturing of glass and ceramic products.

### **IPE 306 Production Processes Sessional**

3 hours every alternate week 50 marks

For Third Year ME

Experiments and solution of problems based on IPE 305

### **IPE 307 Metal Cutting Processes**

2 hours per week 200 marks

For third year Met E

#### **PART A**

Chip formation and tool design: Definition and geometry of a cutting tool: Mechanism of chip formation, importance of such items as tool geometry, Physical properties material friction. Chip length and chip breakers. Theoretical determination of cutting forces: metal cutting fluid, tool cost and life. Machining: Turning processes, Lathes and lathe accessories, turret and capstan, hole making shaping, planing milling, sawing and filing processes and machines.

#### **PART B**

Automatic and semiautomatics; Background of automation, tool movement and material flow control; Single and multispindle automat, Screw thread and spur gear manufacturing process and the related machines. Finishing operations: reaming, honing, superfinishing grinding and grinding machines. Non-precision finishing operation: Buffing, power brushing, shot and sand blasting. Modern machining processes such as LASER, ECM, EDM, ULTRA-sonic and plasma machining.

### **IPE 308 Metal cutting processes Sessional**

3 hours every alternate week 50 marks

For third year Met E

Laboratory work based on IPE 307

### **IPE 313 Measurement and Quality Control**

3 hours per week 300 marks

For Third year ME

#### **PART A**

Organization of inspection: Kinds of inspection, standards of length, scope and techniques for maintaining standard allowance tolerance: Type of tolerance, grades of manufacturing accuracy, Limits and fit, form errors fits, types of fits, basic hole system and basic shaft system. Assembly: Selective and interchachable assembly. Length measurement. Linear measuring instruments for absolute and comparative length, and limit gauges, Taylor's principle on limit gauges. Thread measurement thread gauges.

Frequency distribution, mean, median, mode and other measure of central tendency, standard deviation and other measures of dispersion, moments, probability distributions. Linear. Regression.

#### **PART B**

Abbey's principle; Measureing tools for angles and tapers. Instruments for checking straightness and flatness and for alignment test. Gear measurement. Measurement of surface finish; Testing of measuring instruments. Electrical & Electronic measurements, non-destructive test, pneumatic measuring instruments. Analogue, digital; Absolute and relative values of measurement. Logic switches; Binary and decadian system.

Sampling theory, estimation; Hypotheses testing; Statistical quality control: Acceptance sampling plans-single, double sequential and rectifying sampling plans; Control charts: Objectives X, R and C charts: selection of rational subgroup.

**IPE 314 Measurement and Quality Control Sessional**

3 hours every alternate week    50 marks

For Third year ME

Experiments based on IPE 313

**IPE 400 PROJECT**

9 hours per week    300 marks

For Fourth Year ME

**IPE 403 Industrial Management**

3 hours per week    300 Marks

For Fourth year ME, Met E, NAME

**PART A**

Management Functions: Organizational Fundamentals: Organization structure, Development of Organization theory, Study of various types of organizations. Cost Management: Elements of cost of products. Cost centres and allocation of overhead costs. Management accounting-marginal costing, standard costing, cost planning and control, budget and budgetary control. National budget and ADP. Financial Management-performance analysis of enterprises. Management information system-Concepts and scope of application. Personnel management - importance, scope need hierarchy, motivation, defense mechanism; productivity and satisfaction.

**PART B**

Personnel management - Leadership, Group dynamics Job evaluation and merit rating, Personnel development- Hiring and training; wage systems and incentive wage, salary administration.

Investment schedule, investment appraisal and capital financing. Criteria of investment, Location analysis of Production enterprises. Production management-Analysis of production system, socio-technical system approach of production, Economics of Product design.

Marketing management - Marketing concept, Marketing organization, industrial and consumer selling, channel decisions, advertising decisions new product strategy.

**IPE 409 Machine Tools**

3 hours per week    300 marks

For Fourth year ME

**PART A**

Characteristics of machine tools: Recent development in the design of machine tools. Mechanical, electrical, Hydraulic and Pneumatic drives in machine tools. Bearing, slideways and structures of machine tools, Control in machine tools. Tool engineering: Locators and clamps, chip control, Design of jigs and fixtures and their examples, Die Design.

**PART B**

Detailed case study of engine, turret and automatic lathes, milling machine, grinding machine, hobbing and gear shaping machines, forging machine control machine tools. NC <NC, DNC machines tools, transfer lines. Installation and acceptance test of machine tools.

**IPE 410 Machine Tools Sessional**

3 hours every alternate week    50 marks

For Fourth Year ME

Experiment based on IPE 409

**IPE 413 Production Planning and Control**

3 hours per week    300 marks

For Fourth Year ME

**PART A**

Elements of production planning and control; Types of production system; Product development and design-product analysis; Relation between original planning and supplementary planning; Forecasting coordination between sales, manufacturing and purchase department techniques of forecasting; Inventory cost elements purchase models, production model, ABC analysis, material management; and MRP II.

Plant layout-principles and common problems, evaluation of layout :

Time and motion study. :Material handling. Definition, importance and scope of materials handling Classification of materials-Unit loads and bulk loads: Analysis of material handling problems-system concept; Classification and selection of conveying equipments; Efficiency of materials handling systems; General theory of conveyors.

## PART B

Scheduling-basic concept, different techniques; Gantt charts, left shifting, index method.

Network analysis; Line of balance: Assembling line balancing; Machine capacity; Design of Production system and information system for PPC, Plant performance measurement. Introduction of computer in PPC.

Material handling; Description and design of belt, apron, flight, screw pneumatic and hydraulic conveyer: Operation and selection of Industrial truck loaders; packaging.

IPE 445 Operations Research  
2 hours per week. 200 marks  
For Fourth Year ME

## PART A

Statistics : Fundamentals and probability concepts; Hypothesis testing; Sampling theory and confidence interval. Markovian analysis; Introduction to simple Queueing models; Linear programming (simplex and transportation models); Game theory.

## PART B

Simple regression models; Introduction to probabilistic inventory models; Scheduling; Network analysis; Dynamic programming; Simulation.

## POSTGRADUATE COURSES :

**IPE 6001 Metal Fabrication** **3 credits**  
Casting and powder metallurgy. Metal forming. Unconventional metal forming process; Fusion, pressure and thermit welding; Cutting; brazing and adhesive bonding techniques. Unconventional welding techniques. Design, preparation and testing of welded constructions.

**IPE 6002 Principles of Metal Cutting** **3 Credits**  
Single and multiple edge cutting tools. Tool geometry. Mechanism of chip formation. Chip tool contact processes. Mechanics of metal cutting. Cutting force and factors which influence it. Determination of cutting force. Heat phenomenon in metal cutting. Causes of failure of cutting tools. Cutting tools without definite tool geometry. Superfinishing processes. Modern Machining processes.

**IPE 6003 Advanced Machine Tools** **2 Credits**

Review of structural and functional characteristics of machine tools. Machine tools for the production of gears. Precision Machine tools. Automatic machines and transfer lines. Design of machine tools for static and dynamic rigidity. Economics in the design and the selection of Machine tool. NC machine tools.

**IPE 6004 Production Materials** **3 Credits**

Atomic arrangement and imperfections in microstructure, Ferrous and non-ferrous metals and alloys. Influence on physical and chemical properties of metals by alloying materials, Electrical, magnetic, thermal and mechanical properties.

Composite materials, Surface and heat treatment. Non-metallic materials and their uses. Inspection of metals.

**IPE 6005 Statistical Quality Control** **3 Credits**

Economics of quality control. Probability. Acceptance sampling by attributes and by variables. Controls charts : average, range, standard deviation and fraction defective.

**IPE 6006 Designing for Production** **3 Credits**

Creative decision making in developing products, design criteria, alternative solutions and their evaluation, design morphology. Graphical presentation of design concepts. Product analysis and product development including sales considerations.

Economics of product development and standardization. Group technology, CAD; technological and product substitution. Materials in design. Case study on product design with emphasis on import substitutes.

**IPE 6007 Production System Analysis** **3 credits**

Man-machine-material system in production. Environmental and human factors affecting productions, work measurement. Modern Organizational and plant layout techniques such as matrix organization, group technology, machine lines, O. R. techniques for management and PPC; graphs and networks, linear programming, decision making etc.

**IPE 6008 Advanced Manufacturing Process for Metallic Materials**  
**3 Credits**

Theory of metal forming and its application to drawing, rolling, extrusion, forging etc. Recent development in metal forming processes.

Theory of metal cutting: Mechanics of chip formation, chip-tool-job contact process and Heat phenomenon. Generating processes for gear manufacture. Recent developments in machining processes.

**IPE 6009 Advanced Quality Control**  
**3 Credits**

Basic concepts : Optimum cost of conformance.

Quality Improvement : Management controllable defects and operator controllable defects.

Designing for quality : Failure model/failure defect and fault tree analysis, maintain ability, safety in new product design and Reliability Measurement methods : Mechanical, electrical, electronic, pneumatic, optical, and sonic.

Process control : Concepts and techniques. Acceptance sampling. Quality assurance. Organization for quality.

Optional Courses

**IPE 6101 Tool Engineering**  
**3 Credits**

Functions and Organization. Fits and tolerance. Locating principles and clamping methods. Clamping force. Various types of locators. Tools guides, jigs and fixtures, open and closed die desing. Desing and production of jigs and fixtures.

Cutting tool material; Heat treatment of tools. Production of tools. Carbide, threading and gear cutting tools, milling cutter etc. Economic factors in tooling. Discriminant analysis; Classification of tools. Inventory.

**IPE 6102 Managerial Economics**  
**3 Credits**

Introduction to managerials Economics: Definition and scope; Review of optimization techniques; Comparing investment alternatives; Cost of capital; Capital budgeting, Capital rationing problems, Demand Theory: Production theory: Production function, Marginal rate of substitution of input factors; cost theory; Cost curves of a firm in short-run and long run; Market structure and the theory of prices; firm's price-output decision under (i) pure competition (ii) Monopoly, and (iii) Oligopoly, price leadership; Forecasting; Analysis of time series; Risk analysis and decision theory: Replacement, renewal and reliability. Case studies.

**IPE 6103 Introduction to Control Engineering**  
**3 credits**

Introduction of theory of control systems (Mechanical, hydraulic, termal, preumatic). Study of frequency, stop function and system responses, transfer functions, characteristic functions. Analysis of systems, system compensation, analogues. Application of servo machanisms in mechanical system, hydraulics, servo control pneumatic, electro-mech, control.

**IPE 6104 Principles of Industrial Management**  
**3 credits**

Development of modern management thought; motivation, incentives and morale. Economic analysis in business decision: Quantitative methods in business decisions; Improvement and measurement of work; Information systems.

**IPE 6105 Marketing Management**  
**3 credits**

Conceptualizing Marketing management - the concept of marketing and the marketing system.

Analysing marketing opportunities-marketing, Environment. Consumer markets and buyer behaviour. Market Segmentation, market measurement and forcecasting. Organizing for marketing - Marketing organization and planning. Planning the marketing programme. Product-Policy decisions; New product decisions, price decisions. Channel decisions, physical distribution, advertising, sales decisions. Controlling the marketing effort-marketing control, sale cost and profit analysis, profitable share of market.

**IPE 6106 Plastic Processes Engineering**  
**3 credits**

Different types of polymerization: Molecular weight and its distribution. Mechanical, electrical, thermal and optical properties. Processing properties: thermal and rheological, Die swell, melt tracture, mathematical models of flow canals. Testing of properties and different standards including I. S. O. Degradation, stabilization. Common industrial materials. Basic instrumentation and control. Fabrication processes: Mixing-Batch and continuous types. Extrusion Principles, design calculations and flow theory, graphical representation, constuctional features, materials for extrusion, extrusion dies. Coating of wires, Film extrusion: Techniques of manufacture. Injection moulding; Construction operation, effects of different processing variables.



**IPE 6201 Quantitative Analysis I****3 credits.**

Probability distribution, characteristic function, regression models and statistical design. Stochastic process. Difference equation, linear algebra, convex combination and convex set.

Kuhn-Tucker condition for optimization, maximum and minimum applied to multivariables. Nonlinear programming algorithms. Lagrangian multiplier, Z-transformation and Laplace transformation.

**IPE 6202 Control Engineering****3 credits**

Introduction to automatic control: Representation of control components: mechanical, electrical, thermal and fluid system; series and parallel laws, analysis, comparators and integrators, representation of control systems; block diagram algebra, systems such as hydraulic servomotor, temp. control system, steady-state operation: P-, I-, PI-, D-, PID control system, Laplace transforms, the characteristic function: transient and impulse response; stability criteria, the root locus method, analogue computers, Frequency response method. Improving system performance; study of control systems such as adaptive, hydraulic, pneumatic and electrical systems.

**IPE 6203 Applied Plasticity****3 credits**

Study of plastic behaviour of common engineering metals: Plasticity conditions, deformation equations, buckling, necking. Methods of solving forming problems. Design of extrusion, drawing and other forming tools and dies including recent developments.

**IPE 6204 Linear Programming****3 credits**

Linear Algebra related to linear programming: An overview of simplex algorithms-Theoretical fundamentals: Duality: Dual simplex and post optimality analysis: Transportation- Primal and dual algorithms; Revised simplex: Decomposition principle: Network flow; An introduction to MPSX programme.

**IPE 6205 Quantitative Analysis II (Preq IPE 6201)****3 credits**

Mathematical tools: Cost volume, profit analysis; Decision making with an uncertain future: Linear Programming: Games and Strategies; Inventory and production: Forecasting; Markov analysis; Waiting lines; PERT, CPM.

**IPE 6206 Computer Methods in Industrial Engineering****3 credits**

Computers and modes of storage memory. Access time for different data storage system. Software of a computer: Executive, Macros, Library system, monitoring and editing of a programme. Batch Processing; time-sharing, paging, Computer languages; FORTRAN, GPSS, DYNAMO. Use of computers in Production planning and control. Information system, inventory management, simulation etc.

**IPE 6207 Growth & Management of Technology****3 Credits**

Concept : Technology and technological world, role of technology in the modern society and its influence, multiplier model, hardware and software technologies.

International trade of technology, dependence and self-reliance in technology, late development : opportunities and constraints, technology planning.

Technology assessment- concept, process and techniques. Innovation and substitution of technology, technology life cycle, technology forecasting, transfer of technology-adaptation, absorption and dissemination. Technology infrastructure, ancillarization and subcontracting, models of technology diffusion.

**IPE 6208: Organizational Behaviour****3 credits**

Introduction: Overview of organizational behaviour; models - towards explaining and predicting behaviour.

The Individual: Values and Attitudes: Personality; Perception; Motivation; Learning.

The Group: Foundations of group behaviour; Role Analysis; Group Dynamics; communication; Leadership; Power; Conflict.

The organization System: Organization Structure; Job design; Performance Evaluation and Rewards; Organizational culture; Organizational Development, Organizational Dynamics: Organizational Politics-An integrating concept.

**IPE 6209 Quantitative Technique****3 credits**

Convex combination and convex set. Maximum and Minimum applied to multivariables. Unconstrained and constrained optimization. Linear Programming. Inventory Models. Scheduling Techniques. Markov analysis; Waiting Lines; Dynamic programming; Nonlinear Algorithms.

## **Department of Mechanical Engineering**

### **UNDERGRADUATE COURSES**

#### **ME 101 Thermal Engineering**

3 hours per week    200 marks

For first year ME and NAME

##### **PART A**

Study of sources of energy, introduction to renewable energy sources, study of steam generation units with accessories and mountings, performance study of steam generators; reciprocating steam engines and steam turbines- their study and performance; study of pumps, blowers and compressors.

##### **PART B**

Introduction to internal combustion engines and their cycles, study of petrol engines, diesel engines and gas turbines with their accessories, performance study of internal combustion engines, study of refrigeration and air-conditioning systems.

#### **ME 102 Thermal Engineering Sessional**

3 hours every alternate week    50 marks

For First Year ME and NAME

Sessional classes based on ME 101

#### **ME 103 Basic Mechanical Engineering**

2 hours per week    150 marks

For First year EEE

##### **PART A**

Study of fuels, steam generating units with accessories and mountings, performance study of steam generator, steam turbine, their study and performance; study of pumps and compressors.

##### **PART B**

Introduction to internal combustion engines and their cycles: study of petrol engines, diesel engines and gas turbines with their accessories; performance study of internal combustion engines; study of refrigeration system.

**ME 104 Basic Mechanical Engineering Sessional**

3 hours every alternate week 50 marks

For First year EEE

Sessional classes based on ME 103

**ME 105 Engineering Mechanics**

3 hours per week 200 marks

For First year ChE

PART A

Introduction, resultant and component of forces; Freebody diagrams; Friction-belt friction, pivot friction; Non-coplanar forces; Non-coplanar parallel forces; Centroids; Moments of inertia of area and mass.

PART B

Kinematics of plane motion: Rectilinear motion, Curvilinear motion, Trajectory; Simple Harmonic Motion, Centro, Relative Motion. Kinetics: Newton's law, Inertia force. Conservation of energy, K.E. of a rotational body, Bodies in plane rolling, work, power. Impulse, conservation of momentum, Impact; Basic mechanisms.

**ME 107 Basic Thermal Engineering and Engineering Mechanics**

3 hours per week 200 marks

For First year MetE

PART A

Sources of Energy. Boilers and their accessories and mountings; Study of steam turbines. Introduction to internal combustion engines; study of petrol engines, diesel engines and gas turbines. Introduction to pumps, blowers and compressors. Introduction to Refrigeration and Air-Conditioning.

PART B

Introduction to engineering mechanics: Resultant and components of forces; Free-body diagrams; Moments and coplanar forces; Trusses; Friction. Centroid, Moments of inertia. Application of Work-Energy principles of rigid bodies. Impulse and Momentum.

**ME 108 Basic Thermal Engineering and Engineering Mechanics Sessional**

3 hours every alternate week 50 marks

For First year MetE

Sessional work based on ME 107

**ME 112 Basic Mechanical Engineering Drawing**

3 hours every alternate week 50 marks

Introduction, Scale drawing, Sectional views, Isometric views. Missing line. Auxiliary view.

**ME 201 Basic Thermodynamics**

3 hours per week 250 marks

For Second year ME and NAME

PART A

Fundamental concepts and definition. Laws of thermodynamics and their corollaries, non flow process and flow process, ideal gases and their cycles, thermodynamic cycles and processes.

PART B

Properties of pure substances, mixtures of gas and vapour, fuels and combustion, principles of refrigeration, reciprocating compressors.

**ME 202 Basic Thermodynamics Sessional**

3 hours every alternate week 50 marks

For Second year ME and NAME

Experiments based on ME 201

**ME 203 Engineering Mechanics**

3 hours per week 250 marks

PART A

Introduction and basic concepts. Resultant and components of forces; Free body diagrams. Equilibrium of coplanar forces. Centroids. Moment of inertia of area and mass. Kinematics of absolute motions, Kinematics of relative motions.

PART B

Friction. Maximum and Minimum forces. Equilibrium of spatial force systems. Basic mechanisms. Kinetics of rectilinear and curvilinear motion of particles. Kinetics of Plane motion of rigid bodies. Principles of work and energy. Principles of impulse and momentum.

**Me 205 Mechanics of Solids**

3 hours per week 250 marks

For Second year ME and MetE

PART A

Introduction; Analysis of axially loaded members, Thermal stress; centrifugal stress, statically indeterminate axially loaded members, stresses in thin walled cylinders and spheres; riveted and welded joints.

Beams, shear force and bending moment diagrams, various types of stresses in beams, Flexure formula. Deflection of beams. Integration and area moment methods.

Reinforced concrete beams and slabs.

#### **PART B**

Torsion formula, Angle of Twist, Modulus of Rupture, Helical Springs. Combined stresses, Principal stresses and principal planes, Mohr's Circle, Columns, Euler's formula, Intermediate column formulas, the Secant formula. Flexure formula of curved beams. Thick walled cylinders. Introduction to experimental stress analysis techniques, Strain Energy, Failure Theories.

#### **ME 206 Mechanics of Solids Sessional**

3 hours every alternate week      50 marks

Solution of problems and experiments based on ME 205

#### **ME 207 Thermofluid Mechanics**

3 hours per week      250 marks

For second year EEE

##### **PART A**

System, properties and processes, equation of state, properties and laws of perfect gases, and ideal gas cycles. Pure substance, laws of thermodynamics and their corollaries.

Fluid properties and statics, principles of conservation of mass, pressure on curved surface, energy and momentum and their application, flow measurements, laminar and turbulent flow in pipes.

##### **PART B**

Thermodynamics of steam generation, boiler steam cycles and internal combustion engine cycles.

Turbomachineries, pelton wheel; Reaction turbines. Centrifugal and axial flow pumps and fans; Reciprocating pumps.

#### **ME 208 Thermofluid Mechanics Sessional**

3 hours every alternate week      50 marks

For Second year EEE

Experiments based on ME 207

#### **ME 209 Mechanics of Materials**

3 hours per week      250 marks

For Second year ChE

##### **PART A**

Introduction, Stress, Strain, thermal stress, statically indeterminate axially loaded members, stresses in thin walled cylinders. Riveted and welded joints, Threaded Fasteners.

Beams, shear force and bending moment diagrams, relation between S.F. and B.M., various types of stresses in beams; Flexure formula, deflection of beams, Integration and area moment method.

Reinforced concrete beams and slabs.

##### **PART B**

Torsion of shafts and springs. Combined stress, principal planes, Mohr's circle. Columns, Euler's formula, Intermediate column formula. Thick walled cylinder and spheres. Power transmission elements.

#### **ME 212 Mechanical Engineering Drawing**

3 hours every alternate week      50 marks

Introduction, Fasteners and gears. Working drawing of machine elements with sectional views, detail drawing, sub-assembly drawing, assembly drawing.

#### **ME 217 Elements of Fluid mechanics and machinery**

2 hours per week      150 marks

For Second year MetE

Subject to approval of Academic Council

##### **PART A**

Fluid properties, Fluid static, Manometry, Forces on submerged planes and curved surfaces, buoyancy and floatation.

One dimensional flow of fluids : the equation of continuity, Euler's equation, Flow of fluids in pipes. Bernoulli's equation. Flow through venturimeter, Head losses.

##### **PART B**

Open channel flow, flow through weir, notches, Impulse and momentum principle, fans, blowers, study of centrifugal compressors and reciprocating pumps.

**ME 300 Computer Programming**

3 hours every alternate week      50 marks

Introduction to FORTRAN language. Concept of an algorithm. Development of flow charts to solve engineering problems and to complete the computational task. Conversion of flow chart to computer programme in FORTRAN. Computer programming for solution of algebraic and transcendental equations by different iteration techniques, linear equations, matrices, interpolation, differentiation, integration, finite differences, linear ordinary and partial differential equations. Curve fitting.

**ME 301 Heat and Mass Transfer**

3 hours per week      300 marks

**PART A**

Introduction to the basic modes of heat transfer. Conduction: Law of conduction, general conduction equation; Steady state one-dimensional conduction-plane wall, cylinder, sphere, composite structures, fins of uniform cross section; Consideration of variable thermal conductivity and systems with heat sources. Two-dimensional steady state conduction-analytical and numerical solution. Unsteady state conduction, transient heat flow with negligible-internal resistance and with internal and surface resistance, use of charts for plates, cylinders and spheres.

Radiation : Electromagnetic wave spectrum and thermal radiation, blackbody radiation, radiation properties, Angle factor, net heat transfer rate between two radiating surfaces, infinite parallel planes, concentric spheres and long cylinders, simple enclosure problems; Temperature correction and radiation shield; Solar Radiation.

**PART B**

Convection : Different types of flow and convection, dimensional analysis of forced and natural convection: Forced convection inside tubes and ducts-laminar and turbulent flow, analogy between heat and momentum transfer, empirical equations; Forced convection over a flat plate, hydrodynamic and thermal boundary layer, approximate analysis by integral method. Natural convection from exterior surfaces-vertical plates and cylinders, horizontal plates and cylinders, spheres and inclined plates.

Heat transfer with change of phase : Condensation, types of condensation, laminar film condensation of flat plates and horizontal cylinders, analysis by

Nusselt method, effect of correlations of boiling and heat transfer data. Heat Exchangers : Basic type of heat exchangers, logarithmic mean temperature difference, exchanger effectiveness, fouling and scaling of exchanger surface. Mass Transfer: Introduction, mass transfer by molecular diffusion, convection and change of phase, simultaneous heat and mass transfer, mass transfer equipments.

**ME 302 Heat Transfer Sessional**

3 hours every alternate week      50 marks

Experiments based on ME 301

**ME 303 Mechanics of Machinery**

3 hours per week      300 marks

**PART A**

Turning moment, inertia and kinetic energy of reciprocating parts and connecting rods-design of wheels.

Balancing-static and dynamic applied to rotating and reciprocating parts, partial balance of locomotives, opposed engines, multi-cylinder in-line engines, V-engines, radial engines, concept of direct and reverse cranks, balancing machines.

Undamped free vibrations of simple mechanical systems with one and two degrees of freedom, longitudinal, transverse, torsional vibration. Damped free and steady state forced vibrations with single degree of freedom. Whirling of shafts and rotors. Vibration of geared system, vibration absorption, isolation and disolation, vibration measuring instruments.

**PART B**

Study of cams and cam followers, different types of follower motions, cam profiles to impart definite motion to followers, cam with specified contours. Power transmission by belts, ropes and chains. Friction clutches-conical and plate brakes and dynamometers. Geometry of gear tooth profiles-involute and cycloidal tooth profiles in different types of gears. Study of gear trains-simple, compound and epicyclic.

Governors-spring and gravity control types, inertia types.

Precession and gyroscopic acceleration, gyroscopic couples, gyroscopic stabilisation and directional control.



**ME 304 Mechanics of Machinery Sessional**

3 hours every alternate week      50 marks

Experiments and solution of problems based on ME 303

**ME 307 Fluid Mechanics**

3 hours per week      300 marks

**PART A**

Fundamental concept and fluid as a continuum. Fluid statics-the basic hydrostatic equation, pressure variation in static incompressible and compressible fluid, manometers, pressure distribution of a fluid in a rotating system. Stability of floating and submerged bodies.

Continuity equation for a control volume, relation between system approach and control volume approach, Control volume form of the energy equation, special forms of energy equation. Application of energy equation. Flow through orifice, mouthpiece, venturimeter and notch. Control volume form of the momentum equation, special forms and approximation of the momentum equation. Application of momentum equations.

**PART B**

Similitude and Dimensional analysis. Compressible flow, the speed of sound, speed of wave propagation when the pressure rise is very high. Energy equation for isentropic and isothermal flow. Stagnation states for the flow of an ideal gas. Flow through converging-diverging nozzle, normal shock. Real fluid flow, frictional losses in pipes and fittings. Introduction to open channel flow.

**ME 308 Fluid Mechanics Sessional**

3 hours every alternate week      50 marks

Experiments based on ME 307

**ME 309 Machine Design**

3 hours per week      300 marks

**PART A**

Approach to design, stress analysis: Design factors, design of simple machine elements, material specifications; Stress concentration, notch sensitivity and fatigue, combined stresses, column with axial and transverse loadings, power screws, screw fastenings and other joints; Pressure vessels, boilers and

combustion chambers; Springs; Journal and plane bearings and lubrication; Roller bearings.

**PART B**

Shafts; Rope, Belt and chain drives; Spur, helical, bevel and worm gearings; Couplings and keys; Brakes and clutches.

(Note: Design based on the locally available materials will be stressed.)

**ME 310 Machine Design Sessional**

3 hours every alternate week      50 marks

Design of individual machine elements; Small design projects relating to fluid machines, engines and machine tools.

**ME 321 Mechanical Equipment.**

1 hour per week      100 Marks.

For 3rd Year Architecture.

**PART A**

Review of basic concepts and definitions. Applications of Airconditioning, Psychrometrics, Cooling Load calculations, Cooling and dehumidifying equipment, air handling and distribution, airconditioning systems, airconditioning equipment.

**PART B**

Fire hazards: fire detection and fire fighting methods. Vertical transportation; types of elevators, determination of size and quantity of elevators; Incoming and outgoing traffic handling, mechanical and electrical aspects of elevators, Escalators, moving ramps.

**ME 400 Project and Thesis**

9 Hours per week      300 marks

In this course students are required to undertake a major project in engineering analysis, design development of research. The objective is to provide an opportunity to develop initiative, self reliance, creative ability and engineering judgement. The results must be submitted in a comprehensive report with appropriate drawings, charts, bibliography, etc. along with the products if any. Use of locally available materials in manufacturing and feasibility study of local industrial units will be emphasised.

**ME 401 Applied Thermodynamics**

3 hours per week      300 marks

**PART A**

Properties of steam; Steam turbine cycles; Vapour cycles (i.e. Reheat, regenerative, superposed binary cycles); Flow through nozzles, Flow through blades. Combustion charts, fuel-air and real cycle; Combustion phenomena in spark ignition engine, compression ignition engine and gas turbine, mixture requirements; Carburation and fuel injection; Volumetric efficiency of 2 and 4 strokes engines including scavenging; Performance of supercharged and unsupercharged engines; Principles of similitude in design of IC Engines.

**PART B**

Power plant economics; Fuels and combustion; Combustion equipments; Gas loop; Water loops; Piping; Economiser; Evaporators; Governing equipments; etc. Gas turbine Cycles; Wankle rotary engine, jet and rocket propulsion. Compress process, volumetric efficiency, multistage compression, intercooling; Types of compressors for gas turbine and for supercharging in IC Engines.

**ME 402 Applied Thermodynamics Sessional**

3 hours every alternate week      50 marks

For Fourth year ME and NAME

Experiments based on ME 401

**ME 407 Fluid Mechanics and Machinery**

3 hours per week      300 marks

**PART A**

Types of fluid machinery; Rotodynamic and positive displacement machinery; Velocity diagram and Euler pump turbine equation, Impulse and reaction turbines- Pelton wheel, Francis turbine and Kaplan turbine. Dimensional analysis applied to turbines - specific speed, unit power, unit speed. Performance tests and characteristic curves of turbines. Introduction to inviscid incompressible flow to include two dimensional basic flows and Kutta Joukowski relation.

**PART B**

Centrifugal and axial flow machines- Pumps, fans, blowers and compressors. Deep well turbine pumps; Specific speed. Performance tests and characteristic curves. Cavitation. Reciprocating pump. Hydraulic transmission, torque

converter and fluid coupling. Introduction to boundary layer theory-estimation of boundary layer thickness, skin friction and drag of a flat plate.

**ME 408 Fluid Mechanics and Machinery Sessional**

3 hours every alternate week      50 marks

Experiments based on ME 407

Optional Subjects

**ME 421 Aerodynamics**

2 hours per week 200 marks

**PART A**

Inviscid incompressible flow to include potential function, stream function, circulation and basic flows. Kutta-Joukowski theorem. Aerofoil theory and wing theory.

**PART B**

Drag, aircraft propulsion and propeller, Static performance problem; Special performance problem. Introduction to stability and control; Longitudinal stability and control; Lateral and directional stability and control.

**ME 425 Automobile Engineering**

2 hours per week      200 marks

**PART A**

Component of an automobile; Engine types and classification; Engine construction. Reducing engine friction: Automotive engine fuels including preignition, detonation and knocking; Measurement of antiknock valves. Fuel system including carburation and carburetor circuits; Diesel engine fuel system. Exhaust system; Engine cooling; Ignition system.

**PART B**

Cranking motor system; Clutch system and functions. Transmission propeller shaft and differential function; Rear axles, tyres. Electric system: Steering system; Brake system; Automotive springs and suspension, Automotive performances and efficiencies.

**ME 429 Control Engineering**

2 hours per week      200 marks

Theory of control systems including open loop and closed loop with emphasis on mechanical, hydraulic, thermal and pneumatic systems. Representation of control systems, block diagrams. Frequency, step function and system

responses, transfer functions, characteristic functions. System analysis using polar plots (Nyquist diagram), logarithmic plot (Bode diagram), root locus plots: System compensation. Analogues of control systems. Application of servo mechanism in mechanical engineering. Hydraulic control systems, Servo control valve arrangements and analysis, hydraulic pump motor analysis. Pneumatic control systems. Elements of electro-mechanical and hydraulic controls.

#### **ME 431 Plastics Process Technology**

2 hours per week      200 marks

##### **PART A**

Introduction, Testing of properties, Assessment of flow behaviour; Newtonian fluids; Processing parameters; degradation, decomposition. Fillers, additives used in some common plastics. Common methods of identifying plastics. Mixing and compounding; Mills: internal and continuous mixers.

##### **PART B**

Extrusion: mechanical construction and operation, screw design, temperature controls, cooling, hauling and guillotine units, wire coating, dies. Calendering: roll configuration, process of making sheets, laminating. Compression and transfer moulding, different types of moulds. Injection moulding, mechanical construction and operation, moulding cycle.

Blow moulding: Vacuum forming, reinforcement of plastics. Instrumentation and controls.

#### **ME 441 Introduction to petroleum Engineering**

2 hours per week      200 marks

##### **PART A**

An overview of hydrocarbon reserves in Bangladesh. Classification of rocks and hydrocarbon deposits and their genesis. Geophysical exploration of oil & gas. Physical properties and characteristics of reservoir rocks. Origin, accumulation, composition and behaviour of hydrocarbon reserve, Analysis and prediction of reservoir performance.

##### **PART B**

Drilling rigs and its types. Rig moving equipments. Rig components and its auxiliaries. Drilling operations. Vertical and directional drilling. Well logging and interpretation. Cracking and steaming. Well completion and cementation.

#### **ME 451 Refrigeration and Air Conditioning**

2 hours per week 200 marks

##### **PART A**

Review of basic concepts and definitions. Applications of refrigerations and air-conditioning: Vapour compression refrigeration. Analysis of vapour compression cycle, Absorption refrigeration. Air-Cycle refrigeration. Steam-jet refrigeration. Vortex tube refrigeration. Properties and numerical designations of commonly used refrigerants. Eutectic solutions of brines. Refrigeration equipments. Refrigeration control systems. Multipressure systems of refrigeration. Low-temperature refrigeration.

##### **PART B**

Cooling load calculations for various applications viz. air-conditioning, cold storage, Cooling; Dehumidifying and clearing equipments; Control system.

#### **POSTGRADUATE COURSES**

##### **ME 6003 Problem**

**3 credits**

Selected subjects related to mechanical engineering. No formal lectures; Assigned reading and special problems arranged on an individual basis in consultation with the teacher.

##### **ME 6101 Classical Thermodynamics**

**3 credits**

Fundamentals of classical thermodynamic, first and second law; Concept of properties. Reversible and irreversible processes, entropy and other characteristic functions. Maxwell's relations. Equation of state and generalized co-ordinates; Equilibrium and stability.

##### **ME 6103 Statistical Thermodynamics**

**3 credits**

Kinetic theory of gases; Thermodynamic theory of radiation; Maxwell-Boltzmann distribution, equipartition theorem; Mean free path; Bose-Einstein and Fermi-Dirac statistics; Entropy transport properties; Fluctuation. Thermodynamics of noise.

##### **ME 6111 Solar Energy**

**3 credits**

Energy demand and conventional sources; Alternative sources; Solar energy, solar radiation- extraterrestrial and terrestrial; measurements, data and estimation; Direct utilization of solar energy, collection devices, storage; Solar water heaters, solar stills, solar refrigeration and other special topics.

**ME 6121 Survey of Fluid Mechanics****3 credits**

Survey of principal concepts and methods of continuum fluid mechanics, conservation equations for mass, momentum and energy for control volume; Eulerian and Lagrangian viewpoints; Governing equations of motion of fluid in non-accelerating and accelerating co-ordinate system. Introduction to hydrodynamics and boundary layer theory.

**ME 6123 Mechanics of Inviscid Incompressible Fluid****3 credits**

Kinematics of a fluid medium, the fundamental hydrodynamic equations for an ideal fluid; The simplest cases of motion of an ideal fluid: Vortex motion of an ideal fluid; The plane motion of a body in an ideal fluid; The three dimensional motion of a body in an ideal fluid.

**ME 6125 Mechanics of Viscous Fluid****3 credits**

Equations of motion for viscous fluid; Boundary layer analysis for laminar and turbulent flow; Theories of turbulence; Jets, wakes and separated flows;

**ME 6127 Mechanics of Inviscid Compressible Flow****3 credits**

Shock waves; Analysis of subsonic, supersonic and hypersonic flow fields, characteristic method and perturbation technique; Compressible flow in closed conduit.

**ME 6129 Turbulence****3 credits**

Introduction to Origin of Turbulence, Equations for Reynolds stresses, Estimation of Reynolds stresses for different boundary conditions, Homogeneous and Isotropic Turbulence, Correlations between Turbulence Quantities, Integral Scale of Turbulence, Taylor's one dimensional Energy Spectrum, Hot Wire Techniques in the measurement of Turbulent Flows.

**ME 6131 Wind Power****3 credits**

General introduction, wind energy assessment, wind site selection characteristics, site survey; Theory of power systems, Aerodynamics, turbulence, wind shear, drag and lifting translators; Wind machine fundamentals, machine characteristic, performance, system design for generation of electricity and water pumping, structural system, storage device.

**ME 6133 Wind Turbines****3 credits**

Introduction, General Aerodynamics, Classification of Wind turbines, Theories of Wind turbines, Centrifugal force effect, blade tip effect and other effects on turbine performance; Aerodynamic design of wind turbines, constant and variable speed design, structural analysis, vibration and stress analysis; control system, safety system.

**ME 6135 Advanced Aerodynamics****3 credits**

Introduction to incompressible inviscid flow; Vortex motion; Lifting line theory: induced velocity; Aerofoil theory; Joukowski transformation; Theories of propulsion; Axial momentum, Blade element, Cascade and vortex; Aerodynamic characteristics of aerofoils; Shock waves.

**ME 6141 Advanced Heat Transfer****3 credits**

Modes of heat flow and basic laws of heat transfer: General conduction equations, steady and unsteady heat conductions; Analytical and numerical analysis. Thermal radiation phenomena and heat exchange by radiation, convection; Forced and natural, external and internal flows, analytical and experimental results, condensation and evaporation, combined heat transfer.

**ME 6143 Advanced Conduction and Radiation Heat Transfer****3 credits**

Steady and unsteady state conduction, solutions by analytical, numerical and analogue methods, Thermal radiation processes and evaluation of heat exchange by different methods.

**ME 6145 Advanced Convection Heat Transfer****3 credits**

Convection fundamentals. Forced convection, natural convection, transport equations, differential similarity, boundary layer and pipe flow solutions. Transport in rarefied gases. Condensation and evaporation, convective mass transfer.

**ME 6147 Design of Heat Transfer Equipment****3 credits**

Forced convection, natural convection, heat exchange theories; Application to the design of heat transfer devices; Different types of heat exchangers, analysis and design.

**ME 6149 Heat Transfer Seminar****3 credits**

Discussion of current topics in heat transfer, consideration and summarization of major recent works.

**ME 6151 Boiling and Condensation Heat Transfer****3 credits**

Introduction; Boiling- Pool and forced convection, subcooled and saturated; fundamentals of two phase flow, mathematical and empirical methods, hydrodynamic instability; enhanced boiling heat transfer, estimation methods; burnout; condensation- modes, gas phase heat and mass transfer, filmwise condensation on horizontal and inclined tubes and surfaces; condensation promoters.

**ME 6161 Thermal Environmental Engineering****3 credits**

Refrigerants; Mechanical vapour compression refrigeration systems and details of their components; Absorption refrigeration system and cycle analysis; Miscellaneous refrigeration processes; Cryogenics; Refrigeration applications with special reference to food preservation; Psychrometry; Direct contact transfer processes between moist air and water including evaporative cooling; Heating and cooling of moist air by extended surfaces; Condensation of vapour within walls; Heat transmission in buildings and solar radiation effects upon structures; Air conditioning applications: Air conveying and distribution systems.

**ME 6171 Advanced Dynamics****3 credits**

Lagrange's equations; Small oscillation; Dynamics of rigid bodies in three dimensions; Gyroscopic motion; Introduction to Hamiltonian mechanics.

**ME 6173 Mechanical Vibrations****3 credits**

Single degree of freedom system; Coupled two mass systems. Energy methods. Forced vibrations. Different types of damping. Polar plots. Vibration isolation. Effects of coupled modes. Multidegree of freedom systems. Shock loading. Normal modes of continuous systems.

**ME 6175 Applied Elasticity****3 credits**

Three dimensional stress system: Governing equations. Assumptions to reduce three dimensional to two dimensional stress system; Stress functions; Stress concentrations; St. Venant's principle. Concentrated and line loads.

Superposition. Composite bodies. Energy methods for solution. Principle of stationary potential energy. The reciprocal theorem of Maxwell and Betti.

**ME 6177 Theory of Plates and Shells****3 credits**

Classical theory of plates: Large deflection theory of plates; Membrane theory of shells; Bending theory of shells applied to shells of revolutions and cylindrical shells.

**ME 6179 Elastic Stability of Structures****3 credits**

General stability theory: Discrete and continuous systems. Introduction to calculus of variations. Approximate methods. Buckling of column frames, flexure elements, plates and shells.

**ME 6181 Experimental Stress Analysis****3 credits**

Resistance strain gauges and associated circuits: Strain gauge rosettes. Semiconductor strain gauges. Other electrical, mechanical, pneumatic, and optical strain measuring devices. Recording of dynamic strain measurements. Stress probing. Residual stress. Principles of photoelasticity. Isoclinic and isochromatic fringes. Compensation techniques. Stress freezing Oblique incidence and scattered light methods, Photoelastic coating techniques. Brittle lacquer technique. Analysis of experimental results.

**ME 6183 Finite Element Methods****3 credits**

A review of variational methods and energy theorems. The displacement method. The design of elements for plane stress and plane strain. Three dimensional and axisymmetric elements. Plates and shells. Vibrating elements. The development of finite element program.

**ME 6185 Advanced Numerical Analysis****3 credits**

Computer programming; Components of a digital computer and their functions; Computer programming in FORTRAN. Numerical Analysis: Evaluations of determinants, matrix operations; Eigenvalue and eigen-vectors; Solution of algebraic and transcendental equations. Ordinary differential equations: Initial value problems of linear and non-linear system of equations; Finite-difference technique of solving ordinary differential equations; Multisegement method of solving unstable system of equations. Partial differential equations, finite difference method of solving of both the linear and non-linear partial differential equations.



**ME 6187 Computer and Programming****3 credits**

Schematic diagram and components of a computer. Peripheral units of a computer. Modes of storage in computers, computer memory. Access time for different data storage system. Software of a computer: Executive, macros, library system, monitoring and editing of a program. Batch processing, time sharing, paging, Computer languages.

**ME 6201 Mechanical Behaviour of Engineering Materials 3 credits**

Deformation, elastic behaviour, plastic behaviour, creep and creep rupture; Anelastic behaviour, fatigue fracture, brittle fracture, ductile fracture.

**ME 6203 Structure and Properties of Engineering Materials****3 credits**

Atomic forces, atomic bonding, diffusion, dislocation, motion of dislocation, kinetics of dislocation, mechanical behaviour of single crystal, mechanical behaviour of polycrystals: Strain hardening, alloy hardening, solution hardening; Precipitation hardening, cracks, nucleation and propagation, Plastic wave propagation.

**ME 6205 Theory of Plasticity****3 credits**

Phenomenological nature, stress analysis, strain analysis, yield criteria of metals, stress-strain relations, strain hardening characteristics, plasticity conditions, deformation equations, buckling, necking, some methods of solving forming problems, extrusions, drawing, slip-line solution.

**ME 6207 Dislocation Theory****3 credits**

Concept of dislocations, structures, nature and types of dislocations, stress fields and energy, line tension, multiplication, elastic interaction. superdislocations, partial dislocation, stacking fault; separation of partial dislocation, recombination energy.

**Department of Naval Architecture & Marine Engineering****UNDERGRADUATE COURSES****NAME 107 Basic Naval Architecture**

2 hours per week 150 marks

**PART A**

Naval Architecture and its scope; Ship definitions and nomenclature; Ship geometry and lines; Ship types and offshore vehicles; Numerical integration - calculation of area, volume, moment, displacement, centre of buoyancy, centre of gravity etc. Curve of displacement; shipbuilding materials; structure of ships,

**PART B**

Machines used for naval architecture calculation; Approximate formulae and rules: Initial stability of ships, metacentric diagrams, moment of inertia, Countryboats.

**NAME 108 Ship drawing and Calculations (Sessional)**

3 hours every alternate week 50 marks

Ship drawing and calculations based on NAME - 107

**NAME 201 Strength of Materials I**

2 hours per week 150 marks

**PART A**

Introduction; Uni-axial stress and strain; Bending of beams; combined direct and bending stresses; Two-dimensional stress and strain; Mohr's circle, Membrane stresses in shells-pressure vessel; Strength of riveted and welded joints.

**PART B**

Simple torsion; Deflection of statically determinate beams; Strain energy; Buckling and mechanical properties of metals; Thick cylinders and rotating discs; Theories of failure.

**NAME 202 Strength of Materials I Sessional**

3 hours every alternate week 50 marks

Experiments based on NAME 201

**NAME 203 Fluid Mechanics**

2 hours per week      150 marks

**PART A**

Fluid properties; Static pressure of a fluid; Buoyancy of a fluid; Flow of a fluid; Orifices and mouth pieces; Notches and weirs; Impact of jets; Friction and flow through pipes, Viscous and turbulent flow of fluids, Flow through open channel.

**PART B**

Dimensional analysis; Dynamical similarity and model testing; Compressible fluids; The aerofoil and its application; The boundary layer; Hydraulic machines, reciprocating pumps and centrifugal pumps; Cavitation.

**NAME 204 Fluid Mechanics Sessional**

3 hours every alternate week      50 marks

Experiments based on NAME 203

**NAME 205 Shipbuilding Technology I**

2 hours per week      150 marks

**PART A**

Development of ship welding; Metallurgy of welding; Different types of welding and their equipments; Types of welding joints; Welding symbols; Common defects in ship welding, inspection and testing of welding specimen; Methods and principles of cutting; Cutting equipments.

**PART B**

Development of ship structure; Details of structural members. Introduction to the rules of Classification societies; Boat building by materials other than steel.

**NAME 207 Ship Design I**

2 hours per week      150 marks

**PART A**

Large angle stability; Inclining experiments; Heeling trials and still tests; Effects of freely suspended weight and free liquid surface; Trim and hydrostatic calculations; Stability curves and their applications; Influence of ship form on stability; Stability of completely submerged bodies; Dynamical stability; Stability criteria.

**PART B**

Hazards and protection; Flooding and collision; Safety of life at sea (SOLAS), Pollution of marine environment, Freeboard and tonnage calculations; Launching calculations; Statutory regulations.

**NAME 208 Ship Design I Sessional**

3 hours per week      100 marks

Sessional based on NAME 207

Ship Drawing and some laboratory work.

**Met E 209 Shipbuilding Materials**

3 hours per week      250 marks

**PART A**

Chemistry of materials. Polymers, silicones, ceramics, Structure of metals-elastic and plastic deformation; Properties and standard tests of metallic materials; Production, properties and uses of ferrous materials. Metal casting processes; Casting defects and remedies; Corrosion and its prevention. Paints, varnish, metallic coating, Powder metallurgy.

**PART B**

Manufacture, properties and uses of non-ferrous alloys; Soldering and brazing Manufacture, properties and uses of ferrous alloys. Metal working processes; Heat treatment of metals and alloys; Properties and uses of other shipbuilding materials.

**Met E 210 Shipbuilding materials Sessional**

3 hours every alternate week      50 marks

Experiments based on Met.E 209

**NAME 300 Computer Programming and its Applications**

3 hours every alternate week      50 marks

**PART A**

History of computing machines; Principles of hardware organisation; Storage devices; Input/Output media and devices. Number representations and arithmetic operations; Introduction to Fortran language; Algorithms and Flowcharts; Control Statements; Fortran declarations; Arrays and subscripted variables, Subprograms, Matrix-computer method.

## PART B

Introduction to the application of computers in ship design; Numerical methods for calculating the area of a ship section; Programming for hydrostatic calculations and strength calculations; Computer methods for predicting motions, stability, resistance and propulsion of ships.

### NAME 301 Strength of Materials II

2 hours per week 200 marks

## PART A

Continuous beams; Bending of beams and compression members; Unsymmetrical bending; Curved bars; Energy methods; Inelastic stress distribution.

## PART B

Theory of torsion; Bredt formula for thin walled sections, Bending stresses in thin plates and shells; Thermal stress; Problems in plasticity.

### Name 302 Strength of Materials II Sessional

3 hours every alternate week 50 marks

Experiments based on NAME 301

### NAME 303 Marine Hydrodynamics

2 hours per week 200 marks

## PART A

Flow of an ideal fluid: Introduction, Equation of continuity, Concepts of stream lines, streaklines and pathlines; Two-dimensional flow patterns, rotational and irrotational flow, Stream-functions and velocity potential functions, Euler's Equations of motion; Bernoulli's equation, Velocity and pressure distributions, Standard Patterns of flow, Uniform flow, Concepts of source, sink and doublet, graphical addition of flow patterns, Source and uniform flow; Doublet and uniform flow; Flow past a cylinder with circulations, Magnus effects;

Characteristics of flow around a ship hull, Principle of operation of hydrofoil boats, cavitation phenomena, Supercavitating propellers, Cavitation tunnel, Bulbous bows, Corrosion and foulings of ship hull.

## PART B

Conformal transformation: Analytic functions, singularities, Cauchy-Riemann equations, complex potential, Application of conformal transformation to some

flow cases, Joukowski's hypothesis, Lift of an infinite aerofoil. Theorems of Green Stockes, Cauchy and Blasius and their application to some hydrodynamic problems. The towing tank, physical significance of dimensionless relationships for liquid flow, water jet propulsion, Hydrodynamic aspects of submersibles and true submarine craft, Introduction to different types of oceanic waves.

### NAME 304 Marine Hydrodynamics Sessional

3 hours every alternate week 50 marks

Experiments based on NAME 303

### NAME 305 SHIPBUILDING TECHNOLOGY II

3 hours per week 300 marks

## PART A

Shipyards facilities, Various shops and production facilities and their layout; Process of ship construction, Numerical control and network analysis; Structural discontinuity, Stress concentration, remedial measures; ports and Harbours.

## PART B

Causes of wear and damage of ships; Repair facilities such as floating dock, dry dock; Repair of hull, machineries and equipments; Repair of ship systems; Marine structures; breakwaters, wharves, piers, bulkheads, dolphins and moorings.

### NAME 307 Ship Design II

2 hours per week 200 marks

## PART A

Introduction; tendering and specifications; general design characteristics; determination of principal parameters and dimensions; mass equation and estimates of masses, capacities, stability and trim; body plan design, choice of form and modification to form, general arrangement and layout of the ship, cost estimation, power estimation.

## PART B

Special design features of trawlers, tugs, container ships, ro-roships, tanker and warships.

**NAME 308 Ship Design II (Sessional)**

3 hours per week 100 marks

Design sessional based on NAME 307 including the application of rule books in ship design.

**NAME 311 Marine Engineering I**

2 hours per week 200 marks

**PART A**

Heat Transfer: Steady and unsteady state conduction-one and two demension, Natural and forced convection, heat exchanger; Radiation, form factors.

**PART B**

Power Generation; Boilers and fuels; Steam and Gas turbines, Nuclear plants; Heat balance, Lubricating and fuel oil systems. Internal combustion Engines; different types and their systems. Thrust bearings; Installations, Auxiliaries.

**NAME 313 Analysis and Design of Machine Elements**

3 hours per week 300 marks

**PART A**

Machine Dynamics; Statics, Kinematics of plane motion; Newton's laws applied to engineering components and systems; D' Alembert's principle and inertia stresses; application of momentum, energy and power; simple vibration. Design factors, design of simple machine elements. Stress concentration, notch sensitivity and fatigue.

**PART B**

Power screw fastenings and other joints; springs; journal and plane bearing and lubrication; Roller bearing; shafts; Rope, belt and chain drives spur, helical bevel gearings, Couplings and keys Brakes and clutches.

**NAME 314 Analysis and Design of Machine elements (Sessional)**

3 hours every alternate week 50 marks

Sessional work based on NAME 313

**NAME 316 Shipyard Practice I (Practical)**

3 hours every alternate week 50 marks

Practical work Concentrated in 3 weeks

Ship construction; Mold loft, Gas cutting, welding, fabrication, subassembly, assembly, Field assembly, erection, launching, outfitting, delivery trial. Diesel engine workshop practice.

**NAME 400 Project and Thesis**

6 hours per week 200 marks

Major fields of Project and Thesis are as follows:

- (a) Ship Design
- (b) Ship construction
- (c) Strength of ship
- (d) Material Testing and Fracture Problems
- (e) Ship Motion
- (f) Resistance and propulsion of Ships
- (g) Marine Engines and Ship Vibration
- (h) Marine Transportation System
- (i) Marine Engineering.

**NAME 401 Ship Structures**

2 hours per week 200 marks

**PART A**

Introduction, Longitudinal bending. The buoyancy and weight curves; the load, shearing force bending moment curves. Approximations to maximum values of bending moment and shearing forces. Calculation of the section modulus. Bending stress; correction for the effect of shear lag. Dynamic effects. Design of Submarine pressure hull.

**PART B**

Transverse strength of ships. Strength of plating, bulkheads, decks and tank-tops. Fourier series applied to ship structures. Composite construction. superstructure theory. Grillages. Buckling of unstiffened and stiffened plates. Finite element theory.

**NAME 402 Ship Structures (Sessional)**

3 hours every alternate week 50 marks

Sessional based on NAME 401

**NAME 403 Resistance and Propulsion of Ships**

2 hours per week    200 marks

**PART A**

The resistance problem; Wave-making resistance; Wave interference phenomena; Analysis of wave phenomena and wave making resistance of some bodies with simple forms; Some approximation methods of determining the position of humps and hollows; frictional resistance; The work of William Froude; Air resistance; Appendage resistance; Power estimation.

**PART B**

Effect of form and principal dimensions on wave making and frictional resistance; Resistance at restricted water depth and width; Introduction to the theory of propulsion; propeller types; The velocity field behind the ship; Nominal and effective wake; Design of screw propellers-I (with aid of systematic screw series diagrams); Design of screw propellers-II (according to the circulation theory); Cavitation; Trial and service prediction.

**NAME 404 Resistance and Propulsion of Ships (Sessional)**

3 hours every alternate week    50 marks

Sessional work based on NAME 403

**NAME 407 Ship Design III**

2 hours per Week    200 marks

**PART A**

Principles of engineering economics; supply and demand for ships and trading patterns; basic interest relationships; discounted cash flow calculations; economic complexities in design decisions; application of engineering economics in ship design.

**PART B**

Mathematics of optimization; survey of optimisation problems and techniques for solution, review of ship design problems; the optimal ships size for given speed, the optimal speed for given ship size, optimizing marine transport systems, choice of cargo handling and access equipment.

**NAME 408 Ship Design III (Sessional)**

3 hours every week    100 marks

Sessional based on NAME- 407 including the applications of Rule books in ship design.

**NAME 409 Marine Dynamics**

3 hours per week    300 marks

**PART A**

Kinematics of particles and rigid bodies, Application of Newton's laws to engineering components and systems, D'Alembert's principle, Momentum, energy and power. Simple harmonic motion, Free, forced and damped vibrations of simple systems. Six fundamental forms of ships motions, forces acting on a tossing vessel. Motions in quiet water without consideration of resistance forces; Uncoupled rolling, pitching and heaving motions, Coupled pitching and heaving motions. Motions of a vessel in quiet water with resistance, Methods of computing resistance to ship motions, Effect of the forward motions, Effect of the forward motion of the vessel and the operation of the propellers upon the resistance to rolling.

**PART B**

General information on ocean waves, Application of statistics and probability theory, the random seaway, Ship motion response to regular and irregular waves, Motions stabilizers, Manoeuvring equations of motions and hydrodynamic derivatives. Experimental methods of studying ship motions, Rudder design.

Steady turning in a circle, Determination of hydrodynamic derivatives, Rotating arm test, Planer Motion Mechanism test, controls fixed straight line stability, Full scale Trials, Estimating turning circle parameters.

**NAME 411 Marine Engineering II**

3 hours per week    300 marks

**PART A**

Outline of navigation and shipping laws; fire fighting equipments. Marine Electricity: D. C. Generators & motors, A. C. generators & motors, Transformers, synchronous converter, Electric drives, Rectifiers, switch boards, electron tube and radio, Automatic control, Marine radar and wireless equipments.



#### PART B

Deck machinery, Marine pumps, Marine refrigeration and air-conditioning, principles of refrigeration and their marine applications. Control, twin duct and reheat air-conditioning systems, air-conditioning with direct expansion refrigeration. Heating and ventilating systems. Air treatment in cargo spaces.

#### NAME 412 Marine Engineering (Sessional)

3 hours every alternate week 50 marks

Experiments based on NAME 311 and NAME 411

#### NAME 416 Shipyard Practice II (Practical)

3 hours every alternate week 50 marks

Practical work concentrated in 3 weeks

Ship Design: Basic design, Estimation, Hull design, Piping and equipment design, shell expansion, Detailed construction design.

Optional Subjects

#### NAME 431 Matrix Structural Analysis

2 hours per week 200 marks

##### PART A

Introduction, Brief historical sketch. The aim of matrix methods. Areas of structural analysis. Basic equations of elasticity. Strain displacement equations, stress-strain equations, equations of equilibrium and compatibility equations. Energy theorems; Work and complementary works, strain energy and complementary strain energy.

Basic steps of the Displacement of Stiffness method: Deflection and stiffness influence co-efficients. Stiffness matrix, some properties of stiffness matrix. Assembly of K by superposition. Method of solution. Applications-the truss, the uniform rectilinear beam.

##### PART B

Basic equations of the force method. Equilibrium, Compatibility. Deflection influence co-efficients. Truss analysis by the force method. Beam and frame analysis by the force, Comparison of the force and Displacement methods. The finite element matrix methods: the basic equations, the displacement method. Computational problems: Single and repetitive "Problems. III

conditioning in matrix process. Numerical checks in" matrix processes. Operations on banded matrices. The use of substructures.

#### NAME 433 Optimum Structural Design

2 hours per week 200 marks

##### PART A

Introduction, General formulation of Optimum design, design variables, constraints and objective function. Mathematical Formulation. Structural design optimization approaches. Reviews of structural analysis procedures, elastic analysis, plastic analysis of framed structures. Reanalysis methods- direct methods, iterative methods and approximate methods.

##### PART B

Optimality criteria methods-fully stressed design, displacement limited design. Linear programming-problem formulation and method of solution. Nonlinear programming. Methods for unconstrained minimization. Penalty function methods. Methods of feasible directions. Applications: Steel elements, plastic design by linear programming, optimal design of elastic grillages.

#### NAME 435 Design of Inland Water Way Transportation System

2 hours per week 200 marks

##### PART A

Modes of Inland Water transport, cargo and passengers, Design and operational aspects of country-boats, Mechanisation of country boats, Design principles and criteria for tugbarge system, self propelled system. Port facilities associated with country boats, tugbarge system and self propelled systems. Design principles and criteria for Inland passenger vessels and associated port facilities.

##### PART B

Economic aspects of inland transportation system (1) Country boat (2) Tugbarge system (3) Self propelled system and (4) Passenger vessels. Optimisation of Tugbarge systems self propelled fleet and passenger vessels, Cheapest mode of inland water transport.

#### NAME 437 Propulsion Engineering

2 hours per week 200 marks

##### PART A

A historical background of propulsion; Study of the various propulsive devices developed and used through the ages.

## PART B

A more advanced study of particular topics and recent developments in propulsions. Selected technical papers and recent research reports studied in detail.

### NAME 439 Ship Hull Vibration

2 hours per week 200 marks

Introduction to ship vibration, Theory of free, forced and damped vibration Natural frequencies of hull girder vibration, Added mass for hull girder vibration, Local hull vibration, Measurement of ship vibration, Comparison between observed and calculated frequencies, Empirical formulae for calculating hull frequencies, Vibrations of propulsion shafting system, Exciting force and hull response, Prevention and cure of ship vibration. Some case histories of ship hull vibration. A short treatment of matrix-computer methods of vibration analysis.

### NAME 441 Ship Performance

2 hours per week 200 marks

#### PART A

Introduction, Hull roughness, Roughness measurement, Bottom condition and speed loss, Propeller roughness, Propeller and hull interaction, Methods of predicting resistance increase due to hull and propeller roughness, Nominal speed loss, Power-Diagram, Hull maintenance.

#### PART B

Added resistance due to ship motion in regular waves, Added resistance due to wave reflection, Added resistance in irregular waves, Added resistance due to wind, Yawing resistance. Resistance increase due to drift, Rudder resistance, Normal speed loss of a ship in a seaway.

### NAME 443 Ship Environment

2 hours per week 200 marks

#### PART A

Waves and the sea, simple wave theorems - Trochoidal description, Trochoidal theory introduction. Drawing of a trochoid. Positioning of orbit centres, Establishing trochoid as a surface of equal pressure, Reduction of orbit radius with depth, speed of wave, Vibration of pressure in a wave, Smith's effect. Energy in a trochoidal wave. Superposition of waves. Propagation of energy in

a wave. Irregular wave patterns, Histograms and probability distribution, Joint Probability Distribution, Linear regression, Correlogram.

## PART B

Time series, Fourier Analysis, Spectral Density, Estimation of spectral Density from sample Auto covariance Function, The Fast Fourier Transform, Properties of the spectrum, Sea spectra, ITTC Spectra, BTTP spectra, ISSC spectra, wave amplitudes, Extreme wave amplitudes, other means of defining an irregular wave system, Recent developments in spectral analysis, Directional spectra and shortcrestedness, Spectrum of related quantities; Excitation and response of linear systems, Cross spectra, Response spectra, spectral estimates and parameters and selection of extreme value distributions, Wind wave relationships for fully developed sea waves.

### NAME 445 Control Engineering

2 hours per week 200 marks

#### PART A

Introduction to theory of control systems-mechanical, hydraulic, pneumatic, thermal and electro-mechanical. Representation of control system, block diagrams. Study of frequency, step function and system responses. Transfer functions and characteristics functions. Roth's criterion for stability. System analysis-Myquist and Bode diagrams. Root locus plots.

#### PART B

System compensation. Analogues of control system. Application of servomechanisms in Marine-Mechanical system, hydraulics, servo control, pneumatic and electro-mechanical controls.

## POSTGRADUATE COURSES

### NAME 6101 Ship Structure I

3 Credits

Elastic Analysis-stiffness and flexibility, the equilibrium matrix, rigid and semi-rigid joint connections. Theory of plates and shells, the rectangular plates, large deflection theory of plates, membrane theory of shells. Introduction to finite element methods. Application of finite element methods to simple ship structural problems.

### NAME 6102 Ship Structures II

3 Credits

Analysis of structural failure plasticity, beam and frame analysis, yield line theory. Analysis of strength of welded ship grillage, optimum design. Mechanics

to fracture-brittle and fatigue fractures, design application fracture mechanics. Materials for marine. vehicles-the selection of construction steels, fibre reinforced plastics, concrete as a shipbuilding material. Simple economics for revalries between materials. Design for production.

**NAME 6103 Finite Element Methods**

**3 Credits**

Introduction: Influence co-efficients and stiffness matrices. Formulation and calculation of the finite element matrices using the principles of virtual displacements. Preparing computer programs. Introduction to the isoparametric family of elements.

Familiarization with and use of existing finite element programs developed for marine structural analysis and design. Pre-and Post-processors for data processing.

**NAME 6201 Ship Propulsion**

**3 Credits**

Introduction: Propeller Theory: Blade element theory, vortex theory-lifting line, lifting surface, lifting body; Propulsive Devices; Fixed pitch propeller, Ducted propeller, Contra Rotating propeller, Controllable pitch propeller; Propulsion Machinery; Selection of main machinery auxiliaries.

**NAME 6202 Theory of Wave Making Resistance**

**3 Credits**

Ship wave making resistance; Ship wave systems; wave making resistance of surface ship; Theoretical calculation of wave-making resistance; Interference effects; Effects of viscosity; Scale effects; Comparison between calculated and observed wave making resistance; Design of bulbous bow; Recent developments in wave making resistance of ships.

**NAME 6203 Sea Keeping Performance**

**3 Credits**

Intorduction: Sea Keeping theories, Added resistance due to ship motion in regular and irregular waves, added resistance due to wave reflection; Methods of predicting added resistance in wave, Added resistance due to wind, Methods of predicting added resistance due to wind, Resistance increase due to steering on a straight course, Sea spectra, Response spectra, Involuntary speed loss and power increase at constant power and constant speed approach, Voluntary speed reduction in seaways, Weather routing of ships.

**NAME 6204 Weather Routing of Ships**

**3 Credits**

Introduction: Climatology, Seasonal climatology of different seas, trading routes, coastal and landlocked areas, Storm pattern, Total marine environment, Wave theory and wave height-wind speed relationship. Wave spectral families, Behaviour of ships at sea, Routing methods, Climatic routing, Strategic routing, Tactical routing, Case Studies, Selected papers on water routings.

**NAME 6205 Boundary Layer Theory**

**3 Credits**

Outline of boundary layer theory, Derivation of Navier-Stokes equations, Exact solutions of the Navier-Stokes equations, Very slow motions Boundary layer equations for two-dimensional flow, Boundary layer on a flat plate. Boundary layer development on actual ships. Boundary layer formation over large hull projections and appendage. Detailed effects of hull roughness on the ship boundary layer. Friction formulations taking account of curvature and roughness. Separation of boundary layers around ship components, Separation control.

**NAME 6301 Analysis and Design of Welded Structures**

**3 Credits**

Residual stresses in welded joints; Distortion in weldments; Fracture toughness; Brittle and fatigue fracture of welded structures; Effects of distortion and residual stress on buckling strength of welded structures; Weld cracking and joint restraint. Effect of weld defects on service behaviours; Nondiestructive testing of welded joints.

Strength of welded structures; Design of welded connections; Miscellaneous structural design; Joint design and production for static and dynamic welded structures.

**NAME 6302 Ship Production Technology**

**3 Credits**

The ideal layout of shipyard; Material handling facilities; Production Process; Advanced fabrication processes (N/C flame cutting, double curvature bending by Universal Press and Line Heating etc.); Component assembly; Sub-assembly, assembly and grand assembly; Block assembly; Advanced outfitting; Zone outfitting; Block erection. Machinery installation. Launching; Pier outfitting, trial and delivery.

Production planning, Scheduling and line charts; production piling charts; Manhour control, Subcontracting; Quality control; Application of the Critical path Analysis.

**NAME 6401 Marine Transportation System****3 Credits**

Trade and markets, International trade, operation research technique used in Marine Transportation problem, through transportation system, Marine transportation system design, operation and economics of Marine transportation system.

**NAME 6402 Design of Cargo Access Equipment****3 Credits**

Influence of Cargo Access Equipment of ships performance, Hatch-covers, Cargoes and ships, General requirement for access equipment; Access Equipment for vertical and horizontal loading ships, ship design and selection of access Equipment, specific design requirements of access Equipment, Access Equipment in service, Recent developments and prospects, Economic aspects.

**NAME 6403 Computer Simulation****3 Credits**

Simulation as an Operation Research techniques, General procedure for simulation, simulation types, probability concepts in simulation, Random number generation with arbitrary distribution, Random sequence tests. Simulation languages. Use of Fortran in Simulation, Extended control Simulation language, Computer Simulation model in Marine Transportation system.

**NAME 6501 Advanced Marine Engineering****3 Credits**

Analysis of power plant including mathematical representation of Steam turbine, Gas turbine and diesel plant. Auxiliary system "Evaluation including clutch and gear box control. Total system" performance when subjected to Full ahead to Crash Stop manoeuvre. Control systems philosophy, design and application to machinery set combinations.

Design of marine transmission devices-Spur, helical, bevel, worm gears and wheel systems. Lubrication and cooling, wear characteristics. Clutch design and operation.

**NAME 6502 Marine Transmission Systems****3 Credits**

Detailed assessment Spur, Helical Cross-Axial Helical, Bevel, Worm and Wheel systems. Principles of engagement, generation analytical geometry. Measurement and detail specification. Manufacturing methods and acceptable tolerances. Lubrication, cooling power dissipation, efficiency and wear characteristics.

Clutch design and operation- Friction self synchronising and shift types, performance characteristic. Hydraulic coupling types performance analysis. Heat transfer principles. Controllable pitch propeller operation and control of pneumatic and hydraulic types actuation systems.

**NAME 6503 Control Theory in Marine System Design****3 Credits**

Revision of the fundamental of control. Transient and Frequency Response. Stability analysis, Root locus, Routh Hurwitz-Nichol Chart representation. Compensation methods. Application of stability criteria to systems design. Application to hydraulic, pneumatic and electronic systems. Principles of Analogue computing the operational amplifier and its application to inversion, integration, multiplication and function generation. Problem definition, simulation of Marine systems.

Introduction to digital simulation methods interfacing requirements. Simulation as a design process, optimisation of control schemes and Marine plant performance. Demonstration of Hybrid techniques in the analysis of fast ship performance.

**NAME 6601 Mechanics of Water Waves****3 Credits**

Review of Hydrodynamics: Hydrostatics, Equation of continuity, Rotational and Irrotational Flows, The Dynamical Equations of Motion, Viscous Flows.

Surface Waves: Small amplitude wave theory, Finite Amplitude Waves, Wave Generation by Wind.

Fixed Structure in Waves: Hydrostatic Pressure Beneath a surface waves, waves at a vertical Flat Barrier, Consequences of Viscosity, Wave induced Forces on a Pile, Wave Induced Vibrations of Fixed Structures, Wave Making Drag. Floating Structures in Waves; Coupled Heaving and Pitching, Moored and Towed Bodies.

**NAME 6602 Harbour Engineering****3 Credits**

Tides and harmonic Analysis: Equilibrium Theory of the tides, Harmonic Analysis of Tides, Harmonic Analysis and Continuous Spectra.

Harbour Resonance: Free oscillations in closed Basins, Forced Oscillations in Basins of simple Platform, Modelling of Resonance Phenomenon in the Laboratory.

Wave Statistics: Statistical properties of Individual waves, wave spectrum and wave transformation.

Harbour Planning: Ship Characteristics, Elements of Harbour layouts, Hydraulic Aspects of Harbour layout, Layout of Docks and Breakwaters.

Break Water Design: Information on Mound Breakwater, Wave pressure Formula for Composite Breakwater, Principles of the Design of Composite Breakwaters, Wave force calculation for composite breakwater, design of Breakwater caissons.



