CURRICULUM

OF

B-TECH

For 4 year Degree Program

(Revised 2010)

HIGHER EDUCATION COMMISSION
ISLAMABAD – PAKISTAN

CURRICULUM DIVISION, HEC

Dr. Syed Sohail H. Naqvi	Executive Director
Prof. Dr. Altaf Ali G. Shaikh	Member (Acad)
Mr. Muhammad Javed Khan	Adviser (Academic)
Ms. Ghayyur Fatima	Director (Curri)
Dr. M. Tahir Ali Shah	Deputy Director (Curri)

Composed by: Mr. Zulfiqar Ali, HEC, Islamabad

CONTENTS

PREFACE

The curriculum of subject is described as a throbbing pulse of a nation. By viewing curriculum one can judge the stage of development and its pace of socio-economic development of a nation. With the advent of new technology, the world has turned into a global village. In view of tremendous research taking place world over new ideas and information pours in like of a stream of fresh water, making it imperative to update the curricula after regular intervals, for introducing latest development and innovation in the relevant field of knowledge.

In exercise of the powers conferred under Section 3 Sub-Section 2 (ii) of Act of Parliament No. X of 1976 titled **"Supervision of Curricula and Textbooks and Maintenance of Standard of Education"** the erstwhile University Grants Commission was designated as competent authority to develop review and revise curricula beyond Class-XII. With the repeal of UGC Act, the same function was assigned to the Higher Education Commission under its Ordinance of 2002 Section 10 Sub-Section 1 (v).

In compliance with the above provisions, the HEC undertakes revamping and refurbishing of curricula after regular intervals in a democratic manner involving universities/DAIs, research and development institutions and local Chamber of Commerce and Industry. The intellectual inputs by expatriate Pakistanis working in universities and R&D institutions of technically advanced countries are also invited to contribute and their views are incorporated where considered appropriate by the National Curriculum Revision Committee (NCRC).

A committee of experts comprising of conveners from the National Curriculum Revision of HEC in Basic, Applied Social Sciences and Engineering disciplines met in April 2007 and developed a unified template to standardize degree programs in the country to bring the national curriculum at par with international standards, and to fulfill the needs of the local industries. It also aimed to give a basic, broad based knowledge to the students to ensure the quality of education. The new BS degree shall be of 4 years duration, and will require the completion of 130-136 credit hours.

In line with above, NCRC comprising senior university faculty and experts from various stakeholders and the respective accreditation councils has finalized the curriculum for B-Tech. The same is being recommended for adoption by the universities/DAIs channelizing through relevant statutory bodies of the universities.

PROF. DR. ALTAF ALI G. SHAIKH
Member Academics

June 2010

Abbreviations Used:

NCRC. National Curriculum Revision Committee

VCC. Vice-Chancellor's Committee

EXP. Experts

COL. Colleges

UNI. Universities

PREP. Preparation

REC. Recommendations

LI Learning Innovation

R&D Research & Development Organization

HEC Higher Education Commission

MINUTES OF THE MEETING

A meeting of NCRC was held at HEC RC Lahore from 31st May to 2nd June, 2010. Following attended the meeting: -

Engr. Hafiz Zubair Khan Associate Professor Govt. College of Tech, Peshawar	Convener
Muhammad Shafiq Durrani Associate Professor (Civil) Government College of Tech, Rasul	Member
Dr. Muhammad Javed Assistant Professor NWFP UET Department of Civil Engg NWFP Engg. University Peshawar	Member
Mr. Nadeem Waris Senior Instructor (Civil) Govt. College of Tech S.I.T.E. Karachi	Member
Dr. Asif Ahmed Shaikh Associate Professor NED University of Engg and Tech University Road Karachi	Member
Agha Zafarullah Pathan Professor Department of Electrical Engg Mehran University of Engg. Tech, Jamshoro	Member
Engr. Ghulam Rasool Maka Assistant Professor (Electrical) Govt. College of Technology, SITE, Karachi.	Member
Dr. Saad Ahmed Qazi Associate Professor (Electrical) NED University Engg & Tech University Road Karachi	Member

Engr. Badshah Munir Associate Professor Govt. College of Technology Kohat Road Peshawar	Member
Engr. Muhammad Rafiq Assistant Professor (Electronics) Dy. Director, (Technical) Directorate of Higher & Technical Education (Baluchistan)	Member
Dr. Khalil-ur-Rehman Dayo Assistant Professor Deptt. Of Electronics Mehran University of Engg. Tech Jamshoro	Member
Engr. Muhammad Ali, Principal, Govt College of Technology, Faisalabad	Member
Engr Muhammad Ajmal Associate Professor GCT, Peshawar	Member
Engr. Abdul Wahab Assistant Professor (Mechanical) Govt College of Tech Quetta	Member
Mr. Saeed Ahmed Abbasi Senior Instructor Govt College of Tech Multan	Member
Ms. Farida Memon, Deptt of Electronic Mehran University of Engg Tech Jamshoro	Member
Engr. Hamid Khusro Khan Asst Professor Govt College of Tech S.I.T.E Karachi	Member
Engr. M. Shafi Kashif Department of Electronics Govt. College of Technology, Faisalabad.	Member

Dr. Abdul Qadir Associate Professor NED University of Engineering & Technology University Road Karachi.	Member
Engr. Muhammad Khalid Mahmood, Head of Department (Electrical) Government College of Tech. Lahore	Member
Engr. Muhammad Ramzan Tabbassum Assistant Professor, Govt. College of Technology, Railway Road, Lahore.	Member
Engr. S. Kashif Ali, Dy. Manager (Tech) TEVTA Secretariat Lahore	Member
Engr. Muhammad Iqbal Atif, Chief Instructor, Swedish Pakistani Institute of Technology, Gujrat	Member
Engr. Inayatur-Rehman, Associate Professor, Mech. GCT Peshawar.	Member
Engr. Dr. Nasir M. Khan Additional Registrar, PEC, Islamabad	Member
Engr. Azhar Iqbal Shad Principal, Govt College of Technology Sahiwal	Secretary / Member

On 31st May meeting was started with the recitation of Holy Quran. All the participants were welcomed by Mr. Muhammad Javed Khan, Advisor (Academics). Engr. Hafiz Zubair Khan was unanimously selected as convener and Engr. Azahar Iqbal Sahd as Secretary. After the introduction of participants Ms. Ghayyur Fatima Director Curriculum Islamabad (Coordinator of Committee) told the participants that 3+1 scheme of study i.e. three years schooling and one year training program has been considered by HEC and PEC and a long deliberation was held among the officers of PEC and HEC

on the issues. However as per HEC requirement and international recognizing agencies it was felt that at least 2/3 courses may be added in the 4th year to fulfill the requirement of academic period of 4 years program.

After long deliberation it was decided that as B.Tech Program is being run annually therefore, the committee will work on the basis of contact hours for each course.

Participant asked to clarify the status of different 4 years program started by different universities such as UET Lahore (B.S Program) also some universities have started B.Tech program at weekend i.e. Saturday and Sunday only. Mr. Javed Khan Advisor (Academic) assured that recognition of program by HEC is necessary by each institute.
After discussion participants were divided into four groups which were as under: -

NCRC Sub-Committee for BTech Electrical Technology, 2010

1. Engr. Badshah Munir, Convener
   Associate Professor, GCT, Peshawar
2. Engr. Agha Zafarullah Pathan, Member
   Professor, MUET, Jamshoro
3. Engr. Ghulam Rasool Maka, Member
   Assistant Professor, GCT, Karachi
4. Engr. Muhammad Khalid Mahmood, Member
   Chief Instructor, GCT, Raiwind Road, Lahor
5. Dr. Saad Ahmed Qazi, Secretary
   Associate Professor, NED UET, Karachi

NCRC Sub-Committee for B.Tech Mechanical Technology, 2010

1. Engr. Muhammad Ajmal, Associate Professor Convener
   Government College of Technology, Peshawar
2. Engr. Muhammad Ali, Principal Member
   GCT Faisalabad
3. Engr. Inayatur-Rahman, Associate Professor Member
   GCT Peshawar
4. Engr. Abdul Wahab, Assistant Professor, Member
   GCT Quetta
5. Engr. Muhammad Iqbal Atif, Chief Instructor Member
   Swedish Pakistani Institute of Technology, Gujrat
6. Engr. Muhammad Ramzan Tabassum,
   Assistant Professor, Secretary
   Government College of Technology
   Railway Road, Lahore

Members of Sub-committee for B-Tech in Civil Technology group

1. Engr. Nadeem Warsi — Convener
   Sr. Instructor (Civil) GCT, Karachi.
2. Dr. Muhammad Javed — Member
   Assistant Professor NWFP UET, Peshawar
3. Hafiz Zubair Khan, — Member
   Associate Professor, GCT, Peshawar
4. Dr. Asif Ahmed Shaikh, — Member
   Associate Professor, NEDUET Karachi.
5. Engr. Azhar Iqbal Shad — Member
   Principal, GCT, Sahiwal
6. Engr. Syed Kashif Ali Shah Bukhari — Member
   Deputy Manager (Technical) TEVTA Secretariat, Lahore
7. Engr. Muhammad Shafiq Durrani — Secretary
   Associate Professor, GCT, Rasul.

Members Sub-Committee for B.Tech IN Electronic Group

1. Engr. Farida Memon, — Convener
   Assistant Professor,
   Dept of Electronic Engineering,
   Mehran University of Engg. & Tech.,
   Jamshoro.

2. Dr. Abdul Qadir — Member
   Professor, Dept. Of Electronics
   N.E.D Karachi

3. Engr. Muhammad Rafiq, — Member
   Associate Professor, Electronics Dept., Govt. College of Technology,
   Quetta.

4. Engr. Saeed Ahmed Abbasi, — Member
   Chairman, B-Tech Dept.,(Electronics),
   GCT,Multan

5. Engr.Khusro Hamid Khan — Member
   Assistant Prof Dept. of Electronics, GCT Site
   Karachi.

6. Engr. Mohammad Shaffi Kashif — Member
   G.C.T Faisal abad

7. Dr.Khalil Ur Rehman Dayo, Secretary
   Assistant Professor
   Dept of Electronic Engg:
   Mehran University of Engg. & Tech.,
   Jamshoro

On 2nd day, meeting was started with recitation of Holy Quran and participants were briefed by Dr. Nasir A. Khan from PEC Islamabad, the participants started working on development of course content and finalizing the scheme of studies in their respective group.

A presentation meeting about scheme of studies was held 12:30 p.m. to create uniformity in scheme of studies. Ms. Ghayyur Fatima and Dr. Nasir discussed and finalized the scheme of all groups developing their course content till 06:00 p.m.

On 3rd Day the groups worked on finalization of content of different courses and a meeting was held at 01:30 p.m. to assemble the three day work. Following recommendation were suggested by participants.

1. After finalizing of curriculum, HEC must stop the different B.Tech / B.S. Programs being run by different institutions immediately to ensure the uniformity of technical education at graduation level.

2. All the implementing authorities may be directed to provide all the physical infrastructure and human resources before implementation.

3. It is strongly felt that the faculty associated with the B.Tech education needs serious support for their up-gradation (qualifications and pay-scales) – since these institutions are affiliated with Universities of Engg. & Tech. The HEC should therefore offer incentives such as scholarships, training opportunities and provisions for postgraduate studies on priority basis in this regards.

4. HEC should request the provincial authorities to upgrade the BPS of college teacher to bring them at par with university as well as Federal college's teachers.

Minutes of the meeting

A special meeting of NCRC for 4-years B.Tech Program was held on 12-13/07/2010, the conveners and secretaries of four subcommittee were called to finalize the courses details for four disciplines i.e.

1. Electrical Technology
2. Mechanical Technology
3. Civil technology
4. Electronic Technology

Meeting was started with the recitation of Holy Quran by Mr. Nadeem Warsi. Ms. Ghayyur Fatima, Director, Curriculum explained the purpose of the meeting i.e. to finalize the work done in previous meetings held on 28-30/05/2009 and 31-05-2010 to 02-06-2010 of the revised curriculum for B.Tech 4 years program.

SCHEME OF STUDIES
FOR BACHELOR ELECTRONIC TECHNOLOGY
(2010)
Duration: 4 Years

1st Year
Contact Hours: 1404

S. #	Course Title	Course code	Nature	T	P	Contact hours	Marks Th	Marks Pr
1	English-I	HS112	(Humanities/ English)	2	0	2	100	0
2.	Islamic/Pak Studies	HS122	(Humanities/ Culture)	2	0	2	100	0
3.	Applied Physics	MS133	(Natural Science/ Physics)	2	3	5	100	50
4.	Introduction to Computers	EL143	(Eng: Foundation/ Eng: Fundamentals)	2	3	5	100	50
5.	Electronic Devices & Circuits	EL153	(Eng: Foundation/ Eng: Fundamentals)	2	3	5	100	50
6.	Electrical Technology	EL163	(Eng: Foundation/ Eng: Foundation-I)	2	3	5	100	50
7.	Math-I	MS173	(Natural Sciences/Math)	3	0	3	100	0
8.	Digital Logic & Design	EL183	(Eng: Foundation/ Eng: Foundation-II)	2	3	5	100	50
9.	Instrumen-tation & Measurement	EL193	((Major Based/Breadth)	2	3	5	100	50
10	Professional Ethics	HS102	(Humanities/Social Sciences)	2	0	2	100	0
	Total			**21**	**18**	**39**	**1000**	**300**

2nd Year
Contact Hours: 1404

S. #	Course Code	Course Title	Nature	T	P	Contact hours	Marks Th	Marks Pr
1	HS212	English-II	(Humanities/ English)	2	0	2	100	0
2.	EL223	Amplifier & Oscillators	(Major Based/Breadth)	2	3	5	100	50
3.	EL232	Communication Systems	(Major Based/Breadth)	2	3	5	100	50
4.	EL243	Math-II	(Natural Sciences/Math)	3	0	3	100	0
5.	EL252	Control Technology	(Eng: Foundation/ Eng: Foundation-III)	2	3	5	100	50
6.	EL263	Computer Programming	(Computing/Programming)	2	3	5	100	50
7.	EL273	Electrical Circuits & Analysis	(Eng: Foundation/ Eng: Foundation-IV)	2	3	5	100	50
8.	EL282	Electromagnetic Field Theory	(Major Based/Breadth)	2	0	2	100	0
9.	EL292	Probability & Random Signals	(Eng: Foundation/ Probability methods in Eng:)	2	0	2	100	0
10	EL203	Industrial Electronics	(Eng: Foundation/ Eng: Foundation-V)	2	3	5	100	50
		Total		**21**	**18**	**39**	**1000**	**300**

3rd Year
Contact Hours: 1368

S. #	Course code	Course Title	Nature	T	P	Contact hours	Marks Th	Marks Pr
1.	EL313	VLSI Technology	(Major Based/Depth)	2	3	5	100	50
2.	EL323	Microprocessors & microcontrollers	(Major Based/Breadth)	2	3	5	100	50
3.	EL333	Signals & Systems	(Major Based/Depth)	2	3	5	100	50
4.	EL343	Power Electronics	(Major Based/Depth)	2	3	5	100	50
5.	EL353	FPGA Based System Design	(Major Based/Depth)	2	3	5	100	50
6.	EL363	Automation and Robotics	(Major Based/Depth)	2	3	5	100	50
7.	EL373	Antenna & wave Propagation	(Major Based/Depth)	2	3	5	100	0
8.	EL38X	Mini Project		0	3	3	0	50
		Total		**14**	**24**	**38**	**700**	**350**

4th Year
Contact Hours: 916

S. No	Course Code	Course Title	Nature	T	P	Contact Hours	Marks Th	Marks Pr
1	HS411	Occupational health safety and Environment	(Humanities/ Social Sciences)	1	0	1	100	0
2	MG421	Industrial Management	(Management Sciences)	1	0	1	100	0
3	EL43X	Supervised Industrial Training	Internship	0	36	36	0	600
		Total		**2**	**36**	**38**	**200**	**600**

4th Year Cont..

Supervised Industrial Training (Contact Hours: 38 hrs x 36 wks = 1368 hrs)

The students shall undergo supervised industrial trainings (Minimum period of 12 weeks).

The students are required to submit monthly progress reports to the institute duly verified by their industrial supervisor.

The institute is responsible to liaison fortnightly with all industrial supervisors to check the student's performance.

At the end of the training, the students are required to submit a detailed report to the institute and undergo viva voce examinations.

Summary:

Non Technical Courses = 09 30%
Technical Courses = 21 70%

Domain	Knowledge Area	Total courses	% Overall
Non-Technical	Humanities	5	30
	Management Sciences	1	
	Natural Sciences	3	
	Sub Total	09	
Technical	Computing	2	70
	Engineering Foundation	8	
	Major Based (Breadth)	5	
	Major Based (Depth)	6	
	Sub Total	21	
Total		**30**	**100**

Proposed Calendar

Teaching	36 weeks
Preparation and Examination	8 weeks
Vacations	8 weeks
Total	**52 weeks**

DETAIL OF COURSES

1st YEAR

EL-143 INTRODUCTION TO COMPUTERS

T P C
2 3 5

Aims:
Progressive learning of old to current models of computers and accessories.

Objective:
To assemble or disassemble computers and plug-in devices Enable students to design an optimal computer system environment as per need of customer. Pros and cons of computer business and applications.

Course Outline:
History, classification, social impact of computer age, computers in office, industry and education; basic components, CPU, memory, peripheral devices, storage media and devices, physical and logical storage, data organization, file storage; programs and software; software utilities; types of software, system software and application software, Office Suit, Disc Manager, Windows Tools (Check Disc, De-Fragmentation, Backup) Software Installation procedure, Internet Services; Operating System, Concept of Operating Systems, Types of Operating System; Introduction to basic programming techniques with emphasis on program control structures, data types, functions, data structures.

Lab Outline:
1. Basic machines organization including motherboard, memory, I/O cards, networking devices
2. Use of flow charts
3. Computer peripheral devices
4. Operating Systems
5. Familiarization of MS-DOS commands
6. Microsoft Windows
7. Office Tools & Overview of different browsers
8. Programming Language

Recommended Books:

1. Patrick G.Mckeown, “Living with Computers”, 4th Edition.
2. B.S.Choudhry, A.R.Memon, “Compupedia: The Art of Living with Computer Technology”, .
3. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Seventh Edition.
4. Peter Norton, “Computers”, Latest Edition.

EL-153 ELECTRONIC DEVICES & CIRCUITS

T P C
2 3 5

Aims:

Diodes and transistors are the building blocks of every electronic and communication system. The aim of this subject is to provide the knowledge about the construction and working of basic electronic devices. Good knowledge about this subject will enable students to built large systems successfully.

Objectives:

The course is intended to provide the knowledge about:

- Commonly used semiconductors and formation of PN junction.
- Working of semiconductor diode.
- Construction, working and applications of Bipolar Junction transistors.
- Construction working and applications of field effect transistors.

Course Outline:

Insulators, semiconductors and metals, mobility and conductivity, intrinsic and extrinsic semiconductors and charge densities in semiconductors, current components in semiconductors; PN Junction diode, characteristic and analysis; types of diodes, Zener diodes, Photodiodes, Light emitting diodes (LED's), Varactor diodes and tunnel diodes; rectifiers and filter circuit: Half wave, full wave and Bridge rectifier circuits, Clappers and Clampers circuits, L, C and Pi filters; Basic regulator supply using zener diode; Transistors, construction and characteristics of bipolar junction transistors (BJT's), Comm-Base, Comm-Emitter, Comm-Collector configuration, Transistor at low frequencies, small signal low frequency transistor model (h-parameters); analysis of transistor amplifier circuit using h-parameters; transistor biasing and bias stabilization, the operating point, stability factor, transistor as a switch; Field Effect Transistors, construction and characteristics of JFET, JFET biasing circuits, JFET amplifier, MOSFET construction and characteristics.

Lab Outline:

1. Characteristics of PN junction Diode
2. Rectifiers-half wave
3. full wave rectification
4. Bridge with and without filter- ripple factor and regulation
5. Clipping and clamping circuits
6. Characteristics of Transistors (CE , CB & CC)
7. Characteristics of FETs & MOSFETs

8. RC Coupled (CE) amplifier using transistors -frequency response characteristics
9. FET amplifier (CS) - frequency response characteristics.

Recommended Books:

1. Electronics Devices and circuits by Millman & Halkias.
2. Electronics devices and circuit theory by Robert Boylestad
3. Electronics Devices and circuits by P.John Paul
4. Electronics Devices and circuits by Y.N.Bapat.
5. Electronics devices and circuit by G.K. Mittal

EL-163 ELECTRICAL TECHNOLOGY

T P C
2 3 5

Aims:

To give adequate knowledge & clear understanding about the basic concept of electrical technology.

Objectives:

On completion of this course the students will be able to:

- Understand the concepts of Electromagnetism and Electrostatics.
- Apply and understand the Inductance in simple DC Circuits.
- Explain the two and three-phase circuits.
- Describe the relationship between the line and phase voltage, relationship between line and phase current in three phase circuits of star and delta connections.

Course Outline:

Magnetic Circuits: Transformers, constructional details, principles of operation of emf equation-phasor diagram on load, equivalent circuit, regulation, losses and efficiency; methods of cooling, OC and SC test determination of equivalent circuit; Autotransformers, Instrument transformers; DC Generators, constructional details, principle of operation, performance characteristics and applications; DC Motors, production of torque, shunt, series and compound motors, performance characteristics, applications, methods of speed control; DC servomotors, principle of operation, characteristics and application; Stepper motors; Single phase induction motor, types, characteristics and applications, three phase induction motor, constructional details, production of torque ; Starters, star delta and rotor resistance types; Methods of speed control, stator voltage, V/f control; Losses and efficiency; No load and blocked rotor tests; Alternator, constructional details, emf equation, phasor diagram on load, concept of regulation; Synchronous motor; Measurements of power and

energy in single and three phase system; Electric heating, resistance furnaces and ovens, methods of temperature control, electric arc furnaces and induction furnace, high frequency heating , induction and dielectric heating, applications.

Lab Outline:

1. Load test on single phase Transformer
2. Open circuit and Short circuit Test on Single phase transformer
3. Load test on step-up/step-down transformer
4. Calculation of efficiency and regulation at different power factors
5. Speed Control of DC Shunt motor.
6. Load test on DC shunt generator
7. Open circuit characteristics of DC generator
8. Synchronization and parallel operation of Alternators
9. Load Test on single phase Induction motor
10. Study of stepper and servomotors.

Recommended Books:

1. B.L.Theraja, A.K.Theraja - A text book of Electrical Technology, Vol. 2, S.Chand & Co.
2. Partab - Art and Science of Utilisation of Electric Energy: Dhanpath Rai & Sons.
3. Metha V.K.- Principles of Electrical Engineering and Electronics, S.Chand & Co.
4. Edward-Hughes- Electrical Technology.

EL-183 DIGITAL LOGIC & DESIGN

T P C
2 3 5

Aims:

This course is a comprehensive study of the principles and techniques of modern digital systems.

Objective:

- To provide the students a basic understanding of the Digital Electronics (Digital systems and circuits).
- To provide the student a pre-requisite background for future studies in microprocessors and microcomputer interfacing.

Course Outline:

Number systems & Codes ; Binary, Octal, Hexadecimal number systems and their inter-conversion; Binary Arithmetic (Addition, Subtraction, Multiplication and Division); Error detection and correction; Boolean Algebra, basic theorems and properties of Boolean Algebra, Boolean functions,

Canonical and Standard forms; Digital Logic Gates; Various logic families, like TTL and CMOS, working and their characteristics; Combinational Logic Design ; The K-map method, two, three, four and five variable maps ; Sum of products and Product of Sums simplification, NAND and NOR implementation; Ex-OR and EX-NOR functions; MSI circuits: Binary adder and subtractor, comparators, decoders, BCD-to-Seven segment decoder/drivers, seven-segment displays, encoders, code converters, multiplexers, de-multiplexers; Introduction to Sequential logic, S-R Flip-flops, JK flip-flop, D flip-flop, T flip-flop, master slave flip-flops; Classification of sequential circuits, registers, A to D and D to A converter circuits, Counters; Semiconductor memories, introduction, memory organization, classification and characteristics of memories.

Lab Outline:

1. Verification of truth tables of logic gates
2. TTL & CMOS characteristicsLogic family interconnection (TTL to CMOS & CMOS to TTL)
3. Arithmetic circuits
4. Half adder
5. Full adder
6. adder/subtractor
7. Combinational logic design using decoders
8. Encoders
9. MUXs & DEMUXs
10. Comparators with gates and ICs
11. Code converters and parity circuits using basic gates
12. BCD to Decimal
13. BCD to 7 segment decoder
14. Flip flop circuits (RS latch, D, JK and Master Slave) using basic gates and ICs
15. Design and verify the operation of shift registers and counters using flip flops and ICs

Recommended Books:

1. Morris Mano, Digital Design, Prentice Hall of India.
2. Thomas L. Floyd & R.P Jain, “Digital Fundamentals”.
3. Ronald J. Tocci, Neal S. Widmer, “Digital Systems Principles and Applications”.
4. William Kleitz, “Digital Electronics Practical Approach”.

EL-193 INSTRUMENTATION & MEASUREMENTS

T P C
2 3 5

Aims:
To understand the basic principles of measurement. To understand the principles of basic component and instruments used in electronics.

Objective:
- To understand the basic factors involve in measurement & designing of Electronic Systems.
- To understand the basic functions & the applications of transducer/sensors.

Course Outline:
Precision measurements terminologies: including resolution, sensitivity, accuracy, and uncertainty; principles of different measurement techniques; instruments for measurement of electrical properties, pressure, temperature, position, velocity, flow rates (mass and volume) and concentration; systems for signal processing and signal transmission; modern instrumentation techniques; static and dynamic responses of instrumentation and signal conditioning; principles of operation, construction and working of different analog and digital meters, oscilloscope, recording instruments, signal generators, transducers and other electrical and non-electrical instruments; types of bridges for measurements of resistance, inductance and capacitance; power and energy meters; high voltage measurements.

Lab Outline:
1. Design, construction and analysis of measurement circuits
2. Measurement of electrical parameters using different lab instruments
3. calibration of measurement instruments
4. Use of simulation and instrumentation languages (Lab VIEW).

Recommended Books:

1. Klaas B. Klaassen and Steve Gee, “Electronic Measurement and Instrumentation”.
2. Cooper, W.D, “Electronic Instrumentation and Measurement Techniques”.
3. Herrick, “Instruments and Measurements for Electronics”.
4. Gregory, B.A., “An Introduction to Electrical Instrumentation”.

2nd YEAR

EL-223 AMPLIFIERS & OSCILLATORS

T P C
2 3 5

Aims:
To design systems and circuits using analog techniques.

Objective:
- The students should be able to design the small modules that include amplifier at input and output side with load.
- To use Feedback circuits to stabilize gain, improve impedances, reduce noise & distortion, bandwidth increment etc.
- Familiarization of oscillator circuits used in many applications.

Course Outline:
Amplifier Fundamentals: Gain calculation, system analysis, single stage BJT and FET Amplifiers, frequency response; practical amplifier considerations, input and output impedance, real and apparent gain, amplifier loading, impedance matching of amplifiers; Power Amplifiers, classes of Power amplifiers, Power efficiency and dissipation, harmonic distortion; Tuned Amplifiers; coupling of tuned amplifiers; Feedback Amplifiers, general feedback concepts, voltage feedback amplifiers, current feedback amplifiers, effect of feedback on frequency response, series and shunt feedback amplifiers, effect of feedback on non-linear distortion and noise; The transistor amplifier at high frequency; Step response of high frequency amplifiers; Multi-stage transistor amplifiers; Oscillators, Hartley oscillators, Colpitt oscillators, RC phase shift oscillators, Wein-Bridge oscillators, Crystal oscillators based on BJT and FET.

Lab Outline:
1. Single stage BJT/FET amplifier
2. 2 stage RC coupled amplifier – Frequency response
3. Cascade amplifier – Frequency response
4. Power amplifiers (transformer less)- Class B and Class AB,
5. Measurement of Power;
6. Tuned amplifiers- frequency response
7. Feed back amplifiers (current series, voltage series)- Gain and frequency response
8. Phase shift oscillator using BJT/FET, Hartley / Colpitts oscillator using BJT/FET, Crystal oscillator.

Recommended Books:

1. Cirovic, M.M., “Basic Electronic Devices, Circuits and Systems”, Prentice-Hall.
2. Hayt and Neudeck, “Electronic Circuit Analysis and Design”, Houghton Mifflin Co., Boston.

EL-233 COMMUNICATION SYSTEMS

T P C
2 3 5

Aims:

In this course the fundamental techniques of analog and digital communications and systems are studied.

Objective:

The objectives of this course are:

- To provide the students a basic understanding of the Communication Systems.
- To develop technical expertise in various modulation techniques.

Course Outline:

Various frequency bands used for communication ; types of communication and need of modulation; Modulation techniques: introduction to AM, FM and PM, frequency spectrum of AM waves, representations of AM, power relation in AM waves, need and description of SSB, suppression of carrier, suppression of unwanted side bands, Independent side band system, vestigial side band system, mathematical representation of FM, frequency spectrum of the FM waves, Phase modulation, comparison between analog and digital modulation, wide band and narrow band FM, Sampling theorem, frequency division multiplexing and time division multiplexing; AM Transmitters; AM Receivers; FM Transmitters; FM receivers; Basic concepts of digital modulation techniques; Telephony and Television; Radar, half duplex and full-duplex transmission.

Lab Outline:

1. Study of different modulation techniques
2. Amplitude modulation
3. Frequency and pulse modulation
4. Study of demodulation techniques
5. Examine the main parameters of the single sideband modulation
6. Check the use of filters to generate the SSB
7. Demodulation of SSB signals using product/synchronous detection;
8. Familiarization of Digital modulation and demodulation
9. Examine the operation of RF(Radio Frequency) transmitter

10. Examine the operation of AM-RF (Radio Frequency) transmitter
11. Examine the operation of SSB-RF (Radio Frequency) transmitter
12. Examine the operation of RF (Radio Frequency) receiver
13. Study of super heterodyne AM receiver and measurement of sensitivity
14. Experimental modules for FDM, TDM and PCM
15. MATLAB/SIMULINK modeling and simulation of a simple transceiver.

Recommended Books:

1. Electronic communication Systems by George Kennedy.
2. Principle of Communication Systems by Taub and Schilling.
3. Electronic Communication System by Tomasi.
4. Electronic communication Systems by Dennis Roddy and John Coolen
5. F.C. Jordan & B.C.Balmann, "Electromagnetic waves & radiating System", P.H.I.

EL-253 CONTROL TECHNOLOGY

T P C
2 3 5

Aims:

This course has been designed to introduce the students with basic theory of Control Technology.

Objective:

After completion of this course, students should be able to:

- Derive mathematical methods of simple physical systems.
- Represent control systems using block diagrams, and state space representation.
- Perform transient and steady state analysis.
- Construct Bode diagram and Nyquist plots.
- Check stability, controllability and obervability of control systems.

Course Outline:

Introduction to control systems, history, components of a control system, examples of control system application; open loop and closed loop control systems; block diagrams; signal flow graphs; introduction to modeling; formation of differential equations of electrical, mechanical and other systems, transfer functions; standard test signals, natural frequency and damping ratio, steady-state and transient response of first and second order systems; types and analysis of feedback control systems; stability, Routh's stability criterion, Root locus techniques, Bode plots, Nyquist stability criterion, gain and phase margins; introduction to state-space concepts and design techniques, formation and solution of state equations, eigen values and eigen vectors ; PD, PI and PID controllers.

Lab outline:

1. Study the MATLAB Control System toolbox
2. Study MATLAB SIMULINK toolbox for simulation of control system design
3. Time domain and frequency domain response using MATLAB simulation of step response and impulse response with unity feedback
4. Determination of transfer function, root locus, Bode plot and Nyquist plot using MATLAB
5. Determination of PI, PD and PID controller action of first-order simulated process.

Recommended Books:

1. K.Ogata: Modern Control Engineering, Prentice Hall of India, New Delhi, 4th ed., Pearson Education, 2002.
2. Norman S Nise : Control System Engineering, Addison Wesley.
3. Benjamin C. Kuo: Automatic Control Systems, 7th Edn. Prentice Hall of India, New Delhi

EL-263 COMPUTER PROGRAMMING

T P C
2 3 5

Aims:

Learning step-by-step processing of computer applications, learning of C++ at application level in devising solution of problems.

Objective:

Familiarizing computer processing:

- Compile variety of programs in text-user-interface computer language.
- Enable to differentiate structured and non-structured computer languages.
- To improve Basic Programming Skills.

Course Outline:

Object Oriented Programming v/s Structured Approach, comparison of C++ programming with other languages, Difference between traditional development process and C++ programming development process, history & features of C++ Programming.

Basics of C++ Programming: Constants and variables; Keywords; Identifiers; Variable types; Data types; Format specifiers, Escape Sequence; Operators; if statement, If-else statement, switch statement, Goto statement, for loop, nested for loop, while Loop, Do- while loop; Functions, Difference between Pre-Defined/Standard Function and user Defined Function, using more than one Function, Use of External Variable, Prototype, Function that return a

value; Arrays, Arrays as Function arguments, strings, Null character, string Functions; Pointers, Pointers and arrays, Pointers arithmetic, Pointers and strings; Structures, Nested structures, Arrays structures. Object Oriented programming concepts, objects and classes, Encapsulation, Inheritance, Polymorphism.

Lab Outline:

1. Study the Integrated Development Environment for C++ language
2. Basic structure of C program
3. Programming Experiments in C++ Programming
4. Experiments in C++ to cover operators
5. Control structures, functions, arrays and strings, structures, pointers, classes, inheritance, polymorphism.

Recommended Books:

1. Lafore R, "Object-Oriented Programming in C++," Prentice Hall Latest Edition, ISBN: 0-672-32308-8.
2. Schildt. H, "C++: The Complete Reference", McGraw-Hill Latest Edition, ISBN: 007148860X.
3. Deitel D, "C++: How to Program, Prentice Hall, Latest Edition.

EL-273 ELECTRICAL CIRCUITS & ANALYSIS

T P C
2 3 5

Aims:

To give adequate knowledge & clear understanding about the concept of Electrical Circuits.

Objective:

On completion of this course the students will be able to:

- Understand the concepts of Electrical Circuits of AC & DC.
- Discuss various concepts of Theorems. Draw the equivalent circuits.
- Apply and understand the Inductive, capacitate and resistive circuits in series and in parallel.
- Determine the steady state and transient circuits.
- Explain the exponential, sinusoidal excitations and their responses.

Course Outline:

Introduction; Basic two terminal circuit elements; Ohm's law, Kirchoff's Laws; definitions of Branch, Loop, Node; linearly independent (KCL and KVL) equations; Elementary network topology, Nodal and Loop analysis by systematic application of KVL and KCL; series and parallel connections of two terminal circuit elements; Elementary Transient Analysis; Differential and

integral forms of circuit equations, first-order circuits, solution of single first order differential equations; second-order circuits; exponential excitation and transformed network; representation of excitations by exponential functions; driving point impedance and admittance; network theorems; linear and non-linear networks; superposition theorem, Maximum power transfer theorem, Thevenin's theorem, Norton's theorem, T-equivalent networks.

Lab Outline:

1. Study of DC series circuits,& parallel circuits
2. Kirchoff's current and voltage laws
3. Current divider theorem,
4. Voltage divider theorem
5. Network theorems; simple RLC circuits
6. Transient response of RC, RL & RLC circuits
7. Transformer operation Simulation of basic electrical circuits using PSPICE.

Recommended Books:

1. Desoor and K., "Basic Circuit Theory", McGraw-Hill.
2. Fitzgerald G. and Higganbotham, "Basic Electrical Engineering", McGraw-Hill.

EL-283 INDUSTRIAL ELECTRONICS

T P C
2 3 5

Aims:

The course aims at providing a comprehensive knowledge & understanding of Electronics in Industrial Environment.

Objective:

The main objectives of the course are:

- To give basic concepts of Industrial devices & systems to the students.
- To make students able to analyze and design modern industrial electronic based systems.

Course Outline:

Power diodes, characteristics, power diode types; diodes with RC, RL, LC and RLC loads; thyristors, characteristics, two-transistor model, thyristor types, firing circuits; power transistors, power BJT, power MOSFET, SIT and IGBT, steady state and switching characteristics of power MOS, drive requirements; silicon controlled rectifiers, principle of phase controlled converter operation; single phase and three phase semi converters, full converters, and dual converters, power factor improvements, design of

converter circuits; switch mode converters, Buck-Boost converters; derived DC converters, Fly back, forward, push pull and half bridge converters; overview of switching power supplies; basic configuration of switched mode inverters, UPS, power line disturbance and EMI filters; motor drive system; measurement of resistance, inductance and capacitance using bridges,Wheatstone, Maxwell, Megger, Q meter, Electronic multimeter, RF power meter.

Lab Outline:

1. Characteristics of power diode types
2. Thyristor characteristics
3. Ttwo-transistor model of SCR
4. Turn on and turn off methods of SCR
5. Firing circuits of SCR
6. Introduction to motor drive system
7. v/f control of induction motor
8. Measurement of resistance inductance and capacitance using bridges – Wheatstone

Recommended Books:

1. Md. H.Rashid,: Power Electronics: Circuits, Devices and Applications2/e, Pearson Education.
2. Ned Mohan et. al.: Power Electronics: Converters, Applications and Design, John Wiley and Sons.
3. P.C Sen: Modern Power Electronics, Wheeler Publishers.
4. Joseph Vithayathil: Power Electronics: Principles and Applications. Mc Graw Hill
5. Pressman: Switching Power Supply Design. Mc Graw Hill

EL-293 ELECTROMAGNETIC FIELD THEORY

T P C
2 0 2

Aims:

To study about Electromagnetic concepts and applications.

Objective:

After completion of this course the students should be able to:

- Know and understand the basics of emf theory.
- To differentiate the various types of Electromagnetic waves and their characteristics.

Course Outline:

Introduction; review of vector analysis, scalar & vector products, gradient, divergent and curl of a vector and their physical explanation; transformation amongst rectangular, cylindrical and spherical co-ordinate system;

Electrostatics: coulomb's law, electric field intensity from point charges, field due to continuous distribution of charges, gauss's law, laplace's and poison's equations; Magnetostatics:, magnetic field intensity and magneto motive force, ampere's circuital law, energy stored, Biot-savart law, vector potential, magnetic dipole; Maxwell's equations and their interpretations, boundary conditions; wave equations, sinusoidal time varying fields, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal and oblique incidence surface impedance; pointing theorem; transmission lines, Transmission line theory from the circuit concept, properties; constants; transmission line equations; standing wave ratio; impedance matching, Smith chart.

Recommended Books:

1. Electromagnetic waves & radio system by Jorden R.F.
2. Principle and applications of Electromagnetic fields by Ptonsey R and Collin R.P
3. Applied Electromagnetic by Planus M.A.

EL-203 PROBABILITY & RANDOM SIGNALS

T P C
2 0 2

Aims:

This course is a reasonably through treatment of the theory of Probability and random signals.

Objective:

Upon completion of this course the students should be able to:

- Understand the basic of probability and its importance in the design of communication system.
- Have an awareness of random signals and to analyze the principles & tools to model it random signal and noise.

Course Outline:

Set theory; basic concepts of probability; conditional probability; independent events; Baye's rule; discrete and continuous random variables; distributions and density functions, probability distributions (binomial, Poisson, normal, uniform and exponential); parameters of random variable, mean, variance, standard deviations, moments and moment generating functions; central-limit theorem; random processes, first and second order characteristics, spectral analysis, thermal noise, white noise, band-limited white noise; linear systems with random inputs; optimum linear systems, applications.

Recommended Books:

1. Peyton Z. Peeples, “Probability, Random Variables and Random Signal Principles”, Mc-Graw Hill International Edition.
2. Robert Grover Brown, “Introduction to Random Signals and Applied Kalman filtering”, John Willey and Sons.
3. Susan Milton and Jesse C Arnold, “Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences”, McGraw-Hill, ISBN: 007246836.
4. B.P.Lathi, “Modern Digital and Analog Communication Systems”, Holt, Rinehart & Winslon Series.

3rd YEAR

EL-373 ANTENNA & WAVE PROPAGATION

T P C
2 3 5

Aims:

To know Electromagnetic waves, antenna theory, radiating systems and their applications.

Objective:

After completion of this course the students should be able to:

- Know and understand the basics of Antenna theory and its types.
- To differentiate the various types of Electromagnetic waves mechanism specially TE, TM & TEM.
- Understand various modes of propagation of wave through various information.

Course Outline:

Basic antenna parameters, gain, directivity, beam solid angle, beam width and effective aperture calculations; effective height, wave polarization, antenna temperature, radiation resistance, radiation efficiency, antenna field zones, principles of reciprocity; concept of retarded potential, field and radiation resistance of a short dipole, field and radiation resistance of a half wave dipole; duality of antennas; arrays of point sources; principle and applications of V antenna, helical antenna, log periodic antenna, dish antenna and phased arrays, biconical antenna; measurement of radiation pattern, gain, directivity and impedance; radio wave propagation, modes, structure of atmosphere, characteristics of ionized regions, sky wave propagation, space wave propagation,VHF and UHF Mobile radio propagation; introduction to wave guides, waves between parallel plane, transverse electric waves, transverse magnetic waves; characteristics of TE & TM waves; velocity of propagation; attenuation in parallel plane guides; wave impedance.

Lab Outline:

1. Antenna Measurements - Gain, Directivity, Radiation Pattern of various types antennae
2. Measurement of the frequency at which the Antenna is tuned
3. Different polarization methods and their significance
4. Antenna Noise Temperature
5. Difference between Far-Field Measurements and Near-Field Measurements
6. Free Space range Ground Reflection range, compact range, radio wave characteristics
7. Direction finding methods.

Recommended Books:

1. John D. Krauss: Antennas for all Applications 3rd Edn.,TMH.
2. K.D. Prasad: Antenna and Wave Propagation., Satyaprakashan, 2000, New Delhi.
3. R.E Collin: Antennas & Radio Wave Propagation, Mc Graw Hill.
4. Terman: Electronics & Radio Engineering., McGraw Hill.
5. E.C. Jordan & K G Balmain: Electromagnetic Waves & Radiating Systems, 2nd Edn., PHI.

EL-343 POWER ELECTRONICS

T P C
2 3 5

Aims:

To provide a comprehensive knowledge & understanding of power electronic devices and systems.

Objective:

The main objectives of the course are:

- To give basic concepts of power electronic devices & systems to the students.
- To make students able to analyze and design power electronic systems.

Course Outline:

Semiconductor power switching devices; characteristics of Triac & Diac; introduction to new power semiconductor devices, power diode, power transistor, IGBT,GTO & Power MOSFET; phase controlled converters; bridge circuit with line commutation; single-phase & three-Phase full converters; 3DC Choppers, principle of Chopper operation & control strategies; Types of Choppers; inverters; dc motor speed control; basic machine equations; breaking modes, schemes for dc motor speed control; single-phase separately excited drives; breaking operation of rectifier; control of separately excited motor; single-phase series motor drives; dc Chopper drives; closed loop control of dc drives; ac drives; induction motor characteristics & principle of operation; synchronous drives.

Lab Outline:

1. Characteristics and application of various power devices (SCR, DIAC, TRIAC, UJT)
2. Wave-form of a phase control amplifier with resistive load
3. Measurement and verification of the relative to linear bipolar-transistor
4. Amplification with resistive load
5. Wave-form of a bipolar-transistor PWM amplifier with resistive load
6. Wave-forms of a PWM amplifier with power MOSFET and with a resistive load

7. DC/AC converter with Sine output with load R, load C and load L using Single Phase PWM technique
8. DC/AC converter with Sine output with load R-L, load R-C and load R-L-C using Single Phase PWM technique
9. Morgan chopper and jones chopper
10. Single Phase Half Wave & Full wave rectifier

Recommended Books:

1. Power Electronics by M H Rashid,PHI(1996)
2. Power Electronics by P S Bhimbra, Khanna Pub.
3. Power Electronics by P C Sen,TMH Edn.
4. Power Electronics by C W Lander, McGraw Hill Book Company

EL-313 VLSI TECNOLOGY

T P C
2 3 5

Aims:

To understand the analysis and design techniques of VLSI Technology.

Objective:

- Able to analysis basics of VLSI design.
- Presentation of concepts and techniques used in the fabrication of VLSI circuits.
- Integrated circuit fabrication and layout.
- NMOS and CMOS logic design.

Course Outline:

Introduction, trends & projections in VLSI circuits, flow diagram of VLSI circuit design and VLSI design issues; MOSFET fundamentals, enhancement mode MOSFETs, depletion mode MOSFETs, weak & strong inversion conditions, threshold voltage concept in MOSFETs, IV characteristics of a MOSFET; basic VLSI design styles, NMOS, CMOS process flow ; noise margin; inverter threshold voltage; NMOS inverter design and characteristics; CMOS inverter design and properties; delay , power dissipation and scaling in CMOS circuits; parallel & series equivalent circuits; static CMOS circuit design, VLSI interconnects, stick diagrams; physical design rules; high speed dynamic CMOS logic families; dynamic CMOS logic circuits, cascading , charge redistribution and clocking strategies; memory / regular structure design; ROM design, SRAM design; SPICE models.

Lab Outline:

Experiment of the lab will be based on:

1. Circuit Design using SPICE
2. Circuit Design using Modelsim, VHDL and/ or Verilog HDL.

Recommended Books:

1. S.M. Kang & Y. Leblibici, “CMOS Digital Integrated Circuits-Analysis & Design”, TMH, Ed. 2003.
2. B.G. Streetman & S. Banerjee, “Solid State Electronic Devices”, PHI.
3. K. Eshraghian & Pucknell, “Introduction to VLSI”, PHI.
5. B. Razavi, “Design of Analog CMOS Integrated Circuits”, TMH.
6. N.H.E. Weste & K. Eshraghian, “Principles of CMOS VLSI Design: A System Perspective”, McGraw Hill Pub.
7. Zainalabedin Navabi, “Verilog Computer-Based Training Course”, First Edition, 2002 McGraw-Hill.

EL363 AUTOMATION & ROBOTICS

T P C
2 3 5

Aims:

Learn the basic principles and functions of Automation & Robotics.

Objective:

- Generate interest amongst students in applying robotic tools to problems.
- Learn the basics of Transducers/Sensors, Actuators, Analyzers and Drives.

Course Outline:

Automation, introduction to automatic control system, implementation of industrial control systems; sensors, motion and position sensors, force sensors, hydraulic and pneumatic sensors, temperature sensors, light, radiation and humidity sensors; controllers, computer control, computer-process interface, digital input/output processing; speed control, pulse width modulation speed control of dc and ac motors, stepper motor control, position control friction, backlash and resilience machine tool control, remote position control; process control, pneumatic controllers, analog and digital electronic process controllers, hybrid systems; hydraulic control systems, hydraulic pumps and valves; actuators; introduction to Robotics, requirement of a robot, types of Robot, Robot hard ware; Joint arrangements; Grippers and tools; encoders; motors and control; teaching methods; path control; arm kinematics; Robot sensors and vision systems; Robot applications.

Lab Outline:

1. Transducer and its types
2. Sensors with its categories relative to input and output
3. Speed Control of AC and DC Motors
4. Stepper Motor Control

5. Robot Device, types of Robot, Robot Hard Ware; Joint arrangements, Grippers and tools
6. Encoders, Motors and Control
7. Valves and Actuators.

Recommended Books:

1. R.R. Hunter, “Automated process control systems”, Prentice Hall Inc.
2. N.M. Morris, “Control Engineering”, Mc. Graw Hill.
3. Dr. Malcolm Jr., “Robotics and introduction”, Breton Publishers.
4. W.E. Snyder, “Industrial Robots Computer Interface and Control, Prentice Hall Inc.

EL323 MICROPROCESSORS AND MICROCONTROLLERS

T P C
2 3 5

Aims:

The developments of Microprocessor technology and to become familiar with the microtechnology and building embedded systems.

Objective:

To teach:

- Simplied architecture, 8085, 8600 and 8086 microprocessors and their organization.
- Programming techniques.
- Interrupts.
- Interfacing the microprocessor to out side the world.

Course Outline:

Introduction to microprocessors, microprocessor architecture and programming techniques; structure of 8080/8085 Microprocessors and their organization, pin diagram and functions, data sheet description, interrupts, 8085 instruction set, programming techniques, addressing modes; structure of MC 6800/MC6809 microprocessor and its organization, pin diagram and functions, the 6800 instruction set, programming techniques; interfacing, interfacing with ROM & RAM, interfacing with practical I/O ports (serial and parallel); memory map and address decoding; microcontrollers, 8255A programmable peripheral interface; single board computers; intel 8051 microcontroller architecture, instruction set, timers, serial communication, interrupts, interfacing, real world applications.

Lab Outline:

1. Familiarization of 8085 trainer kit, manual code entry, simple examples
2. Study of Intel Hex file format, Computer aided assembly language program development

3. Use of assembler, linker and simulator for 89C51
4. Programming examples. Sorting, arithmetic operations (Using assembler, simulator)
5. Programming examples using Embedded 'C' compiler for 89C51
6. Programming examples using timer
7. Serial EEPROM, Interface an LED array and 7-segment display through 8255 and display a specified bit pattern/character sequence at an interval of 2 seconds
8. Interface the given microprocessor kit to a personal computer through R.S-232C. The band rate is specified

Recommended Books:

1. Tokheim R., "Microprocessor Fundamentals", Scham's Series.
2. Dotty T.L., "Fundamental Principles of Microcomputer Architecture"
3. Bishop R., "Basic Microprocessors and the 6800"
4. ZAKS R., "Microprocessor from Chips to System", SYBEX Inc.

EL-353 FPGA BASED SYSTEM DESIGN

T P C
2 3 5

Aims:

The main aim of this subject is to analyze, design & implement digital systems, using FPGA Technology.

Objective:

- Design many different application circuits using a single FPGA chip.
- FPGA is reconfigurable chip, students can redesign any digital system.

Course Outline:

Introduction, digital design and FPGA, FPGA-based system design; manufacturing process; transistor characteristics, CMOS logic gates, wires, registers and RAM, packages and pads; FPGA architectures, SRAM-based FPGAs, permanently-programmed FPGAs, circuit design of FPGA fabrics, architecture of FPGA fabrics, logic design process, combinational network delay, power and energy optimization, arithmetic logic elements; logic implementation using FPGAs, physical design (PnR) for FPGAs; synthesis process; sequential design using FPGAs, sequential machine design process, sequential design style, FSM design, ASM design**.**

Lab Outline:

1. Introduction to Verilog HDL gate-level modeling
2. Data flow modeling, behavioral modeling; design
3. Simulation, synthesis and fitting of combinational circuits
4. Design and implementation of FSM and memory

5. Verilog simulation and hardware implementation of combinational circuits such as MUX/DEMUX, encoder/decoder, arithmetic logic unit (ALU)
6. Verilog simulation and hardware implementation of sequential circuits such as flip-flops, shift registers, counters
7. Realization of simple digital circuits using VHDL
8. Familiarization of FPGA trainer kits
9. Realizations of digital circuits using FPGA.

Recommended Books:

1. Wayne Wolf, "FPGA-Based System Design," with CD-ROM, 2004, Prentice Hall, ISBN: 0131424610.
2. Samir Palnitkar, "Verilog HDL", Prentice Hall, ISBN: 0130449113.
3. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", Prentice Hall, ISBN: 0130891614.
4. Michael John Sebastian Smith, "Application-Specific Integrated Circuits", Addison Wesley, ISBN: 0201500221.

EL-333 SIGNALS AND SYSTEMS

T P C
2 3 5

Aims:

This subject presents the theoretical and practical basis for signals and systems analysis and gives students skills in using the techniques to design components for communication systems.

Objective:

This subject is intended to provide the knowledge about:

- Signal types and signal representation in time and frequency domains.
- System Modeling.
- Signal operations in the time and frequency domain.
- Discrete time signals and systems.
- Time and frequency domain performance and correlation.
- Continuous time filters design.
- System stability.

Course Outline:

Introduction, classification of signals, basic operations on signals, signal representation and models, system characteristics; time domain analysis; Sinusoidal and complex exponential signals, singularity function signals, signal energy and signal power, orthogonal signals; signal representation by generalized fourier series, continuous and discrete-time convolution evaluation and properties; frequency domain representation and

analysis;Fourier transform, energy density spectrum, power density spectrum, auto-correlation function, system frequency response, phase delay and group delay. Continuous-time filters; Distortionless transmission, ideal filters, approximation of ideal filters, Butterworth and Chebyshev filter design. Sampled Continuous – Time signals; Ideal sampling, Sampling theorem, practical sampling effects. Frequency Domain representation of Discrete-time signals; Z-transform, Inverse Z-transform, Z-transform solution of difference equations, stability of linear discrete-time systems.

Lab Outline:

1. Study of various types of signals
2. Analysis of signals
3. Fourier series analysis
4. Filter design
5. Analog-to-digital converters
6. Use of MATLAB for time-domain analysis & frequency-domain analysis.

Recommended Books:

1. Carlson G.E. “Signals and Linear System Analysis”, John Wiley & Sons, Inc.
2. Haykin S. and Veen B.V., “Signals and Systems”, John Wiley & Sons, Inc.
3. Oppenheim and Willsky, “Signals and Systems”, Prentice Hall.

EL 38- X MINI PROJECT

T P C
0 3 3

Aims:

To understand the basic structure and organization of components on the breadboard.

Objective:

- To understand the basic factors involve in designing a practical circuit
- To understand the basic functions & the applications of devices and circuits studied in theory.

4th YEAR

MG-411 INDUSTRIAL MANAGEMENT

T P C
1 0 1

Aims:
To understand the basic theory, principles and techniques of Industrial Management

Objective:
- To understand the basic factors involve in Industrial Management Systems.
- To understand the basic functions & the applications of Project Management.

Course Outline:
Introduction to management, history of management, management functions, organizational structure, types of organizations, organizational hierarchy, properties of narrow and wide organizations; production processes, types of production, scale of production, selection of technology, input requirements, capacity utilization, productivity basic concepts, classification, quantitative measurement, productivity improvement; project management, properties of projects, project life cycle, project network analysis, resource requirements, monitoring and control, computer tools; inventory management, inventory replenishment, economic lot size, re-order point, safety stock level, JIT, computer tools; human resource management, management styles, psychological types, recruitment and training, job evaluation, performance appraisal, motivation and incentives.

Recommended Books:

1. Babcock D. L. MANAGING ENGINEERING AND TECHNOLOGY, Prentice Hall, UK.
2. Zuberi M. H. INDUSTRIAL MANAGEMENT, Rabbani Printing Press, Lahore.
3. Bateman T. S. and Snell S. A. MANAGEMENT: BUILDING COMPETITIVE ADVANTAGE. Times Mirror Higher Education Group, USA.
4. Spinner M. ELEMENTS OF PROJECT MANAGEMENT. Prentice Hall, UK.

EH-421 OCCUPATIONAL HEALTH SAFETY AND ENVIRONMENT

T P C
1 0 1

Aims:
To understand the basic theory and principles of Occupational Health Safety and Environment

Objective:
- To understand the basic factors involve in Occupational Health Safety and Environment.
- To understand the basic functions & the applications of safety management techniques.

Course Outline:
Occupational health, classification of health hazards, physical, chemical and biological; sources of risk, machinery, noise, electrical failure, indoor air, poor ventilation and lighting conditions, radiation, and ergonomics, classification of dangerous substances and their toxicity; routes of entry, skin and eyes, lungs and stomach, occupational exposure limits; environmental monitoring at the work place, measurement techniques, data evaluation and analysis; safety technology; importance of safety practices, basic concepts of plant safety, safe machinery, design and guarding; mechanical handing; manual handling; access equipment, transport safety; chemical safety, electricity and electrical equipment; fire fighting techniques; construction safety; demolition; personal protective equipment; safety management techniques; accident prevention, health and safety policy, safe systems of work, first aid provisions, health and safety training, spill response protocols, accident investigation, recording and analysis, communicating safety measures, techniques of inspection, health and safety regulations at work place.

Recommended Books:

1. Mark Friend, Fundamentals of Occupational Safety and Health.
2. A Guide to the Control of Substances Hazardous to Health in Design and Construction. CIRIA Report 125. Thomas Telford Publications London. 1993.
3. F.A. Patty, Industrial Hygiene and Toxicology Vol-I: General Principles.

EL-43X SUPERVISED INDUSTRIAL TRAINING

T P C
0 3 36

Aims:

To understand the Industrial Field and its System Implementation.

Objective:

- To understand the basic factors involve in Industrial Based Systems.
- To understand the basic functions & the applications of Systems and devices studied in theory.

It will be the supervised training in the Industry.

CURRICULUM FOR BACHELOR OF CIVIL TECHNOLOGY

Working Parameters

Before deliberating on the detailed curriculum the Civil Technology Group formulated the following parameters:

a. Name of the Degree:
Bachelor of Technology (Civil)

b. Duration:
It was recommended to continue with four year duration of the course.

c. Mode of Study/Training.
In view of the practical employment of the B Tech graduates, it was felt that course content should be more practical oriented.

Following recommendations were made in thisregard:

1) The course should consist of 4 years campus study/training And OJT (sandwiched on job training). The OJT be during the last year

2) The overall theory and practical ratio will be maintained at 45(T): 55(P).

3) Student will be promoted to next year after completing the previous courses.

d. Subjects of Study:
The subjects of study will be divided in two groups namely core subjects (relating directly to technology) and allied subjects (maths, computers etc). The core and allied subjects will be included in following proportion:

Core subject	=	70 percent
Allied subjects	=	30 percent

2. Revision of Curriculum.

After formulating the above parameters, the Study Group proceeded to finalize the revision of curriculum.

Following documents were consulted for this purpose:

a. Proposed revision plan of TEVTA (Punjab).
b. Existing curriculum of B Tech at Govt. College of Technology, Hyderabad.
c. Existing curriculum of B. E. Civil Mehran University of Engg. & Technology, Jamshoro.
d. B Tech syllabus of Madras Institute of Technology (India).

e. Existing curriculum of B Tech (Hons) at Govt College of Technology, Rasul (Punjab).
f. Existing curriculum of B.Tech Four Years Programme 2004 in vogue in different institution of Khyber PakhtoonKhwan

SCHEME OF STUDIES
FOR BACHELOR OF TECHNOLOGY
CIVIL TECHNOLOGY
Duration: 4 Years

First Year B.Tech. (Civil)

S. No.	Course nature	Course name	T	P	Contact Hrs.	Marks	
						T	P
1	CS113	Applied Mathematics-I	3	0	3	150	0
2	CT122	Computer Applications	1	3	4	50	50
3	CH132	Communication Skills-I	2	0	2	100	0
4	CT144	Applied Mechanics	3	3	6	150	50
5	CT154	Civil Engineering Drawing	2	6	8	100	100
6	CT164	Concrete Technology	3	3	6	150	50
7	CT174	Surveying	2	6	8	100	100
8	CT183	Material and Methods of Construction	3	0	3	150	0
9	CH192	Islamiat and Pak Studies-I	2	0	2	100	0
		Total Hours	**21**	**21**	**42**	**1050**	**350**

Second Year B.Tech. (Civil)

S. No.	Course nature	Course name	T	P	Contact Hrs.	Marks	
						T	P
1	CS213	Applied Mathematics-II	3	0	3	150	0
2	CT223	Theory of Structures	2	3	5	100	50
3	CT234	Soil Mechanics	3	3	6	150	50
4	CT243	Fluid Mechanics	2	3	5	100	50
5	CT253	Mechanics of Materials	2	3	5	100	50
6	CT263	Highway and Transportation Engineering	2	3	5	100	50
7	CT273	Water Supply and Waste Water Management	2	3	5	100	50
8	CT283	Quantity Surveying and Contract Document	3	0	3	150	0
9	CT292	Material Testing, Repair & Maintenance	2	0	2	100	0
10	CH2102	Communication Skills-II	2	0	2	100	0
		Total Hours	**23**	**18**	**41**	**1150**	**300**

Third Year B.Tech. (Civil)

S. No.	Course nature	Course name	T	P	Contact Hrs.	Marks	
						T	P
1	CT314	Irrigation and Hydraulic Structures	3	3	6	150	50
2	CT324	Reinforced Concrete Structures	3	3	6	150	50
3	CT333	Steel Structures	3	0	3	150	0
4	CT343	Hydrology	2	3	5	100	50
5	CT352	Computer Aided Building Modeling and Design	1	3	4	50	50
6	CT364	Foundations and Pavements	3	3	6	150	50
7	CT374	Environmental Management	3	3	6	150	50
8	CT382	Engineering Geology	2	0	2	100	0
9	CT392	Introduction to Earthquake Engineering	2	0	2	100	0
10	CH3102	Islamiat and Pak Studies-II	2	0	2	100	0
		Total Hours	**24**	**18**	**42**	**1200**	**300**

Fourth Year B.Tech. (Civil)

S. No.	Course nature	Course name	T	P	Contact Hrs.	Marks	
						T	P
1	CT413	Project Management	2	3	5	100	50
2	CT423	Engineering Economics	3	0	3	150	0
3	CT432	Project	0	6	6	0	100
4	CT44X	Internship	0	36	36	0	600
		Total Hours	**5**	**45**	**50**	**250**	**750**

Guidelines for Internship

The students shall undergo supervised internship (minimum period of 32 weeks).

The students are required to submit monthly Progress Report to the institute duly verified by their Industrial supervisor.

The institute is responsible to liaison with all industrial supervisors to check the student's performance

At the end of the training, the students are required to submit a detailed report to the institute and undergo viva-voce examinations.

Summary

Non- Technological Subjects (NT)	30%
Technological Subjects (T)	70%

1. Foundation Courses (T/F) 30%
2. Breadth Courses (T/B) 30%
3. Depth Courses (T/D) 40%

DETAIL OF COURSES
FIRST YEAR B-TECH (CIVIL)

CS113 APPLIED MATHAMETICS-1 (Theory 3 Practical 0 Total 3

Objectives:

i. To review the knowledge and practice the skills acquired in diploma Courses

ii. To understand the concept and use of differential equations

iii.- To learn different methods to solve differential equations

iv.- To understand the concept of complex numbers and their applications

Description

A significant part of the course relates to the review of previous studies. The course aims at the learning of different mathematics skills and their applications in solving technical problems.

Course Outlines:

1 Review of the following
- Integral Calculus
- Differential Calculus
- Matrices and Determinant
- Vector Algebra
- Analytical Geometry

2 Introduction to Differential Equations
- Basic Concepts
- Geometric Interpretations
- Separable Equations
- Exact Differential Equations
- Linear First Order Differential Equations
- Bernoulli's Differential Equations
- Families of Curves
- Applications

3 Higher Order Differential Equations
- Homogeneous Linear Equations of Second Order
- Non- Homogeneous Equations
- Application of Higher Linear Differential Equations

4 Partial Differential Equations
- Basic Concepts
- Solution by Separable Variables

- Classification

5 Complex Numbers
- Invented Number Systems
- The Argand Diagram
- Complex Variables
- Derivatives
- Complex Series
- Applications

Text Book

1. Thomas G. B. and Finney R. L.CALCULUS AND ANALYTIC GEOMETRY (latest edition).

Reference Books

1. Kreyszig E. ADVANCED ENGINEERING MATHEMATICS. John Wiley and Sons, USA (latest edition).
2. Cohen H. L. MATHEMATICS FOR SCIENTISTS AND ENGINEERS. Prentice-Hall, UK (latest edition).

CT 122 COMPUTER APPLICATIONS **Theory 1 Prac. 3 Total 4**

Objectives:

i. To review the knowledge and practice the skills acquired in diploma Courses

ii.- To practice the use of BASIC language and Spreadsheet software in different applications

iii.- To learn the concept of CAD/CAM and related applications

iv- Familiarization with commercially available soft wares in the relevant field

Description

This course intends to enhance the knowledge of students regarding computer applications and to provide them a chance to get hands-on exposure to different general purpose and special purpose computer applications.

Course Outlines:

1 Review of the following knowledge/skill
- Electronic Data Processing
- Operating System

- BASIC language

2 Practice in using Word Processing Software
- Character and Paragraph Formatting.
- Tables and Columns
- Page Setup and Print Setup
- Inserting Objects
- Styles, Index and TOC
- Customization

3 Practice in using Spreadsheet software
- Data Types
- Entering and Editing data
- General Calculations
- Statistical Analysis
- Graphics

4. CAD/CAM Applications (Technology Related)

5. Familiarization with Commercially available softwares In the relevant field

Text Books

1. Gottfried R. S. PROGRAMMING WITH BASIC. Schaum's Outline Series (Latest Edition).
2. User's Manuals for Word Processing software, Spreadsheet software and technology specific soft wares.

Reference Books

1. Tucker A. B., Bernat A., Cupper R. D. and Scragg G. W. FUNDAMENTALS OF COMPUTING. McGraw Hill Book Company(Latest Edition).
2. IBM DICTIONARY OF COMPUTING (Latest Edition).
3. Bradley J. C. QUICK BASIC. Wm. C. Brown Publishers, USA (Latest Edition).

CH 132 **COMMUNICATION SKILLS-I** **Theory 2 Prac. 0 Total 2**

ANNEXURE -C

CT 144 **APPLIED MECHANICS** **Theory 3 Prac. 3 Total 6**

INTRODUCTION TO STATICS:

Mechanics: Basic concepts; Scalar and vector; Vector addition, subtraction and product, concept and unit of measurements of mass, force, time, space .

FORCE SYSTEM:

Force: Introduction; Two-dimensional force system; Rectangular components; Law of triangle, parallelogram, moment, couple, resultants; solution of problems.

EQUILIBRIUM:

Equilibrium in two dimensions; Equilibrium conditions; Free body diagram; solution of problems.

BEAMS:

Definition; Types of beams; Bending moment and shearing force in simply supported beams and cantilevers; Solution of problems.

GEOMETRICAL PROPERTIES OF PLANE AREA:

Introduction; Center of gravity and centroid ; Moment of inertia for an area; Parallel – Axis theorem for an area; Radius of gyration of an area; Solution of problems.

KINEMATICS OF RECTILINEAR AND CURVILINEAR MOTION:

Introduction; Displacement; Types of motion; Speed, velocity, acceleration; Equation of motion under uniform acceleration; Normal and tangent acceleration. Solution of problems.

FRICTION:

Introduction; Types of friction; Laws of solid friction; Co-efficient of friction; Solution of problems.

WORK AND ENERGY:

Work, Energy, Power, Impulse; Momentum; Simple harmonic motion and free vibration. Introduction to simple trusses and cables. Solution of problems.

Practical :

1. To determine the resultant of forces.
2. To study the law of moment and equilibrium conditions.
3. To determine the reaction of a simply supported beam.
4. To determine the tension in the simple cable.
5. To determine the reaction of a simply supported truss.

6. To determine the forces in the member of the truss.
7. To draw the shear force and bending moment diagram for one, two and three point load given in experiment no.3.
8. To study the projectile motion.

Books Recommended:

1. Hibler, RC. Engineering Mechanics, Prentice Hall.

CT 154 CIVIL ENGINEERING DRAWING Theory 2 Prac. 6 Total 8

INTRODUCTION:

Use and care of drawing instruments; standard drawing office practice; Principles of orthographic projection related to simple solids.

DESCRIPTIVE GEOMETRY:

Lines in space and in planes showing their traces and true inclination to planes of projection; Plane curves; Cycloids; Hypocycloid; Involute; Curves of interpenetration of solids; Development of surfaces; Isometric views; Shadows.

MACHINE DRAWING:

Representation of riveted joints, Screwed fastenings, Keys and cotters; Preparation of fully dimensioned working drawing of component parts of machines; Practice in reading of drawing and deduction of new views.

BUILDING DRAWING:

Introduction to architectural and structural drawings of simple buildings.

SYMBOLS AND ABBREVIATIONS:

Building materials; Electric and plumbing symbols and abbreviations.

Practical

Preparation of working drawings

Books Recommended:

1. Engineering Drawing by N.D. Butt.

CT 164 CONCRETE TECHNOLOGY Theory 3 Prac. 3 Total 6

Aims

i) To develop an understanding of the composition and behavior of plain and reinforced concrete.

ii) To understand various methods of proportioning of constituent materials for a required concrete quality.

iii) To analyze the problems of transportation, pouring, bleeding of concrete.

iv) To understand methods of curing and compaction and factors affecting strength of concrete.

v) To know the benefits of testing of concrete and to understand the procedure of quality control.

Description

This subject contains the properties and behavior of plain and reinforced concrete, the design of concrete mix and the factors affecting it. The basics of Pre-stressed concrete are also presented.

Course Outlines:

1 Concrete Properties and Its Behavior:
Properties of aggregates, cement and concrete, properties of fresh and hardened concrete, strength, elastic behavior, shrinkage and creep and durability to chemical and physical attacks. Methods of testing concrete cylinders and cubes in compression. Effects of impurities in water and in aggregates on the performance and durability of concrete. Effect of water/cement ratio upon workability and strength of concrete.

2 **Mix Design**:
Introduction to concrete cubes and cylinders. Design mix and the effect of varying proportions of the component parts. Procedure for design of concrete mix (ACI, British Standard Specifications). Laboratory and site testing for assessing the quality, performance and strength of a design mix.

3. Properties of Concrete:

Field practices and quality control, temperature, shrinkage, creep and fatigue, modulus of rupture, light weight, normal weight and heavy weight concrete, additives and admixtures, durability and workability of concrete, underwater concreting, prefabrication of concrete.

3. Pre-stressed Concrete :
Materials and their properties; Pre stressing system and anchorages; Losses of Prestress; Design of simple beam for flexure; methods of prestressing.

Practical

1. Preparation of a cement paste of Standard Consistency.
2. Determination of Initial and Final setting time of cement.
3. Determination of the consistency of a freshly mixed concrete through slump Test.
4. Determination of the Workability of a freshly mixed concrete through compacting factor test.
5. Determination of the compressive strength of concrete cube.
6. Determination of the compressive strength of concrete cylinder.
7. Comparison of cube and cylinder strength.
8. Test on modulus of rupture on beam specimens.
9. Determination of Aggregate Impact Value.
10. Sieve analysis of coarse aggregate.
11. Sieve analysis of fine aggregate.
12. Determination of fineness modulus of coarse and fine aggregate from different sources.

Books Recommended:

1. Properties of Concrete by A. M. Neville; Wiley John & Sons. (Latest Edition).
2. Design of Concrete Structures by H. Nilson, McGraw Hill. (Latest Edition).

CT 174 SURVEYING

Theory 2 Prac. 6 Total 8

Aims

i. To develop an understanding of surveying & leveling theory and practice.

ii. To develop an ability to translate survey information for design and construction purposes.

iii. To develop a skill in the use of survey instruments.

Description

The course provides an overview of surveying & leveling practice and demonstrates an understanding of area control by different survey instruments. It includes the methods of establishing the contours of an area

by field exercise and in setting out and controlling complex construction works.

Course Outlines:

1. **Survey Instruments:**
   Study and use of conventional surveying instruments and EDM devices.
2. **Triangulation and Traversing:**
   Selection of station base line measurement, computations, adjustment, plotting and detailing of triangulation. Introduction and use of Total station. Introduction to GPS.
3. **Leveling:**
   Introduction to leveling, precise leveling, profile leveling. Errors and correction in leveling, plotting long sections and cross-sections, Trignometerical leveling and contouring.
4. **Techeometry:**
   System of techeometry, applications of techeometer in surveying, computation of horizontal and vertical measurements
5. **Setting Out Works:**
   Setting out curves (horizontal and vertical), demarcation for buildings, bridges, sewer lines, route lines and tunnels.
6. **Hydrographic Surveying:**
   Introduction to hydrographic surveying and instruments, sounding methods.
7. **Astronomy:**
   Introduction to true north, latitude, longitude and time.

Practical

1. To acquaint with the minor instruments.
2. Study and use of conventional instruments & EDM surveying instruments.
3. Temporary and permanent adjustment of level and theodolite.
4. Plotting contour map of an area.
5. Traversing of an area by theodolite and total station.
6. Leveling and computation by collimation method and rise and fall method.
7. Triangulation by theodolite.
8. Setting out of Simple Circular Curve by chain and tape using method of offsets from long chord.
9. Setting out of Simple Circular Curve by chain and tape using method of offsets from the Tangents.
10. Layout of a Building using Tape.

Books Recommended :

1. Surveying Theory and Practice by R. E. Davis, J. Anderson, F.S. Foote, McGraw Hill (Latest Edition)

2. Surveying by Jack C. McCormac, (Latest Edition).
3. Schaum's Outline of Introductory Surveying by R. H. Wirshing, Roy Wirshing, James R. Wirshing, (Latest Edition).
4. Surveying: With Construction Applications by Barry F. Kavanagh, Prentice Hall. (Latest Edition).
5. Plane and Geodetic Survey Vol. I and II by David Clark. Trans-Atlantic Publications. (Latest Edition).
6. Surveying and Leveling by T.P.kanetker

CT 183 MATERIALS AND METHODS OF CONSTRUCTION

Theory 3 Prac. 0 Total 3

Aims

i) To develop an understanding of the properties, uses and behavior of the building materials, standards for material quality, various tests on materials.

ii) To develop the basic understanding of construction techniques and methods of building construction with particular reference to R.C. work, brick work, flooring, damp-proofing, roofing and stairs.

Description

The course introduces the properties, uses, behavior and quality control of building materials with special reference to bricks, tiles, lime, cement, aggregate and concrete. A basic understanding of construction techniques and methods of building construction is also included in the course. These concepts are very essential for better understanding of construction technology and design.

Course Outlines:

1. **Bricks, Blocks and Tiles:**
   Manufacture of bricks and blocks and its classifications, standard tests of bricks and blocks and characteristics of good bricks and blocks, process of manufacture of tiles. Ceramic materials.
2. **Stones:**
   Characteristics of good quality stones, dressing of building stones, properties and uses of common construction stones used in Pakistan. Location of stone queries in Pakistan.
3. **Aggregate :**
   Properties of aggregates for Roads, Railways and Concrete , Los Angeles Abrasion Test, crushing strength, gradation, soundness test for aggregates.
4. **Water, Lime, Cement & Timber:**
   Qualities of water used for concrete mixes. Tests and uses of lime.

Methods of manufacture and storage of cement in different conditions. Classification and grading of sand and its bulking, cement sand mortars used for building construction. Characteristics, properties and performance of Pakistani timber used in constructions. Seasoning and preservation of wood. Use of plywood, hard board and chipboard in constructions.

5. **Paints and Varnishes:**
   Types of paints, Composition, preparation and application of paints, varnishes and distempers in building works.

6. **Metals:**
   Characteristics and uses of Ferous and non- Ferous metals and their alloys. Composition and uses of mild steel, and aluminum in buildings.

7. **Glass and Plastics:**
   Varieties, properties and uses of glass, plastics. Properties and uses of asphalt, bitumen, rubber, asbestos and its products, plastic pipes.

8. **Masonry:**
   Bonds in brick masonry and their formation in building construction, Scaffolding and its importance in construction work. Columns, lintels and slab construction in buildings.

9. **Construction:**
   Foundation for walls and piers. Load bearing walls in brick and masonry construction, composite walls cavity construction, concrete framed structures panel walls, Reinforced concrete materials in roof and floor construction, Damp proofing of walls and ceiling. Fire resistant construction. Coffer dams construction.

Practical

1. Practicing hand tools for construction
2. Standard consistency test of cement.
3. Formation of different brick bonds
4. Formation of Standard sizes of blocks.
5. Determination of water absorption of a brick.
6. Determination of efflorescence of brick.
7. Determination of compressive strength of brick and block.
8. Determination of moisture content of wood.
9. Determination of specific gravity of wood.
10. Determination of fineness of Cement.
11. Determination of fineness modulus of various sands.

Books Recommended:

1. Materials of Construction by R. C. Smith and C. K. Andres, ISBN:

0070585040, McGraw Hill. January 1987 (Latest Edition).
2. Fundamental of Building Construction: Material and Methods, by Edward B. Allen, (Latest Edition).
3. Building Construction Vol. I to Vol. IV by Mckay (Latest Edition).
4. Building Construction by Mitchall (Latest Edition).
5. Building Construction by Huntington (Latest Edition).
6. Civil Engineering Materials by Neil Jackson (Latest Edition).
7. Construction Materials by P. D. Domone, University College, London (Latest Edition).
8. Materials of Construction by Z. H. Syed (Latest Edition).

CH 192 ISLAMYIAT AND PAK. STUDIES-I **Theory 2 Prac. Total 2**

Annexure – A&B

SECOND YEAR B.TECH. (CIVIL)

CS213 APPLIED MATHEMATICS-II **Theory 3 Prac. 0 Total 3**

Aim

To develop an understanding of the knowledge/skill of Mathematics and to apply these in Civil Engineering problems.

Description

The course provides basic understanding of differential and the integral calculus and their application in civil engineering problems. Solution of differential equations and their application is also included in the contents.

Course Outlines:

1. **Differential Calculus:**
   Concepts of limit and continuity, review of ordinary differentiation. Partial differentiation. Chain rules. Taylor and Mclaurin's series. Power series expansions of elementary functions.

2. **Integral Calculus:**
   Integration as reverse process of differentiation, techniques of integration. Definite integral.

3. **Application of Differentiation:**
   Differentials. Small increments and error estimates. Linearization. Maxima and minima. Optimization in physical problems. Curvature.

4. **Application of Integration:**
   Area between curves, volume of solids, length of arc and area of surface of revolution. Theorems of Pappus and Guldinus. Centroid;

momentum. Moment of inertia. Theorems of parallel and perpendicular axes. Mean and root mean square values.

5. **Differential Equations:**
Classification of differential equations. First order differential equation. Separable, homogeneous, exact, linear, 2^{nd} order linear differential equation. Methods of undetermined coefficient and variation of parameters. Higher order differential equations. Applications to physical and engineering problems.

6. **Matrices:**
Algebra of matrices. Systems of linear equations. Eigenvalues and eigenvectors. Singularity. Algebra of complex numbers. Complex plane. D'Moiver's theorem. Hyperbolic functions. Complex elementary functions. Differentiability.

Books Recommended:

1. Advanced Engineering Mathematics by Kreyszing E; John Wiley and Sons, USA (Latest Edition).

Reference Books

1. Calculus and Analytic Geometry, by Thomas G. B. and Finney R. L. (Latest Edition)
2. Mathematics For Scientists And Engineers by Cohen H. L; Prentice-Hall, UK (Latest Edition).

CT223 THEORY OF STRUCTURES

Theory 2 Prac. 3 Total 5

Aims:

i. To develop the understanding of the behaviour of determinate structures with reference to beams and frames.

ii. To provide the concept of statically indeterminate structures illustrating their application to structures like beams, trusses and rigid frames.

iii. To understand the behavior of arches and suspension cables.

Description

The contents of this course are organized to have a clear understanding of the stability and determinacy of structures. It introduces basic understanding of conventional methods of analysis for indeterminate structures.

Course Outlines:

Determinacy of Structures:
Static stability and determinacy of structures

Analysis of Determinate Structures
Common types of trusses, analysis of truss by method of joints. Analysis of frames, Arches, Cables and Suspension bridges

Moment Distribution Method :
Concept, stiffness and carry-over factors, distribution factors, analysis of continuous beams and frames without sidesway

Influence lines:
Concept of influence lines, influence line diagrams for statically determinate beams and its application. Maximum shear force and bending moment for moving loads.

Rotation and Deflection :
Rotation and deflection of beams by Unit Load Method , Moment- Area Method and Conjugate beam methad.

Beams and frames under complex loading:
Bending moment and shear force diagrams for statically determinate beams and frames under complex loading.

Practical
Practicing problems for beams, frames, cables suspension bridges and trusses.

Books Recommended:-

1. Statically Indeterminate Structures by C. K. Wang, McGraw Hill (Latest Edition).
2. Elementary Theory of Structures by Yuan-Yu Hsieh. Prentice Hall, Inc. (Latest Edition).
3. Theory of Structures by Timoshenko. McGraw Hill (Latest Edition).
4. Structural Analysis by H. I. Laursen; McGraw Hill (Latest Edition).
5. Theory of Structures by J. C. McCormac. Harper & Colins Publishers (Latest Edition).

CT234 SOIL MECHANICS **Theory 3 Prac. 3 Total 6**

Aims:
i. To develop a basic understanding of the composition, classification, structure and properties of soils.

ii. To obtain knowledge of application of soil mechanics in civil engineering works.

iii. To acquire the laboratory skills for determination of soil properties.

Description

Soil classification methods, fundamental soil properties and standard laboratory tests are included in the course contents. The course contains site exploration techniques and standard practices. It prepares the basis of foundation and highway design.

Course Outlines:

1. **Introduction:**
   Definition, role of Soil Mechanics in design and construction of Civil Engineering projects. Soil formation, principal soil deposits. Soil structure and texture.

2. **Index Properties of Soil & Soil Classification:**
   Principle properties of soil (natural moisture content, density, specific gravity, void ratio, porosity, degree of saturation). Volumetric and volume weight relationships. Index properties of soil (Grainsize distribution, consistency limits). Purpose of soil classification, engineering soil classification systems (ASTM or USCS, AASHTO).

3 **Permeability & Seepage:**
   Definition, scope, Darcy's law, laboratory and field methods of determining permeability, seepage, seepage control, filters.

4 **Stresses in Soil:**
   Geostatic stresses, total and effective stresses, stress from surface loads. Lateral stress, Stress influence charts/diagrams and their uses.

5. **Compressibility & Shear Strength:**
   Definitions, consolidation, consolidation test and data reduction, naturally consolidated clayey and partially consolidated clayey soils, settlement and rate of settlement. Shear strength of soil, Coulomb's law, shear strength parameters (c & □), cohesive and non-cohesive soils. Laboratory and field evaluation of c & □. Utility of shear strength parameters.

6 **Compaction & Ground Improvement:**
   Moisture density relationship, laboratory and field compaction methods. Compaction control during construction, factors affecting compaction, ground improvement techniques – dynamic compaction, pre-loading, vibrator.

7 **Site Selection and Exploration:**
   Scope and objective, exploration methods, field tests (SPT,CPT, Plate load Test, Pressure meter, Dilatometer Test).

Practical

1- Determination of moisture content of a soil sample.
2. Determination of Liquid limit of a soil sample.
3. Determination of Plastic limit of a soil sample.
4. Determination of Shrinkage limit of a soil sample.
5. Determination of Specific Gravity of a soil sample.
6- Determination of Grain size distribution of a Fine Grain Soil by Hydrometer Analysis.
7. Proctor's compaction test and modified compaction test.
8. Direct shear test of a soil sample.
9. Unconfined compression test of a soil sample.
12- Determination of Field density.
13- Tri-axial compression test of a soil sample.
14- Consolidation test of a soil sample.

Books Recommended:

1. Fundamentals of Soil Mechanics by M. S. Qureshi & Aziz Akbar, A-1 Publishers, Urdu Bazar, Lahore. (Latest Edition).
2. Soil Mechanics by A. R. Jumikis (Latest Edition).
3. Fundamental of Soil Mechanics by D. W. Taylor (Latest Edition).
4. Soil Mechanics by T. W. Lambe, Robert V. Whitman, John Willey & Sons. (Latest Edition).

CT243 FLUID MECHANICS **Theory 3 Prac. 3 Total 6**

Aims:

i- To provide a broad concept of fluid mechanics.
ii- To enable students to solve problems relating to pipe flow and open channel flow.

Description

The methods of measurement of static fluid pressure and laws governing fluid flow are explained with their application in pipe network and open channels.

Course Outlines:

1 **Introduction:**
Applications of fluid mechanics. Units and dimensions.

2. **Physical Properties of Fluids:**
Density, specific weight and specific gravity. Viscosity. Newton's law of viscosity.

3. **Fluid Statics:**
Pressure. Absolute and gauge pressure. Measurement of pressure.

Piezometer, manometer, differential manometer and bourdon gauge. Buoyancy, Metacentre and Metacentre height.

4. **Fluid Kinematics:**
   Basic concepts from steady and unsteady flow. Laminar and turbulent flow. Uniform and non-uniform flow. Velocity and discharge. Continuity equation.

5. **Hydrodynamics:**
   Different forms of energy in a flowing liquid, Energy head, Bernoulli's equation and its applications.

6. **Flow Measurement:**
   Measurement of velocity. Pitot tube. Measurement of discharge through orifices, notches, weirs and venturimeter.

7. **Steady Flow Through Pipes:**
   Darcy Weisbach equation for flow in pipes. Hazen Williams formula. Losses in pipelines, hydraulic grade lines and energy lines.
8. **Uniform Flow in Open Channels:**
   Chazy's and Manning equation. Most efficient economical rectangular and trapezoidal sections.

Practical

1. Determination of viscosity of a given liquid using viscometer.
2. Determination of velocity through Pitot tube.
3. Determinationof coefficient of discharge using venturimeter.
4. Determinationof coefficient of discharge of the orifices.
5. Determination of coefficient of discharge using rectangular notch.
6. Determination of discharge using V-notch.
7. To investigate the validity of the Bernoulli's equation for steady flow of water.

Books Recommended:

1. Fluid Mechanics for Civil Engineers by N. B. Webber, Chapman & Hall, (Latest Edition).
2. Fluid Mechanics with Engineering Applications by Dougherty, Franzine and Fennimore, McGraw Hill, New York. (Latest Edition).
3. An Introduction to Engineering Fluid Mechanics by J. A. Fox, Macmillan Company (Latest Edition).
4. Mechanics of Fluids by B. S. Massey, Wan Nost Reinhold International Rand hold Company Ltd., London (Latest Edition).
5. Mechanics of Fluids by J. W. Ireland, Bulterworth & Company, London (Latest Edition).

CT253 MECHANICS OF MATERIALS Theory 2 Prac. 3 Total 5

Aims:

i) To develop an understanding of analysis of the magnitudes and distribution of internal forces in the body by the concept of free body diagram under external loads.

ii) To calculate the shearing force and bending moment in simply supported and cantilever beams.

iii) Understanding of equilibrium conditions.

Description

The course presents an understanding of the mechanics and its basic concepts, geometrical properties of plain area. The use of different analysis tools to understand all the design concepts.

Course Outlines:

Simple Stress & Strain:
Kind of stresses and strain, Hook's law, Modulus of elasticity, Lateral & Volumetric strain, Poison's ratio, Load extension diagrams for different materials, Temperature stresses and compound bars.

Principle Stress & Strain:
Construction of Mohr's circle for stress & strain.

Bending Theory:
Theory of simple bending, position of neutral axis, moment of resistance and section modulus, Bending and shearing stress distribution in beams; Relationship between load, shear force and bending moment.

Slope and Deflection of Beams:
Relation between slope deflection and radius of curvature. Slope and deflection of a beam using Integration method.

Strain Energy:
Strain energy due to direct loads, shear force, bending moment and torque. Stresses due to impact load

Transfer of Torque in Structural Member:
Theory of torsion in circular shafts. Derivation of torsion equation and its application to solid and hollow circular cross-section. Sources of torsion in structures.

Columns and Struts:
Behaviour of short and long columns. Euler's theory of buckling of long columns and other empirical formulae.

Practical

1. To perform tensile test on a mild steel specimen and to determine yield strength, ultimate strength, rupture strength and percentage elongation.
2. Hardness test on a given metal specimen using Avery's Rockwell testing machine.
3. To perform the Izod Impact Test for the given metals.
4. To perform the Charpy's Impact Test for the given metals.
5. To determine shear strength of a half-inch dia steel bar.
6. To determine the modulus of elasticity of the material of given rectangular beam.
7. To determine modulus of rigidity of the material of given specimen with circular cross-section.
8. To perform Bending test on wooden beam.

CT263 HIGHWAY AND TRANSPORTATION ENGINEERING

Theory 2 Prac. 3 Total 5

Aims:

i) To develop an understanding of the fundamentals of highway geometry and to apply it in the design of Highways & Railways.

ii) To produce an ability to use the survey works in the development of layouts of Highways & Railways.

Description

This course introduces the road standards and specifies geometric design of Highway elements. It provides recommendations for the layout of junctions and islands.

Course Outlines:

1 Road Standards:

NHA, AASHTO and Road Note 31, recommendations for the design of roads regarding:

i) Design parameters.
ii) Cross-sectional elements of roads such as lane widths, shoulder widths, median widths, edge clearance, ROW (right of way) requirements, sight distances.
iii) Road layout parameters.
iv) Road camber gradient and super levation. v) Vertical and horizontal alignment of road.

2 Geometric Design:

Geometric aspects of highways, design of transportationfacilities based on operational capacity, site constraints and safety considerations. Layout of circular, transition and vertical curves. Traffic surveys for

design and improvement of roads.

3 Intersections:

Factors influencing the layout of junctions and design of islands, provision of junctions on single carriageway and dual carriageway sites. Parking spaces, underpasses, motorways, flyovers, motorway intersections. Widening of roads on curves.

4 Road Drainage and Protection:

Surface and sub-surface road drainage, camber and grade for highways surface drainage and proper sub-grade for sub-surface drainage, drainage structures of the required capacity for cross drainage.

5 Airports:

Factors affecting site selection and layout of airport with respect to geographical, aeronautical, socio-political and economical conditions. Wheel loads of different aircrafts. Introduction to pavements and typical cross-sections. Introduction to layout of airport buildings.

6 Railways:

Track structure, railway alignment & grades, cross- section of railway tracks & their laying, points, crossing and level crossing. Modern method of laying railway tracks. Railway organization in Pakistan.

Practical

1- Drawing of roads and railway in cuttings and fillings.
2- Exercises in drawing layouts of intersections and islands.
3- Exercises to calculate the quantities of materials required for various types of pavements and various sections of highways.
4- Drawing sheet showing plans and profile of a road.
5- Drawing sheet showing general layout of airport buildings.
6- Detail drawings of different rail fastenings.
7- Exercises for provision of transition curves and re-alignments of curves.

Books Recommended:

1. Highway Engineering by C. H. Oglesby, Russell G. Hicks. ISBN: 047102936X. John Willey & Sons. January 1982 (Latest Edition).
2. A Policy on Geometric Design of Highways & Streets AASHTO Staff, ISBN: 1560510013. January 1990 (Latest Edition).
3. Hand Books of Highway Engineering by Baker (Latest Edition).
4. Railways, Bridges and Tunnels by S. K. Sharma (Latest Edition).
5. Roads, Railways, Bridges and Tunnels by Deshpande Antia and Shahna (Latest Edition).

6- Highway Design Manual, Highway Department, Govt. of the Punjab (latest edition).

CT 273 WATER SUPPLY AND WASTE WATER MANAGEMENT

Theory 2 Prac. 3 Total 5

Aims:

i To introduce basic concepts relating to the provisions of water supply and wastewater collection facilities.

ii- To enable students to design water supply and wastewater collection systems.

Description

This course deals with the application of scientific and engineering principles in water supply and wastewater collection. In this course the students will learn about collecting necessary data on water and wastewater quantities and utilize the collected data in the design of water distribution and sewer systems. The course also covers the topics on construction of water supply and wastewater collection systems.

Course Outlines:

1. **Introduction:** Water supply and wastewater collection systems and their importance with respect to human health. Water brone diseases. Types of impurities and their affects on human health standards, WHO standards.
2. **Estimation of Water Demand:** Water consumption. Components of water consumption. Factors affecting consumption. Fire demand. Variations in demand: average daily consumption, maximum daily consumption and peak hourly consumption. Commonly used values of water consumption. Local design guidelines. Design period: factors affecting design period. Commonly used design period and local criteria. Population forecasting: mathematical and graphical methods of forecasting population. Population density.
3. **Source of Water:** Ground and surface source. Selection of water sources with respect to quantity and quality considerations.
4. **Collection and Distribution of Water:** Intake structure: reservoir, river and canal intakes. Methods of water distribution. Components and layout of water distribution system. Storage capacity of overhead reservoirs. Use of Hazen William formula for the design of water distributions systems. Hardy Cross method. Types of pipes and their use in water distribution. Pipe joints, service connection. Valves and fire hydrants. Construction of water distribution systems. Disinfections of old and new pipes. Waste water surveys and tracing of leakages. Pipes in series and parallel, head losses, major losses, minor losses.

5. **Estimation of Wastewater Quantities:** General considerations. Classification of sewage and sewer systems. Combined and separate sewer systems. Estimation of sanitary sewage quantities. Estimation of storm flow: the rational method, runoff coefficients

6. **Design of Sewer Systems:** Layout of sewers. Sewer appurtenances: manholes, drop-manholes and storm water inlets. Design criteria for sanitary and storm sewers. Self cleansing velocity. Use of Manning's Equation for the design of sanitary and storm sewers. Construction of sewers: types of beddings, joints and laying of sewers. Sewer testing. Sewer cleaning equipment.

Practicals

1. Forecasting population of various cities using different methods.
2. Detailed study of different types of valves.
3. Detailed study of different pipe material and joints for water supply and sewerage.
4. Design of a transmission main.
5. Design of water distribution system for a housing scheme.
6. Design of a sanitary sewer system.
7. Design of storm sewer system.
8. Preparation of drawings for different bedding of sewers.
9. Preparation of working drawings for manholes, drop manholes and storm water inlets.

Books Recommended:

1. Water Supply and Sewerage by E. W. Steel and L. J. McGhee. McGraw
2. Hill, New York. 1979 (Latest Edition).
3. Water and Wastewater Technology by M. J. Hammer, John Wiley &Sons. New York, 1986 (Latest Edition).
4. Wastewater Engineering: Collection and Pumping of Wastewater by Metcalf and Eddy. McGraw Hill, New York, 1981 (Latest Edition).

CT283 QUANTITY SURVEYING AND CONTRACT DOCUMENTS

Theory 3 Prac. 0 Total 3

Aims:

i) To develop an ability to measure construction works in an orderly manner.

ii) To develop a systematic approach of cost estimation of a construction job.

iii) To develop an understanding of preparing of contract documents and managing/execution of civil engineering works.

Description

The course starts with a brief review of the diploma course and extends the knowledge of a systematic approach for cost estimation, understanding of preparing of contract documents and tendering of works. The use of computer spreadsheets in estimation are also introduced.

Course Outlines:

1. **Earth Work Quantities:** Working out earthwork quantities for various civil engineering constructions. Calculating quantities for road embankments in plain and hilly areas and for irrigation channels.
2. **Rate Analysis:** Scheduled and non-scheduled rates. Analysis of rates, abstract of costs. Significance of rate analysis and its application to market rates of material and labor. Rate analysis for various items of civil engineering works.
3. **Cost Estimates:** Systematic and logical approach to the estimating and costing of civil engineering works, rough cost & detailed estimates, bill of quantities and part bills for construction, costs and profit margins to be considered in the cost estimates. Estimates for roads, buildings, reservoirs, water supply, drainage projects, steel works and bridge construction. Estimates using computer spreadsheets.
4. **Contract Documents:** Introduction to work contracts and tendering. Types of contracts. Requirements of a specific contract, drawings necessary for a contract and those required during the execution of work. Tender documents, construction specifications, bill of quantities and other setting out data required for a contract. Time scheduling of different construction activities for the execution of the projects. General conditions of contract and special conditions of contract. Safety and control aspects required in the execution of the contract.
5. Introduction of different planning commission performas and measurement books.
6. Labour output, incentives and laws.

Books Recommended:

1. Estimating Construction Costs by R. L. Peurifoy. McGraw Hill. (Latest dition).
2. Contract Specifications by Daniel and W. Mead (Latest Edition).
3. Construction Scheduling, Cost Optimization and Management by H. Adeli and A. Karim. (Latest Edition).
4. MES/Pak PWD Schedule of Rates (Latest Edition).
5. WAPDA Drafting Standards (Latest Edition).

CT 283 QUANTITY SURVEYING AND CONTRACT DOCUMENTS

Theory 3 Prac. 0 Total 3

Aims:

i) To develop an ability to measure construction works in an orderly manner.

ii) To develop a systematic approach of cost estimation of a construction job.

iii) To develop an understanding of preparing of contract documents and managing/execution of civil engineering works.

Description

The course starts with a brief review of the diploma course and extends the knowledge of a systematic approach for cost estimation, understanding of preparing of contract documents and tendering of works. The use of computer spreadsheets in estimation are also introduced.

Course Outlines:

1. **Earth Work Quantities:**
   Working out earthwork quantities for various civil engineering constructions. Calculating quantities for road embankments in plain and hilly areas and for irrigation channels.

2. **Rate Analysis:**
   Scheduled and non-scheduled rates. Analysis of rates, abstract of costs. Significance of rate analysis and its application to market rates of material and labor. Rate analysis for various items of civil engineering works.

2. **Cost Estimates:**
   Systematic and logical approach to the estimating and costing of civil engineering works, rough cost & detailed estimates, bill of quantities and part bills for construction, costs and profit margins to be considered in the cost estimates. Estimates for roads, buildings, reservoirs, water supply, drainage projects, steel works and bridge construction. Estimates using computer spreadsheets.

3. **Contract Documents:**
   Introduction to work contracts and tendering. Types of contracts. Requirements of a specific contract, drawings necessary for a contract and those required during the execution of work. Tender documents, construction specifications, bill of quantities and other setting out data required for a contract. Time scheduling of different construction activities for the execution of the projects. General conditions of contract and special conditions of contract. Safety and control aspects required in the execution of the contract.

4. Introduction of different planning commission performas and measurement books.
5. Labour output, incentives and laws.

Books Recommended:

1. Estimating Construction Costs by R. L. Peurifoy. McGraw Hill. (Latest dition).
2. Contract Specifications by Daniel and W. Mead (Latest Edition).
3. Construction Scheduling, Cost Optimization and Management by H. Adeli and A. Karim. (Latest Edition).
4. MES/Pak PWD Schedule of Rates (Latest Edition).
5. WAPDA Drafting Standards (Latest Edition).

CT 292 MATERIAL TESTING REPAIR & MAINTENANCE

Theory 2 Prac. 0 Total 2

Aims:

i) To know about the failure of building structures and their measures
ii) To understand the rules and regulations of maintenance

Course Outlines:

Material Testing:

Destructive and Non-destructive test, Mechanical properties, Method of testing of Fatigue test, impact and hardness test, tensile test and mild steel specimen.

Repair and Maintenance of Civil Works:

1. Introduction to different types of failures in building structures and their causes.
2. Assessment of damage by different methods including non-destructive methods.
3. Introduction to Rules and Regulations of Maintenance.
4. Repair and Maintenance Measures.

Books Recommended

1. Building Construction by S.K.Sharma
2. Different Practicing Codes used in different department of Civil Works like (P & D, PWD etc).

CH 2102 COMMUNICATION SKILLS-II **Theory 2 Prac. 0 Total 2**

ANNEXURE - C

THIRD YEAR B.TECH. (CIVIL)

CT 314 IRRIGATION AND HYDRAULIC STRUCTURES

Theory 3 Prac. 3 Total 6

Aims:

i) To apply the understanding of fluid mechanics in the analysis & design of hydraulic structures.

ii) To develop an understanding of irrigation resources and apply for head works & barrages.

Description

The course provides the students an understanding of hydraulic jump, water hammer, hydraulic similitude and hydraulic turbo machines. It further includes resources of irrigation, methods of discharge measurement, lining and design of channels, irrigational storage works and water logging problems.

Course Outlines:

1 **Non-Uniform Flow:** Non-uniform flow and its variation with the slope of bed and shape and size of cross-section. Energy equation for gradually varied flow. Hydraulic jump.

2. **Unsteady Flow:** Types of unsteady flow, water hammer, rate of discharge under varying head, compressible fluids in pipes.

3. **Hydraulic Similitude:** Geometric, kinematics and dynamic similarities, physical and numerical models.

4. **Hydraulic Turbo Machines:** Impulse and reaction turbine. Hydraulic pumps (centrifugal and reciprocating), characteristics, Types and working with special reference to deep wells. Selection of pumps.

5. **Irrigation and Irrigation Structures:** Resources of irrigation and discharge measurements. Theories of channel design, lining of channels. Silt control in irrigation canals, silt ejection and uniform distribution. Types of outlets and construction of falls, weirs and barrages, canal head regulator. Canal alignment and cross drainage structures. Types of cross drainage works.

6. **Irrigation Storage Works:** Review of river regulation, reservoir, operation and silting of reservoirs. Analysis and design of gravity dams.

7. **Water Logging and Drainage:** Soil salinity, water logging their environmental impact & assessment. Introduction to Drainage and Drainage system.

Practical

1. Design of channels in alluvial soil.
2. Study of canal fall.
3. Study of outlet.
4. Study of a barrage on pervious foundation.
5. Determination of loss of total head in converging and diverging flow.
6. Measurement of velocity with pitot tube in a closed conduit.
7. To determine the discharge in orifice under varying head.
8. Study of Hydraulic Jump.
9. To study flow channel (by Hydraulic Bench)
10. To study flow over weir (by Hydraulic Bench)

Books Recommended:

1. Irrigation and Hydraulic Structures (Theory, Design and Practice by Dr. Iqbal Ali, Institute of Environmental Engineering & Research, NED University of Engineering & Technology, Karachi (Latest Edition).
2. Irrigation Canals by Iqtidar H. Siddiqi (Latest Edition).
3. Fundamentals of Irrigation Engineering by V. B. Piryani (Latest Edition).

CT 324 REINFORCED CONCRETE STRUCTURES

Theory 3 Prac. 3 Total 6

Aims:

i) To develop an understanding of the behavior of reinforced concrete members.

ii) To develop an ability of design and preparing working drawings of concrete structures.

Description :

This course presents a review of properties of concrete and systematic approach of design of RCC structures. Detailing of reinforcement and preparation of working drawings of various types of structures are covered.

Course Outlines:

Materials and their properties:
Overview of materials used in construction & their properties. Introduction to concrete constituents and their properties, Mechanical properties of concrete, reinforcing material, steel as reinforcing materials and its mechanical properties.

Principles of Reinforced Concrete.
Basic concepts of reinforced concrete; basic concepts of working strees method and ultimate strength method.

Slabs.
Analysis of one-way and two-way slabs with general discussion of other slab system; Design for flexure and shear.

Columns.
Analysis of section in pre compression; Design of short columns under pure compression and with eccentric loading.

Beams.
Analysis and design of prismatic singly reinforced, doubly reinforced and T-beams section in flexure, shear by using ultimate strength design method.

Detailing .
Preparation of working drawings of structural elements. Details of bar Bending and preparation of schedules.

Staircase.
Design of staircase of different types spanning both horizontally and vertically

Joints.
Introduction to columns and beam joints (type-I and type-II).

Practical:
Practicing problem of slabs, beams, columns

Books Recommended:

1. Design of Concrete Structures by H. Nilson, McGraw Hill.
2. Reinforced Concrete – Design & Behavior by C. K. Wang & Salmon.
3. Reinforced Concrete by J-Faber and F. Meed; Chapman & Hall.
4. Reinforced Concrete design by Keneth Leet (Latest edition)

CT 333 STEEL STRUCTURES **Theory 3 Prac. 0 Total 3**

Aims:
i) To develop an understanding of the behavior and design of structural steel members and connections using ASD (Allowable stress design) method.

ii) To develop an understanding of the behavior and characteristics of structural steel systems.

Description

The course is intended to provide an introduction to specification and code of practice for steel design. It further introduces the methods of fabrication, construction details, maintenance of steel structure and rehabilitation.

Course Outlines:

Introduction

Steel properties, design loads and load factors; Types and shapes of structural steel members; specifications and design codes , safety factors

Tension members

Design and analysis of tension member.

Flexural members

Design of laterally supported and unsupported beams; deflection check

Compression members

Design and analysis of axially and eccentrically loaded short and long columns

Connections

Types of high strength bolts and rivets; Friction and bearing type connections; Continuous beam to beam and beam to column connection.

New Design Codes

Introduction to LRFD method (load resistance factor design)

Books Recommended:

1. Steel Structures by Z. A. Siddiqi, M. A. Chaudhry and M. Ashraf, Civil Engineering Series Publishers (Latest Edition).
2. RFD Steel Design Aids in SI Units by Z. A. Siddiqi, M. A. Chaudhry & M. Ashraf; Civil Engineering Series Publishers.
3. Structural Steel Design LRFD Method (Second Edition) by Jack C. McCormac; Harper Collins Publishers. ISBN: 0065016270. January 1994.
4. Design of Steel Structures by E. H. Gaylord, C. N Gaylord; McGraw Hill. 1991.
5. Steel Structures Design & Behavior by Charles G. Salmon, John E. Johnson.
6. Structural Steel Designers Handbook by Fredrick S. Merritt.
7. RFD Steel Design by William T. Segui; PWS Publishers. ISBN: 053493353X. January 1993.
8. Design in Structural Steel by John E. Lothers

CT 343 HYDROLOGY

Theory 2 Prac. 3 Total 5

Aims:

i. To provide a broad concept of basic hydrology.

ii. To enable students to calculate surface runoff and ground water flows.

Description

This course describes the hydrological cycle and the way it is affected by weather, climate and geology. The groundwater hydrology is explained along with its use as a resource. Floods processes in a river basin are also illustrated in the course.

Course Outlines:

1. **Introduction:** Definition and significance of hydrology. The hydrologic cycle and hydrologic equation.

2. **Meteorology:** Atmosphere and its composition. Measurement of air temperature, relative humidity, radiation, sunshine and atmospheric pressure.

3. **Precipitation:** Types and measurement of precipitation. Rain gauges. Variations in precipitation. Computation of average precipitation.

4. **Evaporation and Transpiration:** Factors affecting evaporation. Determination of evaporation. Evapotranspiration and potential vapo transpiration. Variations in evapotranspiration and transpiration.

5. **Stream Flow:** Units of measurement. Water stage and its measurement. Site selection for water stage. Selection of control and metering section. Methods of measurement of stream flow. Stream flow and its measurement.

6. **Runoff:** Factors affecting storm runoff. Methods of estimating storm runoff. Introduction to unit hydrograph. Rational method for calculation of runoff. Introduction to low flow and flood flow frequency. Frequency-duration analysis, Introduction to intensity-duration-frequency function for precipitation.

7. **Groundwater Flow:** Zones of underground water. Water table. Sources of groundwater. Types of aquifers. Various types of wells. Equilibrium equations for flow of water into wells. Tubewell and its components. Borehole pumping test. Development of tubewells.

Practical

1. Determination of velocity and discharge using current meter.
2. Determination of velocity and discharge using floats.
3. Study of the barometer.

4. Study of the rainfall gauge.
5. Measurement of wind velocity.
6. Measurement of humidity.
7. Measurement of atmospheric temperature.

Books Recommended:

1. Hydrology for Engineers by Linsley, Kohler and Paulhus. McGraw Hill, New York, 1982 (Latest Edition).
2. Handbook of Applied Hydrology by Chow, McGraw Hill, New York (Latest Edition).
3. Introduction to Hydrology by Viessman, Lewis and Knapp. Harper and Row, New York (Latest Edition).

CT 352 COMPUTER AIDED BUILDING, MODELING AND DESIGN

Theory 1 Prac. 3 Total 4

Aims:

To enhance the capabilities of student to independently prepare the building drawings and develop an ability to analyse and design structures by commercially used computer packages

Course Outlines:

Fundamentals of CAD

Introduction, the design process, application of computers for design, creating the manufacturing data base, benefits of CAD.

Hardware in CAD

The design workstation, graphics terminal, operator input devices, plotters and other output devices, the central processing unit, secondary storage.

Computer Graphics Software and Data Base

The software configuration of a graphics system, functions of a graphic package, constructing the geometry, data base structure and content, wire-frame versus solid modeling, other CAD features and CAD/CAM integration.

Mathematical Elements of CAD

Two dimensional transformations, Translation, Scaling, and Rotation, Concatenation, Various techniques for design optimization, finite element analysis / modeling.

Design Software

Use of different software packages employed in several Civil Engineering applications

CT 364 FOUNDATIONS AND PAVEMENTS

Theory 3 Prac. 3 Total 6

Aims:

i) To develop an ability of applying the layout and alignment parameters to the highway design and its construction.

ii) To develop an understanding of the design of rigid and flexible pavements.

iii) To understand the design of foundations.

Description

The course is required to provide an introduction to the types of base, sub-base courses, wearing surface and determination of CBR value of soil and foundation design. Standard AASHTO loading, AASHTO and British Road Notes for highway design are explained. Principles for the design of various elements of flexible and rigid pavements are given. Revision of basic concept and explanation of important definitions, design, concepts for various types of foundations are presented.

FOUNDATIONS

Course Outlines:

a. **Definitions:** Foundation, contact pressure, allowable bearing capacity, total and differential settlements, permissible settlement.

b. **Foundation Types:** Shallow foundation, deep foundation. Choice of foundation, type and depth of foundation, foundation design requirements. Foundation design geotechnical design and structural design.

c. **Shallow Foundation:** Types of shallow foundation, Design of Isolated and combined footing.

d. **Deep Foundations:** Piles, caissions, piers, well foundation. Types of piles, pile capacity, pile group, proportioning of pile cap. Function of piles and their uses. Negative skin friction (down drag).

e. **Lateral Earth Pressure:** Rankine's & coulomb's Theories of Lateral earth pressure; analysis of earth retaining structure, Types of retaining wall.

PAVEMENTS

Course Outlines:

a. **Highway Loads:** Standard AASHTO loadings, local heavy vehicles, Axle loads, equivalent and design axle loads. Overview of new technologies involved in loads i.e. weight in motion.

b. **Pavement Design:** Types of pavements for roads and Runways, Stresses in pavements, Principles underlying methods for the

design of various elements of flexible and rigid pavements (AASHTO and British Standards) for highways and airports, materials for highways, development of subgrade, determination of subgrade reaction, CBR value of soil, construction equipment.

c. **Construction Details:** Method of constructions of roadway and highway drainage. Relative merits and procedures. Climate and traffic effects, regulation and control of traffic, traffic signs, signals and pavement markings. Pavement management systems. Cold recycling and hot recycling techniques.

Practical

1. Determination of "Flakiness Index" & "Elongation Index" of aggregates.
2. Test for angularity no. of aggregate.
3. Frictional properties of road surface.
4. Loss-Angeles Abrasion test on aggregate.
5. Determination of viscosity of a given binder using Englers Viscometer.
6. Specific gravity and water absorption test.
7. Penetration test on asphalt.
8. Ductility test on asphalt.
9. Determination of softening point of bitumen.
10. Determination of flash point of a sample of bitumen.
11. Determination of specific gravity of asphalt sample.
12. Marshell stability test.
13. Design problems.
14. Traffic surveys. .
15. CBR test.
16. Boring log with SPT values up to 30 ft.
17. Plate load test.

Books Recommended:

1. Foundation Analysis and Design by J. E. Bowles, 5th Edition, McGraw Hill. ISBN: 0070068739. January, 1996.
2. Foundation Engineering by Ralph B. Peck, W.E. Hanson, Thomas H. Thornburn; John Willey & Sons, ISBN:0471675857.January 1974.
3. Foundation Design and Construction by Michael. J. Tomlinson; Longman Publishing Group. ISBN: 058222697X. January 1996.
4. Foundation Design by W. C. Teng; Prentice Hall. ISBN: 0133298051.
5. Geotechnical Engineering: Foundation Design by John.N. Cernica, John; Willey & Sons. ISBN: 0471308870. January 1994.
6. Principles of Pavement Design by E. J. Yoder and M. W. Witezak,

ISBN: 0471977802, Wiley John & Sons. January 1975 (Latest Edition).
7. Pavement Analysis & Design by Yang H. Huang, ISBN: 0136552757.January 1992 (Latest Edition).
8. Flexible Pavement Design and Management Materials Characterization, ISBN: 0309021286 (Latest Edition).
9. Traffic Engineering by T. M. Matson; McGraw Hill. ISBN: 0070409102 (Latest Edition).
10. Highway Engineering by C. H. Oglesby, R. G. Hicks; John Willey & Sons. ISBN: 047102936X. January 1982 (Latest Edition).
11. Transportation Engineering by O.O. Flaherty.

CT 374 ENVIRONMENTAL MANAGEMENT

Theory 3 Prac. 3 Total 6

Course Outlines:

1. Introduction to solid waste, classification of solid waste. Collection methods, transfer and transportation of solid waste, type of equipment, recycling, reuse and disposal of solid waste, BOD and COD.
2. Air pollution: Introduction to air pollution, sources of air pollution, its effects, classification and control.
3. Introduction to EIA functions of Environmental Pollution Council, role of provincial EPAs, Environmental Protection Act, 1977, National Environmental Quality Standards.
4. Introduction to noise pollution and its mitigation measures.
5. Environmental health and safety.

Practical

1. To determine the Bio-Chemical Oxygen Demand of waste water sample.
2. To determine the amount of suspended solids in drinking water and waste water sample by photometric method.
3. To determine the amount of settleable solids in waste sample.
4. To determine the turbidity of continuous flow by Low Range Turbidimeter.
5. To determine the amount of volatile suspended solids (MLVSS) in waste water sample by gravimetric method.
6. Determination of Oil and Grease by Partition – Gravimetric Method in wastewater
7. Determination of the impact of discharges on the surface water (river, canal etc)
8. Composition of solid waste (percentage)
9. Energy Value.
10. Moisture content.
11. Nox and Sox by hand meters.
12. Carbon monoxide by hand meters.

Books Recommended:

1. Introduction to Environmental Engineering by Peavy (McGraw Hill)
2. Environmental Engineering by Mckenze (McGraw Hill)
3. Environmental Profile of Pakistan by IUCN.
4. National Conservation Strategy by IUCN.
5. ILO laws regulations

CT 382 ENGINEERING GEOLOGY

Theory 2 Prac. 0 Total 2

Aims:

To understand geology or various minerals and rocks and their properties.

To learn to select proper site for civil engineering structures.

Course Outlines:

1 **Introduction.** Introduction to Geology. Importance of Geology in civil engineering projects. Sedimentary, igneous and metamorphic rocks. Volcanic activity. Internal structure of the Earth. Engineering and physical properties of rocks. Identification of common rock forming minerals.

2 **Classification of Rocks and Minerals.** Colour of grain with respect to rock colour Chart of Geological Society of America. Identification of grains (coarse, medium and fine) of sedimentary rocks. Hardness classification (very soft, soft etc) with respect to simple field tests and uniaxial compression strength. Identification of rocks by megascopic studies. Identification of subordinate constituents in rock samples.

3 **Structural Geology.** Introduction to structural Geology and plate tectonics. Causes and effects of earthquakes. Protective measures against earthquakes. Sequence and principles of stratigraphy, earthquake zoning for Pakistan. Land-sliding and its causes. Hydrogeology: wells, springs, streams and ground water conditions. Causes of glaciers and their types.

4 **Geology in Civil Technology.** Role of geology in selection of sites for dams, reservoirs, tunnels and other important civil engineering structures, such as highways, airfield and bridges. Ground subsidence: Mining subsidence due to alteration of fluid levels. Methods of avoiding mine collapses. Introduction to blasting. Engineering geology of tunnels, geological survey prior to tunneling, lining of tunnels and its section. Selection of tunnel site and its requirements, case histories, brief introduction to local geology.

Books Recommended

1. A Geology for Engineers, Blyth, F G H 7th Arnold International student edition.
2. Geology and Engineering, Legget, R F 3rd edition McGraw Hill International edition.
3. Principles of Engineering Geology and Geotechniqcs, Krynine, DP 1st Edition McGraw Hill International edition.

CT 392 INTRODUCTION TO EARTHQUAKE ENGINEERING

Theory 2 Prac. 0 Total 2

Aims:

1. To provide a fundamental understanding of causes responsible for occurrence of Earthquake.
2. To provide basic knowledge about the response of buildings when subjected to Seismic excitations
3. To identify the type of seismic damages in buildings.
4. To provide knowledge about various methods of strengthening the building structure against earthquake.

Course Outlines:

Introduction, Earthquake magnitude & intensity, importance of ground conditions, Nature of seismic forces, Factors affecting the severity of seismic forces, Damping, response spectrum, Ductility, Resisting seismic forces, capacity design, Role of diaphragm, Bond beams, Collectors and ties, Shear walls, Braced frames, Moment resisting frames, Non-structural elements, Retrofitting its objectives, approaches & Techniques, seismic isolation, Dampers, Theory of plate Tectonics, Lumped mass and distributed mass, Single Degree of Freedom (SDOF) and Multiple Degree of Freedom (MDOF), Seismic waves

Books Recommended

1. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrihande published by Prentice Hall of India.
2. Seismic Design for Architects by Andrew Charleson ISBN: 978-0-7506-8550-4

CH 102 ISLAMIAT AND PAK. STUDIES

Theory 2 Prac. 0 Total 2

ANNEXURE – A&B

FINAL YEAR B.TECH. (CIVIL)

CT 413 PROJECT MANAGEMENT

Theory 2 Prac. 3 Total 5

Aims:

i- To learn the basic concepts of management
ii- To understand the importance of productivity and related concepts
iii- Introduction to project management and inventory management
iv- Familiarization with human resource management

Description

This is a management-oriented course for technologists. It will enhance their general abilities of management, required in a technical environment.

Course Outlines:

1 Introduction
- Management: Science or Art
- History of Managements
- Management Functions

2 Organizational Structure
- Types of Organizations
- Organizational Hierarchy
- Properties of Narrow and Wide Organizations

3 Production Processes
- Types of Production
- Scale of Production
- Selection of Technology
- Input Requirements
- Capacity Utilization

4 Productivity
- Basic Concepts
- Classification
- Quantitative Measurement
- Productivity Improvement

5 Project Management
- Properties of Projects
- Project Life Cycle
- Project Network Analysis
- Resource Requirements
- Monitoring and Control
- Use of Computer

6 Inventory Management
- Inventory Replenishment
- Economic Lot Size
- Re-order Point

- Safety Stock Level
- JIT
- Use of Computer

7 Human Resource Management
- Management Styles
- Psychological Types
- Recruitment and Training
- Job Evaluation
- Performance Appraisal
- Motivation and Incentives

Text Books

1. Babcock D. L. MANAGING ENGINEERING AND TECHNOLOGY. Prentice Hall, UK (Latest Edition).
2. Zuberi M. H. INDUSTRIAL MANAGEMENT. Rabbani Printing Press, Lahore (Latest Edition).

Reference Books

1. Bateman T. S. and Snell S. A. MANAGEMENT: BUILDING COMPETITIVE ADVANTAGE. Times Mirror Higher Education Group, USA (Latest Edition).
2. Spinner M. ELEMENTS OF PROJECT MANAGEMENT. Prentice Hall, UK (Latest Edition).

CT 423 ENGINEERING ECONOMICS

Theory 3 Prac. 0 Total 3

Aims:

i- To understand value and cost concepts

ii- To acquire the knowledge and skills related to the application of time value for money

iii- To acquire the knowledge and skills related to the application of costing, financing and risk

iv- iv- To acquire the knowledge and skills related to the application of depreciation, obsolescence and replacement factors.

Description

This is a management-oriented course with a significant involvement of calculations to find solutions to financial problems.

Course Outlines:

1 Value and Cost Concepts
- Terminology
- The General Economic Environment
- Cost Driven Design Optimization

2 Time Value for Money
- The Concept of Equivalence
- Present Value
- Future Value
- Uniform series
- Discounted Cash Flow

3. Applications of Money-Time Relationships
4. Cost/Benefit Ratio
5. Depreciation and Obsolescence
6. Costing
   - Cost Factors
   - Product Cost and Selling Price
   - Project Cash Flows
   - Absorption Costing
   - Marginal Costing
   - Breakeven Analysis

7 Replacement Analysis
- Factors to be Considered
- Economic Life of Asset
- Comparison and Replacement

8 Risk Analysis
- Sources of Uncertainty
  Sensitivity Analysis
- Optimistic-Pessimistic Estimates
- Risk Adjustment

9 Capital Financing
- Financing with Debt Capital
- Financing with Equity Capital
- Leasing
- Capital Allocation

Books Recommended:

1. DeGarmo E. P., Sullivan W. G., Bontadelli J. A. and Wicks E. M. ENGINEERING ECONOMY. Prentice-Hall International, Inc., USA.
2. Morris C. QUANTITATIVE APPROACHES IN BUSINESS STUDIES. Pitman Publishing, UK (Latest Edition).
3. Tung A. and Thomas P. A. ENGINEERING ECONOMICS FOR CAPITAL INVESTMENT ANALYSIS. Prentice-Hall. UK (Latest Edition).
4. Horne J. C. V. and Wachowicz, Jr. J. M. FUNDAMENTALS OF FINANCIAL MANAGEMENT. Prentice-Hall International, Inc., USA (Latest Edition)

CT 432 PROJECT

Theory 0 Prac. 6 Total 6

Aims:

To develop the ability of exercising the B-Tech (Hons) program in the analysis and design of construction/highway projects.

Course Outlines:

The project involves survey, analysis and design of Civil Engineering project. The student in close consultation with department faculty will complete the project using Library, Computer or Laboratory facilities. Progress reports and a comprehensive written report are required.

CT 44X INTERNSHIP

AIM

To make the student skillful by giving him on job training through Industry.

CURRICULUM FOR BACHELOR OF ELECTRICAL TECHNOLOGY

The revised scheme is spread over four years. The first three years comprise of major academic courses while the fourth year accommodates some academic courses followed by supervised industrial training of minimum 32 weeks. The guidelines for Industrial training are as follows:

Guidelines for Industrial Training:

The students shall undergo supervised industrial trainings (Minimum period of 32 weeks).

The students are required to submit monthly progress reports to the institute duly verified by their industrial supervisor.

The institute is responsible to liaison fortnightly with all industrial supervisors to check the student's performance.

At the end of the training, the students are required to submit a detailed report to the institute and undergo viva voce examinations.

Summary of the course distribution:

Non-Technological Subjects (NT)		**30%**
Technological Subjects (T)		**70%**
1. Foundation Courses (T / F)		30%
2. Breadth Courses (T / B)		30%
3. Depth Courses (T / D)		40%
Total	**100%**	**100%**

SCHEME OF STUDIES
FOR BACHELOR OF ELECTRICAL TECHNOLOGY
Duration: 4 Years

1st Year

S.#	Code #	Subject	Nature	T	P	Contact Hours	Marks T	Marks P
1	ES-113	Mathematics-I	NT	3	0	3	150	0
2.	ET-123	Basic Electronics	T / F	2	3	5	100	50
3.	ET-133	Basic Mechanical Technology	T / B	2	3	5	100	50
4.	ET-142	Computer Applications	T / F	2	0	2	100	0
5.	ES-153	Applied Physics / Chemistry	NT	2	3	5	100	50
6.	ET-162	Engineering Drawing	T / B	0	6	6	0	100
7.	EH-172	Islamic / Pak Studies	NT	2	0	2	100	0
8.	ET-183	Electrical Machines – I	T / F	2	3	5	100	50
9.	ET-193	Network Analysis-I	T / F	2	3	5	100	50
				17	**21**	**38**	**850**	**350**

2nd Year

S.#	Code #	Subject	Nature	T	P	Contact Hours	Marks T	Marks P
1	ES-213	Mathematics-II	NT	3	0	3	150	0
2.	ET-223	Measuring Instruments & Measurement	T / F	2	3	5	100	50
3.	ET-233	Digital Electronics	T / F	2	3	5	100	50
4.	ET-243	Power Generation & Utilization	T / B	3	0	3	150	0
5.	ET-253	Electrical Machines – II	T / D	2	3	5	100	50
6.	ET-263	Network Analysis-II	T / D	2	3	5	100	50
7.	ET-273	Power Transmission & Distribution	T / D	2	3	5	100	50
8.	EH-282	Communication Skills – I	NT	2	0	2	100	0
9.	EH-292	Total Quality Management	NT	2	0	2	100	0
				20	**15**	**35**	**1000**	**250**

3rd Year

S.#	Code #	Subject	Nature	T	P	Contact Hours	Marks T	Marks P
1.	ET-313	Microprocessor Theory and Interfacing	T / B	2	3	5	100	50
2.	ET-323	Power and Industrial Electronics	T / D	2	3	5	100	50
3.	ET-333	Switchgear and Protective devices	T / D	2	3	5	100	50
4.	ET-343	Communication Technology	T / B	2	3	5	100	50
5.	ET-353	Power System Analysis	T / D	3	0	3	150	0
6.	ET-363	Data and Computer Communication	T / B	2	3	5	100	50
7.	ET-373	Control Technology	T / D	2	3	5	100	50
8	ET-383	High Voltage Technology	T / D	2	3	5	100	50
9	EH-392	Communication Skill-II	NT	2	0	2	100	0
				19	**21**	**40**	**950**	**350**

4th Year

S.#	Code #	Subject	Nature	T	P	Contact Hours	Marks T	Marks P
1.	EH-412	Occupational Health Safety and Environment	NT	2	0	2	100	0
2.	EH-422	Industrial Management	NT	2	0	2	100	0
3.	ET-432	Project	T / D	0	6	6	0	200
				4	**6**	**10**	**-**	**-**
4.	ET-44X	Supervised Industrial Training	T / B	0	36	36	0	600
				-	**-**	**-**	**200**	**800**

DETAIL OF COURSES
1ST YEAR

EH-113 Mathematics – I **TPC** 3 0 3

Objective:

To enable the students to comprehend basics of linear algebra and calculus.

Course Outline:

- FUNCTION: Exponential and logarithmic functions, Hyperbolic and inverse hyperbolic functions, relations between circular and hyperbolic functions.
- DETERMINANTS AND MATRICES: Simple properties and their application to solution of system of equations, Algebra of Matrices and their application to solution of system of equations.
- COMPLEX NUMBERS: Argand's diagram, operations with complex numbers and their geometrical interpretations.
- COORDINATE GEOMETRY: Hyperbola, asymptotes, Simple properties of the parabola, ellipse, and hyperbola. Solid Geometry of line, plane and sphere.
- DIFFERENTIAL CALCULUS: Rules of Differentiation, function of a function, implicit function and successive differentiation; partial differentiation.
- INTEGRAL CALCULUS: Integration as inverse of differentiation, general rules; integration by substitution and by parts, use of partial Fraction, Definite integrals, Double integrals.
- APPLICATIONS OF CALCULUS: Slope of curve, Maxima & minima; areas of surfaces and volumes of solids Mean and root mean square values; curvature and radius of curvature and differential equations of first order and first degree.
- VECTORS: Addition and subtraction of vectors, scalar and vector products.

Books Recommended:

1. Thomas G.B. and Funney, R.L. Calculus and Analytic Geometry
2. Peter Kuffiting, Technical Mathematics with calculus.
3. K. A. Stroud, "Engg. Mathematics"

ET-123 Basic Electronics T P C 2 3 3

Objective:

To enable students to understand fundamentals of Electronic principles and devices.

Course Outline

- Semi conductor Diodes: Conduction in Solids – Doners and acceptors, Impurities, Simple Diode Circuits, Biasing and applications.
- Rectifiers and power supplies, special purpose diode, Zener diodes.
- Bipolar Junction (BJT) and field effect transistors (FET) – JFET, MOSFET, Construction, Biasing and working as amplifiers.
- Operational amplifiers and relevant circuits such as summer, integrator, differentiator etc.

Practical list

1. Study and plot the characteristics of semiconductor diodes.
2. Perform half-wave and full-wave rectification.
3. DC non-regulated power supply.
4. Regulated power supply using zener diode.
5. Perform biasing of a BJT and determine Q-Point.
6. Study and plot the characteristics of a BJT transistor for all configurations.
7. Study and plot the characteristics of a junction field effect (JFET) and metal oxide field effort transistor (MOSFET).
8. Study and observe the input / output parameters of operational amplifier.
9. Use operational amplifier in inverting and non-inverting configuration.
10. Use operational amplifier as summer, integrator and differentiator.

Books Recommended:

1. Paynter, “Introductory Electronics”
2. Elder, R.L. Boylestod, “Electronic Devices and Circuit Theory”
3. A.P. Malvino, “Electronic Principals” (Latest Edition)
4. Thomas Floyd, “Electronic Devices” (Latest Ed.)

ET-133 Basic Mechanical Technology

T	P	C
2	3	3

Objective:

To enable students to grasp necessary mechanical technology skills.

Course Outline:

- Stress, strain, stress – strain relationships, tensile test theory of simple bending.
- Shearing distributions in various sections. Bending moment and shearing force. Deflection of beams, torsion of bars of circular cross-section.
- Introduction to pure bending and torsion.
- Overview of design of shafts, pulleys, fly wheels, bearing and couplings.
- Power transmission by belts, spur-gears and friction clutches.

Practical list

1. Study of Universal Testing Machine (UTM).
2. Perform tensile test on UTM for a mild steel specimen.
3. Verification of Hook's Law and determination of Modules of Elasticity.
4. Determination of Modules of Rigidity for circular shaft.
5. Determination of central deflection of rectangular section simply supported and fixed ended beams.
6. Verification of Bending moment and shearing force principles.
7. Determine the co-efficient of V shaped leather belt in contact with a cast iron pulley.
8. Determine mechanical advantage, velocity ratio and Mechanical efficiency of simple Gear Train.

Books Recommended:

1. Crustar Nieman, "Machine elements design and calculations in Mechanical Engineering", Springer International, latest Ed.
2. F. P. Beer and Johnston, "Mechanics of Materials", McGraw Hill Book Co., Latest SI version.
3. T. Beven. "Theory of Machines"
4. F.L. Singer, "Strength of Materials" Latest SI ed.

EH-142 Computer Applications

T	P	C
2	0	2

Objective:

To enable students to comprehend fundamentals of computer essentials.

Course Outline:

- BASIC COMPUTER ORGANIZATION: Major building blocks; their functions & inter connections.
- NUMBER SYSTEMS: Number conversion, Data Representation & Data structure. Processed operation, Memory & I/O of a computer

- LANGUAGES: High level & Low Level Languages, Compilers interpreters, operating systems, computer programming.
- APPLICATION PACKAGES: Word processors, Data Bases, Spread Sheets.
- COMPUTER NETWORKING FUNDAMENTALS

Books Recommended:

1. Charles Parker, Computers today and tomorrow.
2. Tucker A. B., "Fundamentals of Computing", McGraw Hill Book Company

ES-153 Applied Physics / Chemistry

T	P	C
2	3	3

Objective:

To enable students to cover basic requirements of Physics and Chemistry.

Course Outline:

PART – A: PHYSICS

- Basics of Mechanics, Moment of inertia, simple harmonics motion.
- Electrostatics And Magnetism: Coulombs Law, Electrostatic potential energy of discrete charges, continuous charge distribution, Gauss's Law, Electric field around conductors, dielectrics, dual trace oscilloscope, magnetic fields, Hall effect.
- Semiconductor Physics, semiconductor materials, Insulation and Conduction in different materials. Illumination.

PART – B: CHEMISTRY

- Properties Of Solution And Liquids: Surface tension, viscosity, osmosis and osmotic pressure, pH-buffer solution, spectrophotometer.
- Electrochemistry: Kinetics of electrode reaction, law of electrolysis, Electrolytes, batteries and fuel cells, corrosion and preventive measures.
- Thermochemistry: chemical thermodynamics, Hess Law, Heat of reaction, relation between H and U, calorimetery.

Practical work will be based on above theory.

Books Recommended:

1. David Halliday, R. Resnick. “Physics” (Latest Edition).
2. H.D. Gesser, Applied Chemistry.

EH-162 **Engineering Drawing**

T	P	C
0	6	2

Objective:

To enable students to learn and develop engineering drawing skills.

Course Outline:

- MECHANICAL DRAWING: Use of drafting instruments. Basic drafting techniques, drawing and lettering, dimensioning, projections and section of solids, Orthographic projections, Isometric views with particular reference to piping and ducting, Practice of assembly drawing.

- CIVIL DRAWING: Plan, Elevations (front, left and right) and details of buildings., elements of perspective drawings.

- ELECTRICAL DRAWING: Electric substation equipment layout, Schematic Diagrams of substations, lighting and power distribution boards, Electrical Symbols and one line diagrams of a typical power system.

Books Recommended:

1. Mitchel & Spencer, “Technical Drawing” (Latest Edition)

EH-172 **ISLAMIC AND PAKISTAN STUDIES ANNEXURE A&B**

T	P	C
2	0	2

EH-183 **Electrical Machines – I**

T	P	C
2	3	3

Objective:

To enable students to comprehend principles and working of DC machines and transformers.

Course Outline:

- ELECTROMAGNETIC INDUCTION AND BASIC CONCEPTS IN ROTATING MACHINES: Introduction to magnetic circuits, magnetically induced e.m.f. and force, AC operation of magnetic circuits, Hysteresis and Eddy current losses. Magnetic fields in rotating machines, generated voltages, torque.

- DC GENERATORS: Constructional features and principle of operation, EMF equation, excitation types, load and no-load characteristics, commutation, armature reaction.

- DC MOTORS: Principle of operation, back e.m.f., torque equation, types of DC motors, speed-torque characteristics, speed control, applications.

- TRANSFORMERS: Principle of operation, constructional features of single and three phase transformers, EMF equation, transformer on no-load and load, three phase transformer connections, auto-transformers.

- TESTING OF DC MACHINES AND TRANSFORMERS: Losses and efficiency, testing of DC machines and different types of tests.

Practical list

1. Running of DC motor as generator action.
2. Speed control of DC motor by armature control.
3. Speed control of DC motor by field control.
4. No load saturation characteristics of separately excited DC generator.
5. Speed/voltage characteristics of self excited DC generator.
6. Speed/torque characteristics of DC motor.
7. Determination of BHP of motor by brake test.
8. Determination of torque and efficiency by dynamo meter.
9. Regenerative or Hopkinsons test.
10. Determination of efficiency of a single phase transformer by open and short circuit tests.

Books Recommended:

1. Stephen J. Chapman. Electrical Machinery Fundamentals

EH-193 **Network Analysis – I**

T	P	C
2	3	3

Objective:

To enable students to understand electric circuits and learn basic circuit solving skills.

Course Outline:

- ELECTRICAL ELEMENTS AND CIRCUITS: Resistance, inductance, and capacitance, laws of resistance, Ohm's law, Kirchoff's laws, DC node voltage and loop current methods of analysis of resistive network calculations, current and voltage divider.

- NETWORK THEOREM: Superposition, Thevenin, Norton, reciprocity and maximum power transfer theorems.

- A.C. FUNDAMENTALS: Periodic function, RMS, effective, average and maximum values of current and voltage for periodic wave forms, study of simple circuits using instantaneous values of current and voltages, introduction to three phase system.

- PHASOR QUANTITIES: Phasors; representation of phasors by 'J' notation, complex expression for current, voltage and impedance, solution of simple RL, RC and RLC series and parallel circuits. Resonance in series and parallel RLC circuits.

Practical list

1. Demonstration of Ohm's law, Kirchoff's voltage and current laws.
2. Demonstration of Superposition, Thevenin and Norton theorems with DC sources.
3. Study of phase displacement using oscilloscope.
4. Draw phasor diagrams for RL, RC and RLC circuits.
5. Determine power factor for inductive and capacitive loads.
6. Calculation and demonstration of RMS, average and peak values of a periodic waveform using signal generator and oscilloscope.
7. Determine active and reactive power for single phase circuits.
8. Determine active and reactive power for three phase circuits.
9. Demonstration of series and parallel resonance in R, L and C circuits.

Books Recommended:

1. Hughs, Electrical Technology.
2. Floyd, Circuit Analysis
3. W. Hayt, Engineering of Circuit Analysis

EH-213	Mathematics – II	T	P	C
		3	0	3

Objective:

To enable students to cover advanced mathematical topics.

Course Outline:

- Linear differential Equations of first and second order and their applications to relevant engineering problems.
- Partial differential equation: Total differential and its application to small errors. Taylor's series of two variables. Maxima and minima.
- Second & Third order integration, area of surfaces and volume of solid. Application to technical problems.
- Complex variable theory: Analytical functions and line integrals.
- Fourier series: Even and odd functions.
- Laplace transforms, Inverse Laplace Transforms and their applications.
- Probability and its theorems, Mean & Standard deviation, Passion and Normal distribution.

Books Recommended:

1. Krayzic, Advanced Engineering Mathematics.
2. Modern Advanced Engineering Mathematics, Glyn James.

EH-223	Measuring Instruments and Measurements	T	P	C
		2	3	3

Objective:

To enable students to develop measuring skills with different types of instruments.

Course Outline:

- MEASUREMENT FUNDAMENTALS: Classification of measuring instruments – according to construction and working principle,

measurements, errors and their compensation, accuracies and tolerances, probability of error, noise.

- ELECTRO MECHANICAL INSTRUMENTS: Galvanometer, AC, DC voltmeter, ammeter, wattmeter, watt hour meter, power factor meter, frequency meter, KVAR meters.

- ELECTRONIC INSTRUMENTS: Digital Volt meters, ammeters and multi meters, Digital counters, Oscilloscope.

- Calibration of instruments. AC and DC bridges, sensors and transducers, measurement of non electrical quantities.

- INSTRUMENT TRANSFORMERS: Theory and construction of current and potential transformers and their characteristics.

Practical list

1. Familiarize with different type of analog and digital meters.
2. Understanding of signal generator and oscilloscope.
3. Measurement of Power by three voltmeters method.
4. Measurement of Power by three ammeters method.
5. Measurement of power factor of a load by voltmeter, ammeter and wattmeter.
6. Measurement of resistance by Wheatstone bridge, Kelvins double bridge.
7. Measurement of capacitance and loss angle of capacitor by Schering bridge.
8. Measurement of inductance by voltmeter method.
9. Measurement of voltage, phase and frequency using oscilloscope.
10. Find transformation ratio of instrument transformers.

Books Recommended:

1. Berlin, Electronic Instruments & Measurements

EH-233 Digital Electronics

T	P	C
2	3	3

Objective:

To enable students to understand and develop digital electronic circuits.

Course Outline:

- Number Systems, Decimal to Binary conversions, Binary Arithmetic, Boolean algebra.

- Switching devices, logic gates, AND, OR, NOT, NAND, NOR, XOR, XNOR gate circuits, Modular implementation of combinational logic circuits. K-maps & truth tables.

- Different logic families: TTL, Emitter Coupled Logic, NMOS, CMOS.

- Combinational logic circuits: adders, comparator, encoder, decoder, multiplexer, de-multiplexer, A/D and D/A converter.

- Components of sequential circuits: Flip flops, their characteristics and transition tables for sequential circuit design, registers, counters.

Practical list

1. Study the characteristics of a Transistor as a switch.
2. Construction of a NOT gate using TTL.
3. Construction of AND and OR gates.
4. Construction of NAND and NOR gates.
5. Construction of adder and comparator.
6. Construction of Analog to Digital and Digital to Analog convertors.
7. Study the operation and truth tables of S-R, D, JK and T flip-flops.
8. Study of encoder/decoder circuits.
9. Study of multiplexer/de-multiplexer circuits.
10. Study and construction of digital counters.

Books Recommended:

1. T. L. Floyd, Digital Fundamentals.
2. M. M. Mano, Digital Circuits and Computer Logic.

EH-243 Power Generation and Utilization

T	P	C
3	0	3

Objective:

To enable students to familiarize with important topics related to power generation and utilization.

Course Outline:

- Conventional and non-conventional sources of energy, various types of plants and their efficiencies.

- Hydro electric power plant: Site selection, plant layout, types of dams and turbines.

- Thermal power plant: Site selection, plant layout, steam and gas turbines; flue gas, coal and ash flow diagrams.

- Nuclear power plant: Basic theory of nuclear energy, reactors, shielding, generating station layout, safety and health hazards.

- Electrical energy utilization: Design techniques for electrical wiring for domestic and industrial applications, Cable selection,

- Electrical heating: Resistive, inductive and dielectric heating, electric furnaces.

Books Recommended:

1. S. L. Uppal, Electric Power.
2. Soni, Gupta, A course in Electrical Power.

EH-253 **Electrical Machines - II**

T	P	C
2	3	3

Objective:

To enable students to understand principles and working of single and three phase AC machines.

Course Outline:

- ALTERNATORS: Construction, principle of operation, armature reaction, voltage regulation, synchronization and parallel operation.

- SINGLE PHASE MOTORS: Universal, shaded pole, split phase, repulsion motors, speed control, starting methods.

- SYNCHRONOUS MOTORS: Construction, principle of operation, characteristics, applications.

- THREE PHASE INDUCTION MOTORS: Construction, working principle, types, equivalent circuits, starting methods, speed control and applications.

Practical list

1. Study the effect of field excitation on the generation of voltage by an alternator.
2. Draw the load characteristic curve of an alternator.
3. Study the parallel operation of alternators using dark lamp and bright lamp methods.
4. Study the effect of applied voltage on an induction motor at no load.

5. Study the speed/torque characteristic of the single phase induction motor.
6. Study the speed/torque characteristic of 3-phase induction motor.
7. To carry out no load test of 3-phase induction motor.
8. Observe the changes in power factor and current with excitation of 3-phase synchronous motor.
9. Observe the effect of increasing load on power factor, armature current and speed of 3-phase synchronous motor.

Books Recommended:

1. Stephen J. Chapman. Electrical Machinery Fundamentals

EH-263 **Network Analysis – II**

T	P	C
2	3	3

Objective:

To enable students to learn advanced circuit solving skills.

Course Outline:

- AC CIRCUIT ANALYSIS: Loop and node analyses for AC circuits. Power factor, power factor improvement. Transients in RL, RC and RLC circuits.

- AC NETWORK THEOREMS: Superposition, Thevenin, Norton, reciprocity and maximum power transfer theorem.

- POLY-PHASE CIRCUITS: Star and Delta connections and conversions. Voltage, current and power calculations.

- ELECTRIC FILTERS: RC low pass and high pass filter circuits, band pass and band stop filters.

Practical list

1. Verification of mesh and nodal circuit methods for AC analysis.
2. Observe variation of impedance and current in RLC series circuit with changes in frequency.
3. Study and observe transient response of R, L, C circuits with the help of oscilloscope.
4. Demonstration of Superposition, Thevenin and Norton theorems with AC sources.
5. Demonstration of maximum power transfer theorem with AC sources.
6. Study of Star and Delta connection.
7. Demonstration of RC low pass filter circuits.
8. Demonstration of RC high pass filter circuits.

Books Recommended:

1. Boylested, Introductory Circuit Analysis.
2. Floyd, Circuit Analysis
3. W. Hayt, Engineering of Circuit Analysis
4. K. Y. Tang, Circuit Analysis.

EH-273	Power Transmission and Distribution	T	P	C
		2	3	3

Objective:

To enable students to familiarize with topics in transmission and distribution.

Course Outline:

- TRANSMISSION LINES: Purpose of transmission, choice of frequency and voltage, parameters of overhead transmission lines, types and calculations of transmission lines. Ferranti, corona and skin effects on transmission lines.

- MECHANICAL DESIGN OF OVERHEAD LINES: Line supports, sag and tension calculations, effect of wind pressure and ice loading, conductor vibration and use of dampers.

- INSULATORS: Insulator material, types of insulators, voltage distribution over insulator string, string efficiency, methods of improving the string efficiency, testing of insulators.

- DC AND AC DISTRBUTORS: Pointed and uniform AC and DC distributors, distributors fed at one and both ends, ring mains, stepped mains, unbalanced loading of three-phase AC distributors.

- UNDERGROUND CABLES: Cable resistance, inductance and capacitance, methods of cable installation, voltage drop and power loss, types of cables used in industries, cable fault localization.

- STATIC SUBSTATION: Substation location and layout, classification of substations, bus bar arrangement, grounding of star neutral point.

Practical list

1. Determine the phase sequence of 3-phase source.
2. Observe the flow of real and reactive power in a 3-phase transmission line with known passive loads.

3. Observe the voltage regulation at receiving end of a 3-phase transmission line as function of type of load.
4. Study of various types of insulators used in transmission and distribution systems.
5. Study of voltage distribution along a model of string of suspension insulators.
6. Study of various poles and towers used for transmission and distribution systems.
7. Design of cables for various loads.
8. Prepare a layout scheme for a substation.
9. Visit of substation for familiarization with substation equipment.

Books Recommended:

1. AT Starr, Transmission and Distribution.
2. Turan Gonan, Transmission and Distribution.

EH-282 **COMMUNICATION SKILLS – I** T P C
2 0 2

ANNEXURE - C

EH-292 Total Quality Management

T	**P**	**C**
2	0	2

Objective:

To enable students to develop quality management skills.

Course Outline:

- Introduction to Quality: Quality concepts, types and aspects, Significance of quality.
- Commitment and Leadership: Commitment and Policy, Creating or changing the culture, effective leadership.
- Quality Planning: Flow charting, process charting, purchase planning, planning for JIT.
- Design for Quality: Innovation, Quality Function Deployment and the House of Quality.
- Quality Related Costs: Prevention, Appraisal and Failure Costs, Models for Quality Costing.
- Quality Measurement: Significance, Methods
- Tools and Techniques for Quality Improvement: Basic Tools, Advanced Tools.
- Quality Management System (ISO 9000 series): Significance, Documentations, Implementation and Certification, Audits, Expected Problems.

- Environmental Management System (ISO 14000 series): Significance, Documentations, Implementation and Certification, Audits, Expected Problems.

Books Recommended:

1. Oakland J. S. TOTAL QUALITY MANGEMENT, Bulterworth Heinemann Ltd. UK.
2. ISO 9000 series of standards
3. ISO 14000 series of standards
4. Feigenbaum, TOTAL QUALITY CONTROL. McGraw Hill Book Co., USA.
5. Gillow H. S. and Gillow S. J. TOTAL QUALITY MANGEMENT IN ACTION, Prentice Hall UK.

EH-313	**Microprocessor Theory and Interfacing**	**T**	**P**	**C**
		2	3	3

Objective:

To enable students to learn essential theory and application of microprocessors.

Course Outline:

- MICROPROCESSOR FUNDAMENTALS: Introduction, simplified CPU organization and instruction set, Bus systems.
- MICROPROCESSOR ARCHITECTURE AND PROGRAMMING TECHNIQUES: Structure of Intel 8086/88 microprocessor and its architecture, pin diagram and functions, data sheet descriptions, Interrupts, 8086/88 Instruction set, programming techniques. Assembly language programming of Intel microprocessor.
- INTERFACING THE MICROPROCESSORS: Interfacing concepts, Interfacing of Microprocessor with RAM & ROM, Basic of I/O Interfacing with I/O ports (serial and parallel), Memory Map and Address Decoding, D/A & A/D interfaces, Study of CD – ROM, controllers.
- MICROPROCESSOR CONTROLLED SYSTEMS: Closed loop control systems – temperature monitoring and control system, washing machine controller, diesel generator set controller, stepper motor controller.

Practical list

1. Study of 8086/88 processor, its instruction set and pin layouts.
2. Execute Data transfer group of instructions.
3. Execute Arithmetic group of instructions.
4. Execute I/O instructions.

5. Execute Logic group of instructions.
6. Execute Shift and rotate instructions.
7. Execute Transfer of control instructions
8. Use ADC/DAC with 8086/88.
9. Interface a printer with 8086/88.

Books Recommended:

1. Daglas V. Hall., Microprocessing Interfacing.
2. Berry B. Bari., Intel Microprocesses.

EH-323 Power and Industrial Electronics

T	P	C
2	3	3

Objective:

To enable students to learn use of Power Electronic devices and their industrial applications.

Course Outline:

- INTRODUCTION: Introduction to power semiconductor devices, power diodes, power transistors, power MOSFET, Insulated Gate Bipolar Transistor (IGBT) and their characteristics, diodes with RC, RL, LC and RLC loads.

- THYRISTORS: Principle of operation, characteristics, two transistor model of SCR, thyristor types, ratings, protection and cooling, thyristor turn-on and turn-off, series and parallel operation of thyristors, thyristor firing circuits.

- THYRISTOR CONVERTERS: AC voltage controllers, controlled rectifiers, inverters, DC link converters, DC choppers, cyclo-converters.

- INDUSTRIAL ELECTRONICS: Electromechanical Control relay, Solid state relay, timing and latching relays, relay logic, Magnetic contactor, solenoids, magnetic motor starters, solid state contactors, hydraulic & pneumatic actuators. Sensors and transducers based systems and interfacing of microcontrollers.

- PROGRAMMABLE LOGIC CONTROLLER: Introduction to PLC, ladder logic diagram and programming of PLC, computer controlled machine interfacing of PLC.

Practical List

1. Study the characteristics of an SCR.

2. Study the characteristics of power transistors.
3. Single phase half-wave controlled rectifier with resistive load.
4. Single phase full-wave controlled rectifier with resistive load.
5. Single phase rectifier with inductive load.
6. Three- phase half-controller rectifier.
7. Three-phase full-controller rectifier.
8. Generation of a pulse width modulation waveform.
9. Study of different types of relays.
10. Study of PLCs.

Books Recommended:

1. B. W. Williams, Power Electronics
2. Chute, Electronics in Industry
3. M. Birmingham, K. Brown, Programmable logic controllers
4. M. H. Rashid, Power Electronics

EH-333 Switch gear and protective devices

T	P	C
2	3	3

Objective:

To enable students to familiarize with the use of different switchgear and protective equipments.

Course Outline:

- INTRODUCTION OF SWITCHGEAR: Switchgear, essential features of switchgear, switchgear equipment, bus bar arrangement, switchgear accommodation, short circuits and short circuit currents.

- CIRCUIT BREAKERS: Principle of circuit breakers, arc in circuit breakers, zero current - interruption theory, types of circuit breaker, oil, air blast, SF6, vacuum circuit breaker, recovery and re-striking voltage, rate of rise of re-striking voltage, rating of circuit breakers.

- PROTECTIVE RELAYS: Purpose and functions of relays, basic requirement of protective relaying, types of relays, electromagnetic attraction relays, induction relays, distance or impedance relays, differential relays.

- PROTECTION: Protection of alternators and transformers, protection of bus bars and transmission lines, protection against over voltages, neutral grounding.

Practical list

1. Study of various types of circuit brakers.
2. Study of various types of relays.
3. Study of protection system for alternators.
4. Study of protection system for transformers.
5. Study of protection system for bus bars.
6. Study of protection system for transmission lines.
7. Visit of Grid station for familiarization with relevant protective devices.
8. Visit of Switch yard of a power house for familiarization with relevant protective devices.

Books Recommended:

1. V.K. Mehta, R. Mehta, Principles of Power Systems.
2. The Art and Science of Protective Relaying, Vol I and II.

EH-343 Communication Technology

T	P	C
2	3	3

Objective:

To enable students to cover essential topics in communication systems.

Course Outline:

- Review of Fourier series, transform and its properties.
- Amplitude Modulation: Principle of amplitude modulation. AM transmitter and receiver,
- Frequency Modulation: Principle of frequency modulation, FM transmitter and receiver, Aerial and wave propagation.
- Time division multiplexing (TDM), Frequency division multiplexing (FDM), Comparison of FDM and TDM.
- Digital modulation, Types of digital modulations, effect of sampling and quantization of signals.
- Digital transmission, AWGN and Inter symbol interference, matched filtering and pulse shaping.
- Introduction to Satellite System, Earth satellite station, Orbit satellite station.
- Mobile communication system: Concept of cellular phone, various types of mobile communication systems.

- Optical fiber: Characteristics, types, sources and detectors

Practical list

1. Generate signals of different frequency from signal generator and observe their superposition using oscilloscope.
2. Implement lowpass and highpass filters to separate low frequency signals from high frequency.
3. Perform Amplitude modulation and demodulation.
4. Perform Frequency modulation and demodulation.
5. Demonstrate the effects of sampling and quantization through ADC and DAC.
6. Prepare a GSM mobile communication network structure.
7. Visit a base transiever station (BTS) site to familiarize with BTS equipment.
8. Study optical fiber data sheets and determine signal losses in optical fiber.
9. Splicing techniques for optical fiber.

Books Recommended:

1. B.P. Lathi, Communication System
2. Bruce Carlson, Communication System

EH-353 Power System Analysis

T	P	C
3	0	3

Objective:

To enable students to learn various types of electrical faults and their calculation.

Course Outline:

- Generalized Circuit Constants: General circuit equation, generalized constants of simple networks, constants of combined networks, measurement of generalized circuit constants, numerical problems.

- Representation of Power Systems: One-line diagram, impedance and reactance diagram, percent or per-unit quantities, selection of base and change in base of p.u. quantities, per unit representation of single phase transformer, per unit reactance diagram of a power system, per unit impedances of three winding transformers.

- Symmetrical Three Phase Faults: Symmetrical three phase faults on an unloaded synchronous machine, short circuit currents and reactances of synchronous machines, internal voltages of loaded machines under transient conditions, fault calculation and numerical problems.

- Symmetrical components: Symmetrical components of unsymmetrical phasors, power in terms of symmetrical components; sequence networks – positive, negative and zero sequence networks, unsymmetrical series impedances.

- Unsymmetrical faults: Unsymmetrical faults on unloaded generators, unsymmetrical faults on power systems; single line-to-ground faults; line-to-line faults, double line-to-ground faults, double line to line faults; demonstration problems.

- Power system stability: Steady state and transient stability, swing equation, the power angle equation, equal area criterion of stability and its application, demonstration problems.

Books Recommended:

1. W. D. Stevenson, Jr., Elements of Power System Analysis

EH-363 Data and Computer Communication

T	P	C
2	3	3

Objective:

To enable students to develop necessary computer communication and networking skills.

Course Outline:

- Introduction to computer networks, network topologies, OSI and TCP/IP reference models, the physical layer.

- Transmission media, data encoding, data communication interfaces, data link layer and its protocols.

- LAN, Ethernet, wide area networks, routing, hub and switches.

- Inter-networking, IP protocol and addressing modes, transport Layer, services provided by transport layer, worldwide web.

Practical list

1. Study basic network topologies and IP addressing modes.
2. Use hyper terminal to establish a console session between two PCs.

3. Use of LAN switch to create simple networks.
4. Study and familiarization of Router.
5. Configure a Router for different network scenarios.
6. Perform network operations such as file and printer sharing.
7. Interface serial, parallel and USB ports for data transfer.
8. Study of Wide Area Network (WAN).
9. Understanding World Wide Web (WWW) network structure and IP assignment.
10. Understanding web hosting process on internet.

Books Recommended:

1. W. Stallings, Data and Computer Communication.
2. M. Kaufmann, Computer Networks.

EH-373 Control Technology

T	P	C
2	3	3

Objective:

To enable students to understand principles and working of control systems.

Course Outline:

- Introduction to control systems, open and close loop control systems. Principle of feed back systems.
- Modeling of electrical and mechanical control systems, time and frequency domain analysis.
- Block diagram, transfer function, unit and impulse response, signal flow graphs.
- Control system components, gear trains, levers, servo mechanism; study of feed back system for automatic control of physical quantities such as voltage, speed and mechanical position. Industrial application of servo mechanism. Overview of PID controllers.
- Stability, Routh-Hurwitz stability criteria, compensation techniques, steady state error.

Practical list

1. Study of DC servomechanism.
2. Perform speed control of servo motor in open loop configuration.
3. Perform position control of servo motor in open loop configuration.
4. Perform speed control of servo motor in closed loop configuration.
5. Perform position control of servo motor in closed loop configuration.

6. Study of AC Servomechanism.
7. Servomotor control using PID controller.
8. Mini-project – demonstration of feedback control system using micro-controller.

Books Recommended:

1. Norman Nice, Control Systems
2. B. Kuo, Automatic Control Systems.

EH-383 High Voltage Technology

T	P	C
2	3	3

Objective:

To enable students to familiarize with theory and practices in High voltage technology.

Course Outline:

- Introduction to high voltage technology.

- Conduction and Breakdown in gases, liquid dielectrics, breakdown in solid dielectrics.

- Applications of Insulating materials in power transformers, rotating machines, circuit breakers, cables.

- Generation of high voltage and currents, measurement of high voltage and currents.

- Overvoltage phenomenon and insulation coordination in power systems.

- Testing of high voltage electrical apparatus.

Practical list

1. Study of high voltage testing transformers.
2. Study of Vandegraff generator
3. Observation of corona inception and breakdown voltage in air.
4. Measurement of high voltahe by sphere gap and uniform field gap.
5. Measurement of dielectric strength of solid insulation.
6. Measurement of Dielectric strength of insulating liquids.
7. Measurement of Impulse voltage.
8. Flashover along line insulators.

Books Recommended:

1. Naidu, High Voltage Engineering.
2. Alston, High Voltage Technology
3. Dr. Abdullah, High Voltage

		T	P	C
EH-392	**Communication Skills – II** **ANNEXURE - C**	2	0	2

		T	P	C
EH-412	**Occupational Health Safety and Environment**	2	0	2

Objective:

To enable students to develop occupational health and safety awareness skills.

Course Outline:

- OCCUPATIONAL HEALTH:
  - Classification of health hazards: physical, chemical and biological;
  - Sources of risk: machinery, noise, electrical failure, indoor air, poor ventilation and lighting conditions, radiation, and ergonomics,
  - Classification of dangerous substances and their toxicity; Routes of entry: skin and eyes, lungs and stomach, Occupational exposure limits;
  - Environmental monitoring at the work place: measurement techniques, data evaluation and analysis.
- SAFETY TECHNOLOGY: Importance of safety practices, basic concepts of plant safety, safe machinery. design and guarding. Mechanical handing. Manual handling. Access equipment, transport safety. Chemical safety, electricity and electrical equipment. Fire fighting techniques. Construction safety. Demolition. Personal protective equipment.
- SAFETY MANAGEMENT TECHNIQUES: Accident prevention, health and safety policy, safe systems of work, first aid provisions, health and safety training, spill response protocols, accident investigation, recording and analysis, communicating safety measures, techniques of inspection, Health and safety regulations at work place.

Books Recommended:

4. Mark Friend, Fundamentals of Occupational Safety and Health.

5. A Guide to the Control of Substances Hazardous to Health in Design and Construction. CIRIA Report 125. Thomas Telford Publications London. 1993.
6. F.A. Patty , Industrial Hygiene and Toxicology Vol-I: General Principles.

EH-422 Industrial Management

T	P	C
2	0	2

Objective:

To enable students to learn necessary managerial skills related to industrial requirement.

Course Outline:

- Introduction to management: History of management, management functions, organizational structure, types of organizations, organizational hierarchy, properties of narrow and wide organizations
- Production Processes: Types of production, scale of production, selection of technology, input requirements, capacity utilization, productivity basic concepts, classification, quantitative measurement, productivity improvement.
- Project Management: Properties of projects, project life cycle, project network analysis, resource requirements, monitoring and control, computer tools.
- Inventory Management: Inventory replenishment, economic lot size, re-order point, safety stock level, JIT, computer tools.
- Human Resource Management: Management styles, psychological types, recruitment and training, job evaluation, performance appraisal, motivation and incentives.

Books Recommended:

1. Babcock D. L. MANAGING ENGINEERING AND TECHNOLOGY, Prentice Hall, UK.
2. Zuberi M. H. INDUSTRIAL MANAGEMENT, Rabbani Printing Press, Lahore.
3. Bateman T. S. and Snell S. A. MANAGEMENT: BUILDING COMPETITIVE ADVANTAGE. Times Mirror Higher Education Group, USA.
4. Spinner M. ELEMENTS OF PROJECT MANAGEMENT. Prentice Hall, UK.

CURRICULUM FOR BACHELOR OF MECHANICAL TECHNOLOGY

First Year

Sr. No	Course Code	Subjects	T	P	Contact hours	Marks		Total
						T	P	
1	MH 112	Islamiat & Pak Studies	2	0	2	100	0	100
2	MH 122	Communication Skills	2	0	2	100	0	100
3	MS 133	Applied Maths – I	3	0	3	150	0	150
4	MS 143	Applied Physics	2	3	5	100	50	150
5	MT 152	Computer Applications-I	1	3	4	50	50	100
6	MT 164	Machining Processes	2	6	8	100	100	200
7	MT 172	Computer Aided Drafting (CAD)	1	3	4	50	50	100
8	MT 183	Mechanics of Materials	2	3	5	100	50	150
9	MT 193	Applied Thermodynamics	2	3	5	100	50	150
		Total	17	21	38	850	350	1200

Second Year

Sr. No	Course Code	Subjects	T	P	Contact hours	Marks		Total
						T	P	
1	MS 213	Applied Maths – II	3	0	3	150	0	150
2	MT 222	Computer Applications – II	1	3	4	50	50	100
3	MT 232	Industrial Materials	2	0	2	100	0	100
4	ELT 243	Electronic Fundamentals	2	3	5	100	50	150
5	MT 253	Machine Design	2	3	5	100	50	150
6	MT 263	Fluid Mechanics	2	3	5	100	50	150
7	MT 272	Industrial Management	2	0	2	100	0	100
8	MT 284	Manufacturing Processes	2	6	8	100	100	200
9	MT 292	Production Planning & Control	2	0	2	100	0	100
		Total	18	18	36	900	300	1200

Third Year

Sr. No	Course Code	Subjects	T	P	Contact hours	Marks		Total
						T	P	
1	MT 313	I.C.Engines	2	3	5	100	50	150
2	MT 322	Plant Maintenance	2	0	2	100	0	100
3	MT 333	Mechanical Vibration	2	3	5	100	50	150
4	MT 343	Instrumentation & Control	2	3	5	100	50	150
5	MT 353	Production Automation	2	3	5	100	50	150
6	MT 362	Material Handling	2	0	2	100	0	100
7	MT 372	Energy & Environmental Technology	2	0	2	100	0	100
8	MT 383	Metrology & Gauging	2	3	5	100	50	150
9	MT 393	Refrigeration & Air Conditioning	2	3	5	100	50	150
		Total	18	18	36	900	300	1200

Fourth Year

Sr. No	Course Code	Subjects	T	P	Contact hours	Marks		Total
						T	P	
1	MT 412	Total Quality Management	2	0	2	100	0	100
2	MT 422	Occupational Safety & Health	2	0	2	100	0	100
3	MT 432	Technical Project	0	6	6	0	100	100
4		Internship	0	40	40	0	700	700
		Total	4	46	50	200	800	1000

DETAIL OF COURSE
FOR
MECHANICAL TECHNOLOGY

MS 133 APPLIED MATHEMATICS-I

Course Outline:

Complex numbers, Argand diagram, De Moivre's theorem, hyperbolic and inverse hyperbolic functions. Algebra of vectors and matrices, systems of linear equations. Derivative as slope, as rate of change (graphical representation). Extreme values, tangents and normals, curvature and radius of curvature. Differentiation as approximation. Partial derivatives and their application to extreme values and approximation. Integration by substitution and by parts, integration and definite integration as area under curve (graphical representation).

Reduction formulae. Double integration and its applications. Polar and Cartesian coordinates, polar curves, radius of curvature, cycloid, hypocycloid, epicycloids and involutes of a circle.

Books Recommended:

1. Calculus and analytical Geometry, 11th **Edition** *By Thomas Finney* John Wiley & Sons.
2. Advanced Engineering Mathematics 5th **Edition** *By C. R. Wylie* McGraw-Hill Education.
3. Advanced Engineering Mathematics, 8th **Edition** *By* HT*Erwin Kreyszig* TH John Wiley & Sons.

MS 143 APPLIED PHYSICS

Course Outline:

Introduction:

Scientific notation and significant figures. Unit in different systems.

Vectors:

Review of vectors, Vector derivatives, Line and surface integrals, Gradient of scalar.

Mechanics:

Coordinate systems. Motion under constant acceleration, Newton laws and their applications, Uniform circular motion. Vortex Motion, Frictional forces.

Work and energy. Potential energy, energy conservation, energy and our environment.

Electrostatic and magnetism:

Coulombs law. Gauss's law. Electric field around conductors. Dielectrics. Magnetic fields. Magnetic force on current.

Semiconductor Physics:

Energy levels in a semiconductor. Hole concept. Intrinsic and extrinsic regions. Law of mass action. P-N junction. Transistor.

Waves and Oscillation:

Free oscillation of systems with one degree of freedom. Classical wave equation. Transverse modes for continuous string. Standing waves. Dispersion relation for waves.

Optics and Laser:

Basic introduction to Optics and Laser. Diffraction grating. Lasers, population inversion. Resonant cavities. Quantum efficiency. He-Ne, Ruby and CO2 lasers. Doppler effect and sonic boom.

Modern Physics:

Photoelectric effect, Compton effect. Bohr theory of hydrogen atom, atomic spectra, reduce mass, De-broglie hypothesis braggs law, electron microscope, zeeman effect, atomic nucleus, mass energy relation, binding energy, nuclear forces and fundamental forces. Exponential decay and half life.

MT 164 MACHINING PROCESSES

Objectives:

To enable the student to understand:-

- Mechanism of Chip formation.
- Cutting tool materials and cutting fluids.
- Lathe operations, milling operations, planning.
- Shaping and broaching operations.

Course Outline:

Cutting Tool Materials and Cutting fluids.

- Steels
- Carbides.
- Carbides Coated Tools
- Ceramics, Diamond tools, abrasives, stellites
- Cutting Fluids properties, purposes and their types

Lathe Operations.

- Turning parameters, further work on lathe machines i.e. eccentric and form turning, under cutting, centre hole
- Calculation of MMR, Power and Cutting Time
- High Precision Machining
- Hard Turning.
- Cutting Screw Threads (single, double and triple start).
- Lathe accessories and attachments
- Semi Automatics and automatics.

Milling Operations.

- Milling parameters.
- Calculations of MMR, power and Cutting Time
- Milling attachments
- Accessories.
- Copy Milling.
- Die Sinking
- Index Milling.

Planning, Shaping and Broaching Operations.

- Principle
- Tools.
- Applications.

Gear Manufacturing

- Machining
- Form Cutting
- Shaping.
- Hobbing

Finishing Operations

- Grinding.
- Honing
- Lapping
- Polishing and Buffing

Lab Outline

1) Familiarization with types of cutting tools and tool holders used with a standard center lathe machine
2) To perform alignment tests for a lathe machine
3) To produce external threads on components using different methods
4) Practice of boring operation on the lathe machine
5) To produce internal threads on components using different methods
6) Identification and familiarization of various types of milling cutters.
7) Familiarization with the parts and accessories of a universal milling machine.
8) To perform alignment tests for a milling machine
9) To manufacture a given component for the practice of side milling, end milling, slot milling and engraving on a universal milling machine.
10) To manufacture a given component for the practice of copy milling, index milling and die sinking on a universal milling machine.

11) Familiarization with the parts, accessories and cutting tools of a gear hobbing machine.
12) Practice of spur gear cutting on a gear hobbing machine.
13) Familiarization with the parts, accessories and cutting tools of a shaper.
14) Manufacturing a given component on shaper.
15) Practice on cutting a key way with a broach using an arbor press.

Books Recommended:

1. Workshop Technology by W A J Chapman (Part I, II, III)
2. Elements of Workshop Technology Vol II – Machine Tools by SK Hajra Choudhury

Reference Books:

1. "Machine Tools" Processes and Applications by Genevro W A J and Heineman S S Prentice Hall UK
2. Machine Tool Practice by Kibbe R R Neely J E Neyer R O and White W T Prentice Hall UK

MT 172 COMPUTER AIDED DRAFTING (CAD)

Prerequisites: Computer Application

Objectives:

After completion of the subject the student will be able to understand different techniques used for drawing in 2D and 3D Auto Cad.

Course Outline:

1. Introduction to AutoCAD (Latest version available), AutoCAD interface, toolbars, Menus, Coordinate System, and AutoCAD commands uses for creating organizing modifying saving & plotting 2D drawings.
2. Drawing in layers, object properties, hatching, text dimensioning, blocks, attributes, external reference, auto cad design center.
3. Introduction to 3D modeling, solid modeling, surface modeling & wire frame modeling. Extrude, Revolve, Union, Subtract, Intersect & other 3D commands, 3D view, view ports, model space, paper space & layouts.
4. Introduction to product design. Basic concepts in product designing using pro engineering software (feature – based) parametric solid modeling.
5. Creating simple mechanical parts
6. Assembling simple mechanical parts.
7. Generating 2D drawings of the parts & assemblies.

Lab outline

Practice of the above course outline in lab.

Recommended Books:

1. AutoCAD user guide by Auto Desk.
2. AutoCAD command reference by Auto Desk
3. Mastering AutoCAD by George Omura

MT 184 MECHANICS OF MATERIALS

Prerequisites: - Engg. Mechanics

Objective:

Enable the students to understand application of forces & their effects on different mechanical & structural members in statics & Dynamics.

Course Outline:

Mechanical properties of Materials, tensile, compression and shear stress & shear strain, Elastic constants & their relationships, compound bars, thermal stresses, Moments of inertia, shearing force and bending Moment, torsion of circular bars, hollow circular shafts, strain Energy.

Lab outline

1. Study of Material testing Lab.
2. Study of universal testing m/c
3. Tensile test on UTM for a mild steel specimen.
4. Compression test on cement mortar cube
5. Shear test on mild steel specimen
6. Torsion test on ductile steel, Cast iron & brass.

Books Recommended:

1. Mechanics of Materials by F.P Beer & ER Johnston
2. Mechanics of Engg Materials by FV Warnock P.P Benham & R.J Crawford.
3. Strength of Materials by F.Singar.

MT -193 APPLIED THERMODYNAMIC

Objectives:

Enable the student to comprehend:

- The laws of Thermodynamic and their application to engineering thermodynamic systems. IC Engines, Air Compressors, Steam Engines.
- Entropy, irreversibility application to heat engine.
- Turbines, Air standard Efficiency, Thermal and mechanical efficiency.
- Air fuel ratio, octane number and cetane number

Course Outline:

Basic concepts of thermodynamics:

- Thermodynamics and energy
- Closed and open system
- Properties of a system
- State and equilibrium
- Processes and cycles
- Pressure and its measuring instruments

Properties of Pure Substances

- Pure substance and its phase change processes
- Property diagram
- Specific heats
- Internal energy, enthalpy and specific heats of ideal gases, liquids and solids

Energy Transfer by Heat, Work and Mass

- Energy transfer by work
- Flow work and energy of the flowing fluid
- Modes of heat transfer

Laws of Thermodynamics

- First law of thermodynamics
- Energy balance for closed systems and for steady flow systems
- Energy balance for closed systems and for unsteady flow systems
- Second law of thermodynamics
- Explanation of the second law
- Heat engines, refrigeration and heat pumps
- Carnot cycle and its principles
- Perpetual motion machines
- Reversible and Irreversible processes

Entropy

- Definition and description of entropy
- Increase of entropy principle
- Entropy change of pure substances
- Isentropic processes
- T-S relations
- Isentropic efficiencies of steady flow devices.

Lab. Outline

- To measure a regular and irregular shaped area with the help of Planimeter / Mechanical Integrator
- To measure area of indicated PV diagram; with the help of Planimeter / Mechanical Integrator.
- To analyze the thermodynamic systems and its properties
- Study of working principle of external combustion engine.
- Study of working principle of internal combustion engine.
- To study and analyze the erecting, installation, maintenance and working principles of water tube and fire tube boilers.

Books Recommended:

1. Basic engineering Thermodynamic By Rayner Joel
2. Thermodynamics an Engg Approach latest edition by Youns A Cengel and Michael A Boles

MS – 213 APPLIED MATHEMATICS –II

Course Outlines:

Differential equation; basic concepts and ideas; geometrical interpretation of first and second order differential equations; separable equations, equations reducible to separable form, exact differential equations, integrated factors. Linear first order differential equations, Bernoulli's differential equation. Families of curves, orthogonal trajectories and applications of differential equations of first order to relevant engineering systems. Homogeneous linear differential equations of second order, homogeneous equations with constant coefficients, the general solutions, initial and boundary value problems, D-operator, complementary functions and particular integrals. Real, complex and repeated roots of characteristics equations. Cauchy equation, non-homogeneous linear equations. Applications of higher order linear differential equations. Ordinary and regular points and corresponding series solutions; introduction to Laplace transformation

Books Recommended:

1. Advanced Engineering Mathematics **5th Edition** *By C.R. Wylie* McGraw-Hill Education
2. Advanced Engineering Mathematics,**8th Edition** *By* HT*Erwin Kreyszig*TH John Wiley & Sons

MT-232 INDUSTRIAL MATERIALS

Objectives:

Enable the student to comprehend:

- The concept of crystal geometry. BCC, FCC and HCP.
- The material composition, composite materials.
- Materials properties and material substitution.
- The basic heat treatment process.
- The effect of alloying elements on mechanical properties of steel.
- Common heat treatment processes of non - ferrous metals.
- Concept of non metallic materials. application of plastics, ceramics glass and rubber

Course Outline:

Concept of crystal geometry, Crystalline structure of metals, BCC, FCC and HCP structure, formation of alloys, binary alloys, phase diagram of binary alloys, cooling curves, solid solution, eutectic alloy, intermediate compounds, iron-iron carbide equilibrium diagram, micro structure of plain carbon steels, effect of carbon percentage and rate of cooling on micro structure and properties of plain carbon steel.
Heat treatment processes, Annealing, Normalizing, Hardening, Tempering, Harden ability, Case-hardening, Carburizing, Nitriding, Cyaniding, Flame & induction Hardening, Effect of alloying elements on mechanical properties of steel. Cast Irons, Gray Cast iron. White Cast Iron and Malleable cast Iron.
Non-ferrous Metals and alloys. Mechanical properties of copper and aluminum, copper zinc and copper tin alloys. Composite Materials and their applications, Polymers and its types, polymerization applications, additives to polymers etc.

Books Recommended:

1. Introduction to Engineering Materials By V John
2. Materials and Processes in Manufacturing (latest Edition) By Degarmo. Black & Kohscr.
3. Manufacturing Process (8^{th} Edition) By Amstead, Ostwald & Begeman
4. Introduction to Physical metallurgy by Avner

ELT – 243 ELECTRONIC FUNDAMENTALS

Objectives:

Enable the students to understand the basics of electronics and different electronic components used in industries.

Course Outline:

Insulators, semiconductors and metals; PN junction diod, characteristics and analysis, power supplies, rectifier circuits; transistors, constructions and characteristics of bipolar junction transistor (BJT); construction and characteristics of FET; amplifiers; basic principles, static and dynamic load lines, classification, frequency response; integrated circuits; monolithic and hybrid integrated circuits; integrated circuits for industrial controls; transducers, displacements sensing, load cells, velocity sensing, force sensing, photo sensors, laser devices; construction and working of digital multi-meters, oscilloscopes, signal generators; number system, Boolean algebra, logic gates, combinational logic design; sequential circuits and logic design, introduction to microprocessors and micro controllers, I/O devices, interfacing to memory and I/O devices.

List of Practical

1. To study the V-I characteristics of a Semiconductor Diode
2. To demonstrate the use of a Semiconductor Diode as a half-wave and full wave rectifier
3. To demonstrate operation and characteristics of BJT.
4. To demonstrate operation and characteristics of FET.
5. To demonstrate operation of single stage transistor amplifier
6. To demonstrate the design and operation of integrated circuits.
7. Transistor familiarization and function behavior.
8. To demonstrate the design and operation of Analog type Integrated Circuits.
9. To demonstrate the design and operation of Potentiometer Sensor
10. To demonstrate the design and operation of strain-page load cell
11. To demonstrate the design and operation of Digital Multimeters

Books Recommended:

1. Electronic Devices by Floyd.
2. Microprocessor Fundamentals by R. Tokhem.
3. Digital Electronics by Floyd
4. Chute. Electronics in Industry, McGraw Hill, UK

MT 253 MACHINE DESIGN

Objectives:

Enable the student to comprehend:

- Acquire Practice in analyzing Stresses setup in machine parts subjected to loads/sources
- Calculate diameters of solid and hollow shafts subjected to combined bending and twisting moments
- Practice design of Coupling, types and calculation of proportional sizes of flange couplings.
- Design of belts and ropes.
- Design of welded and riveted joints subjected to static loading
- Design of helical spring, conical and volute springs, torsion springs, leaf springs and spiral springs, gear terminology and application of different types of gears.
- Different types of modeling like Wire Frame Modeling, Solid Modeling and Surface Modeling
- Selection of Ball and Rolling bearings

Course Outline:

Introduction to design, design consideration, basic concepts in designing machine parts, design of solid and hollow shafts subjected to combined

twisting and bending moment, flange couplings and proportional sizes, Calculation of stresses due to static loading, design of belts and ropes for given power transmission, design of helical spring, conical and volute springs, torsion spring, leaf spring spiral springs, Gear terminology and design of spur gear, selection of ball and roller bearings.

Lab. Outline

Introduction to 3D modeling, Wire Frame Modeling, Solid Modeling, Surface Modeling, Development of solid modeling for Engineering Analysis.
Introduction to different solid modeling, soft ware (Uni graphic, solid edge), pro-E, CATIA, Solid works, comparison of different commands

Books Recommended:

1. Mechanical Engineering Design, By .I.E. Shigley.
2. Fundamentals of Machine Component Design by R.C. luvinall & K.M. Marsak
3. Manual of CAD Soft Ware Package

MT- 263 FLUID MECHANICS

Objectives:

Enable the students to understand different properties of fluids in statics and kinematics and also will be familiar with flow and pressure measuring instruments.

Course Outline:

Introduction:
Development of fluid dynamics, distinction between solid and fluid, gas and liquid, properties of fluids, Density, specific weight, specific volume, specific gravity, compressible and incompressible fluids, ideal fluids, viscosity and its units, surface tensions, vapor pressure of liquids etc.

Fluid Statics:
Pressure, variation of pressure in a static fluid, pressure head, review of types of pressures, pressure measurement gauges, Force on plane area, center of pressure, force on curved surface, Buoyancy and stability of submerged and floating bodies.

Kinematics of Fluid Flow:
Types of flow, flow rate and mean velocity, equation of continuity, flow net, velocity and acceleration in steady and unsteady flow.

Measurement of flow rate velocity:
Energy Consideration in Steady Flow: Kinetic energy of a flowing fluid, potential energy, internal energy, general equation for steady flow of any fluid, energy equation for steady flow of incompressible fluids. Bernoulli's theorem, Head, Power consideration in fluid flow cavitations, energy equation for steady flow of compressed fluids, equation of steady motion along a steam line for ideal fluid and Euler's equation, equation of steady motion along a stream line for real fluid, Hydraulic gradient, energy line, problems, Pressure in fluid flow and its measurement,set trajectory, flow in a curved path, vortex, types of vortex.

Similitude and Dimensional analysis:
Definition and importance, geometrical, kinematic and dynamic similarity, dimensionless ratios, scale ratios, dimensional analysis.

Steady & Incompressible Flow in Pressure conduits:
Laminar and Turbulent flow, critical Reynold's number, hydraulic radius, general equation for friction, Darcy-Weisbach pipe friction equation, laminar flow in circular pipes, turbulent flow in circular pipes, pipe roughness, chart for friction factor, fluid friction in non-circular conduits, empirical equations for pipe flow. Flow measurements, Pitot tubes, venturimeter, orifices, nozzles.

Lab Outline:

1. Study of Hydraulic Bench
2. To determine the co-efficient of Venturimeter & discuss its application.
3. To calibrate the given rectangular notch and discuss its application.
4. To calibrate a triangular notch and discuss its application.
5. To find the co-efficient of discharge
6. To calibrate the given pressure gauge & discuss its application.

Books Recommended:

1. Fluid Mechanics with Engg. Application by Daugherty and Franzini.
2. Fluid Mechanics by Victor L. Strecter. McGraw Hill
3. Fluid Mechanics and Hydraulic Machinery by K R Arora, Standard Publisher India

MT 272 INDUSTRIAL MANAGEMENT

Prerequisite: Business Management & industrial Economics

Objectives:
Enable the students to develop Managerial skills, get acquainted with the principles of management & human relations.

Course Outline:

Management

a. Industrial Management:
   Introduction, Management as science or art, history of management, management functions.
b. Organization:
   Introduction, organizational structure, types, their advantages & disadvantages.

c. Foremanship & leadership:
   Introduction, duties of foreman, essential qualifications of a foreman, types of leaders, acceptance of administration, leadership, qualities of leadership.
d. Inventory control:
   Introduction, types of inventory, Need of inventory control, The maximum stores, minimum stores, The standard order, The ordering point, lead & procurement time, Economic ordering quantity (EOQ), Use of computer.

Production:

Introduction, method of production, advantages & disadvantages, planning & scheduling, introduction to CPM & PERT.

Inspection:

Definition, objectives, function of inspection deptt., qualities of inspector, major principles, standard of inspection, kind of inspection, advantages & disadvantages.

Human Resource Management:

Management styles, psychological types, recruitment and training, job evaluation, performance appraisal, motivation and incentives.

Books Recommended:

1. Babcock D.L Managing Engineering & Tech. Prentice UK.
2. Banga & Sharma Industrial Management.

MT 284 MANUFACTURING PROCESSES

Prerequisites: Workshop practice and basic knowledge of machining operations.

Objectives:

Enable the student to know about different types of machine tools used in production/manufacturing.

Material Removal:
Mechanics of chips formation, Types of chips produced, Chip breakers, Orthogonal & Oblique cutting, Cutting forces in conventional turning, Friction & heat sources in cutting, surface finishing processes, Lapping, Honing, Super finishing, Polishing, Buffing, Electroplating, Galvanizing, Metal Spraying.

Cutting Tools:
Single point tool Geometry, Multi point tools, Tool life & wear, Tool failure, Factors affecting tool life, Measuring tool life, Tool material & its characteristics, Cutting fluids, Purposes, Types & properties of cutting fluids.

Machining Processes:

Broaching & broaching machines, Press machine, Types of Press machines, Press work operations.

Sheet Metal Forming:

Sheet metal characteristics, Formability of sheet metals, Bending sheet & plate, Tube bending & forming, Deep drawing, Super plastic forming.

Jigs & Fixtures:

General Design principle, Elements of Jig, Locating Devices & Clamping Devices.

Non-Conventional Machining Processes:

Ultrasonic machining, Abrasive-jet machining, Water-jet machining, Electrical discharge machining (EDM), electromechanical machining & grinding, Laser beam machining, Electron beam machining, Chemical milling, Chemical Blanking, Chemical Engraving.

Lab Outline

1. Study of Broaching machine.
2. Study of Press machine.
3. Practice on press machines to make different shapes.
4. Study of bending machine.
5. Bending Sheet metals of different thickness.
6. Practice on making of simple jigs and clamping & locating devices.
7. Mini Project on making a simple Jig or Fixture.

Books Recommended:

1. Elements of Workshop Technology Vol. II by SK Hajra Choudry.
2. Manufacturing Processes BH Amstead & PF Ostwald.

MT- 292 PRODUCTION PLANNING AND CONTROL

Objectives:

Enable the students to understand skills in forecasting, inventory control, JIT and new concepts in production planning.

Course Outline:

1. Forecasting
   Introduction, Forecasting Approaches, Time Series Forecasting Techniques, Casual Forecasting Techniques, Role of Computer in Forecasting
2. Inventory Management
   Inventory Systems, Economic Lot Size, Quantity Discounts, Safety Stock Level
3. Just-in-Time Systems:
   JIT Production, Kanban,
4. Supply-Chain Management
   Significance, Purchasing Strategies, Purchasing Management, Materials Management,
5. MRP and MRP-11
   Master Production Schedule, Bill of Materials, Resource Requirements, MRP Management,
6. Short Term Scheduling Tactics
   Job Shop Scheduling, Shop Loading, Sequencing, Line Balancing
7. Queuing Theory
   Introduction, Queue Characteristics, Queuing Models, Introduction to Simulation

Books Recommended:

1. Render B and Heizer J PRINCIPLES OF OPERATIONS MANAGEMENT. Prentice-Hall, Inc. USA.
2. Littlechild S. OPERATIONS RESEARCH IN MANANGEMENT. Prentice Hall, UK.

Reference Books:

1. Tersine R J. PRINCIPLES OF INVENTORY AND MATERIALS MANAGEMENT. Prentice Hall, UK.
2. Adam E E and Eber R J. PRODCTUION AND OPERATIONS MANAGEMNET. Prentice Hall, UK

MT-313 I.C. ENGINES

Prerequisites. Applied Thermodynamics.

Objectives:

1. Understand Engine classification.
2. Understand working cycles of I.C. Engines.
3. Understand Systems of I.C.engines.
4. Understand servicing and overhauling of I.C. Engines.

Course Outline:

1. Introduction.
   History and development of I.C. Engines.
2. Classification of l.C. Engines
   - Spark ignition Engines.
   - Compression ignition Engines.
   - Fundamental difference between SI and CI Engines.
3. Working Cycles.
   - Four stroke petrol engine.
   - Two Stroke petrol engine.
   - Four Stroke Diesel engine.
   - Two stroke Diesel engine
   - Comparison of petrol and diesel engines.
   - Comparison of 4-stroke and 2~stroke engines.
4. Fuel air mixing
   - SI engines and
   - CI engines.
5. Carburetion.
   - Construction of simple carburetor
   - Types of carburetors.
6. Carburetion performance
   - Full range of load.
   - Full range of speed.
7. Fuel injection in CI engines
   - Air injection system
   - Solid injection system
   - Their merits and demerits.
8. Fuel injection system performance
   - Full Range of load.
   - Full range of speed.
9. Spark ignition systems.
   - Battery ignition system.
   - Magneto ignition system.

- Electronic ignition system.

10. Ignition advance and ignition retard.
    - Their effect on the output of reciprocating engines
11. Engine cooling and lubrication
    - Necessity of cooling.
    - Types of cooling system.
    - Necessity of Lubrication.
    - Types of lubrication system.
12. Turbocharged engines.
    - Installed in road vehicles
    - Installed in industry.
13. Servicing and overhauling
    - Vehicle engine.
    - Industrial engines.

Lab. Outline

1. Measurement of cylinder pressure variation as function of time.
2. Measurement of cylinder temperature as function of time.
3. Engine performance variation with ignition retard.
4. Engine performance variation with ignition advance.
5. Performance comparison of a petrol engine with and without fuel injection.
6. Effect of fuel injection pressure variation on performance of petrol engine.
7. Performance of diesel engine at different injection pressure.
8. Measurement of ignition delay in petrol engine.
9. Measurement of ignition delay in diesel engine.
10. Effect of intake change pressure on performance of diesel engine.
11. Effect of intake change pressure on performance of petrol engine

Text Books.

1. I.C. engines by C.I Tayler.
2. I.C. Engines Fundamentals by J.B Heywood.
3. Introduction to I.C. engines by Richard stone
4. Internal combustion engines by Dr. R.K signal

MT -322 PLANT MAINTENANCE

Objectives:

Enable the students to comprehend different types of maintenance, cost control & maintenance and the application of computer in maintenance.

Course Outline:

1. **Equipment Installation**

Selection of Appropriate Location for Installation. Design and Preparation of Foundation for Equipment. Provision of Supplies and Services. Transportation, Unpacking and checking the equipment as per specifications Checklist of Precautions to be observed. Commissioning of the Equipment

2. **Organization and Management of Maintenance function**

Introduction to the Theory and practice of maintenance. Operating policies Operating practices to reduce maintenance control. Reports from maintenance deptt. Area and Centralized Maintenance control. Considerations in using outside contractors. Incentive payment for maintenance workers. Human factors in maintenance

3. Establishing the Costs and Controls of Maintenance

Work measurement. Work authorization and control. Rating and evaluating maintenance. Work simplification in maintenance. Estimating repair and maintenance costs. Cost control for effective operation. Small plant maintenance control. Maintenance Control and inventory control. Maintenance storerooms

4. Applying the computer to maintenance management and control

An introduction to computers in maintenance. Automating maintenance information by computer. Computerized planning and scheduling Computer terminology defined.

5. Maintenance of plant facilities and housekeeping

Industrial Housekeeping. Painting and protective coatings. Maintenance of elevators and special lifts

6. Maintenance of mechanical equipment

Plain and rolling bearings. Flexible couplings and chains for power transmission. Overhead and Gantry Cranes. Chain hoists Drives

7. Maintenance of service equipment

Air-conditioning equipment. Ventilating fans and exhaust systems. Dust collecting equipment. Centrifugal Pumps. Reciprocating Air Compressors Valves. Piping. Scaffolds and Ladders.

8. Lubrication

Lubricants. Lubrication Systems, Devices and Procedures

9. Preventive and predictive Maintenance , expose factor

Books Recommended:

1. Higgins L.R. Maintenance Engineering Handbook. McGraw Hill Book Company, UK.
2. Weaver R. Manger's Guide to Machinery Maintenance. Prentice Hall, UK.

Reference Book

1. Pertocelly K and Press F. Commercial and Institutional Maintenance Management, Prentice Hall, UK
2. Lamb R. G. Availability Engineering and Management for Manufacturing plant performance, Prentice Hall, UK.

MT -333 MECHANICAL VIBRATION

Objectives:

Enable the students to comprehend the basic concepts and terminologies in Mechanical Vibration, vibration in different mechanical systems & methods to remove/reduce vibration.

Course Outline:

Vibration:
Introduction, types of vibration, basic concepts and terminologies

Revision of matrix algebra:
Characteristic equations, solution methods, free vibration, equation of motion, energy methods, series and parallel combination, viscously damped free vibration, logarithmic decrement, coulomb damping.

Harmonically excited vibration:
Forced harmonic vibration, rotating unbalanced, and vibration measuring instruments.

Mechanical system:
Gravity pendulum, spring-mass vibrating system, compound gravity pendulum, stiffness, potential energy, stability, torsional pendulum, free vibration and resonance.

Physical stiffness of elements:
Rods, beams, stiffness coefficients as matrix elements.

Eigen value analysis of:
Two degree of freedom problems, three degree of freedom problems, determination of modes of vibration.

Rayleigh's method and its applications.

Lab Outline

1. Demonstration on simple spring mass system and related calculation.
2. Demonstration simulation of beams and rod vibration.
3. Demonstration on damped vibration and analysis.
4. Computer simulation of whole range of vibrating components.
5. Application of computer for solving set of equations.

Books Recommended:

1. Vibration theory and applications – William, T. and Thompson.
2. Fundamentals of mechanical vibrations by Kelly.
3. Mechanical Vibration by S S Rao

MT 343 INSTRUMENTATION AND CONTROL

Prerequisites:- Basic Electrical technology & mechanical gages of different types.

Objectives:

Enable the students to know about basics of control system & measuring instruments.

Course Outline:

Introduction to control system, input & output, open loop, closed loop control system & feedback control system, Elements of a general control system & their examples, transfer function.

Transducers, classification of Transducers

Study of different indicating, measuring & recording instruments for length force, torque, frequency, pressure, flow & temperature.

Free body Diagram and Newton's law of motion, operational notation, grounded chair representation, series & parallel laws. Equation of motion for a spring mass & damper system, Electrical & Mechanical analogous circuits.

Stability:-
Concept, routh criterion & root locus method for stability measurements.

Lab outline:

1. Experimental Determination of Transfer function of a given mech system.
2. Experimental study of different types of pressure measuring devices
3. Experimental study of different types of temperature measuring devices
4. Use of oscilloscopes.

Books Recommended:

1. Automatic control by Francis H Raven
2. Modern control system by Richard C dorf
3. Automatic control by J.J Distofanoelef.

MT 353 PRODUCTION AUTOMATION

Prerequisites: Workshop practice

Objectives:

Enable the students to understand basics of automation & CNC machines and apply new techniques in production engineering.

Course Outline:

Automation

Introduction, Economics of Automation, Flow lines, Mathematical models, Storage Buffers, Partial Automation, Balancing, Group Technology and Flexible manufacturing.

Hardware of Automation:

Introduction:

Building Blocks of Automation, Robotics Geometry, Kinematics, Drives and Motion Control, Uses of CNC Machines, Advantages, Machine Control, Machine Codes, Programming,

CNC Machines:

General information, Operation, Control panel description, Tool function, Practical application of tool wear offset, feed function, spindle function, programming of CNC in absolute & incremental system, program creation, preparatory function, CAD/CAM approach to part programming, CAD/CAM application(turning problem, surface milling, machining of curved surfaces.)

Programmable Logic Controllers:

Introduction to PLCs, Advantages of PLCs, Ladder Logic Diagrams, Switching Logics, Components of PLC, PLC Operating Cycle, PLC Connection, PLC operation, PLC Applications.

Lab Outline:

1. Practice on manual Lathe machine to make & perform operation like facing, turning, drilling, threading etc.
2. Practice on manual milling machine to make & perform operation like grooving facing, milling etc.
3. Drawing & Production of parts using CAM software for CNC lathe.
4. Drawing & Production of parts using CAM software for CNC milling.
5. Introduction to programming G & M codes, CNC simulators.
6. Linear interpolation & rapid traverse.
7. Absolute vs incremental coordinate programming.
8. Turning & facing of a stepped shaft.
9. Circular interpolation & roughing cuts with a tool change.
10. Canned cycle – Facing & Rough Turning.
11. Canned cycle – Grooving external threading.

Books Recommended:

1. Automation, Production System, & CAM by MR Groover (Prentice Hall)
2. Robotics & Manufacturing Automation (2nd Ed.) by C.R. Asfahl. (John Wiley)
3. Computer Control of machines & Processes by Bollinger & Duffie.
4. Handbook of Industrial Engineering (2nd Ed.) by G.Salvendy .(John Wiley)

MT 362 MATERIAL HANDLING

Objectives:

After going through this subject the student will be able to know about the various types of conventional material handling equipments along with modern and latest equipment and devices e.g: AGVs, Robots, Pallet trucks, different types of electronic sensor using devices etc.

Course Outline:

1. The material-handling problem

Introduction, Material Handling Equipment Marketing, Principles of material handling, factors affecting material handling

2. Bulk-Material-Handling Equipment

Belt Conveyers, Bucket Elevators and Bucket Conveyers, Screw Conveyers, Vibratory Conveyers, Feeders and Screws, Vehicle Bulk-Handling Systems, Marine Bulk-Material Handling.

3. **Packaged-Material-Handling Equipment**
   Pallets and Palletizing Operations, Package and Unit Conveyer Systems, Belt Package Conveyer
   Power Roller conveyer, Conveyer Turns and Switches, Conveyer Sortation and Accumulation Systems, Pallet Conveyers.

4. **Monorail conveyer Systems**
   Light Duty Chain and Cable System, Heavy Duty Systems, Power-and-Free Systems, Powered-Carrier Monorail Systems

5. **Counterbalanced Forklift Trucks.**
   Reach-Type Non-Aisle Forklift Trucks, Narrow-Aisle Turret-Type Forklift Trucks, Side-Loading Forklift Trucks,

6. **Miscellaneous Material Handling Equipment**
   Vehicular Unit Handling equipment, Pallet Transporters and Material Handling Tools. Towline Systems, Tractor-Trailer Trains.

7. **Integrated Material Handling Systems**
   Automated Guided Vehicles and Their Applications, Use of Robots

Books Recommended:

1. Sims Jr. E.R. “PLANNING AND MANAGING INDUSTRIAL LOGISTICS SYSTEMS” Elseveir, Amsterdam.
2. Maynard’s ‘INDUSTRIAL ENGINEERING HANDBOOK” McGraw Hill, UK.

Reference Book

1. Langford J. W. “LOGISTICS PRINCIPLES AND APPLICATIONS”. McGraw Hill, UK.

MT- 372 ENERGY AND ENVIRONMENTAL TECHNOLOGIES

Prerequisites: Basic knowledge of thermodynamics

Objectives:

Enable the students to comprehend energy resources, alternative energy resources, environmental pollution and its remedies.

Course Outline:

1. **Energy Resources:**
   Fossil fuel resources, coal, oil and gas, resources of energy, supply and demand.

2. **Alternative energy resources:**
   Nuclear, Solar, Wind, Ocean, Tidal and geo thermal.

3. **Steam power plants:**
   Modern steam plants, reheat and regenerative Turbines, flow through steam nozzles, Impulse and reaction turbines, pressure compounding, Velocity compounding, extraction and back pressure turbines. Boiler makeup and treatment.

4. **Gas Turbine Power Plants:**
   Practical Gas turbine cycle. Isentropic efficiency of compressor and turbines, intercooling and reheating.

5. **Combine Cycle Power Plants:**
   General-combined cycle with heat recovery boilers.

6. **Jet Propulsion Plant:**
   Aircraft Jet engine, efficiency and performance of turbojet plant, ram jet, comparison of plants for subsonic and supersonic flights.

7. **Nuclear Power Plant:**
   Introduction, power from nuclear energy, nuclear fusion and fission, Radioactivity, Decay rates and half life, converting mass into energy by fission. Thermal-Fission Reactors and Power Plants, Pressurized water reactor (PWR), The boiling water reactor (BWR)

8. **Environmental pollution:**
   Introduction, Importance of environment. Scale of environmental pollution.
   a) **Atmospheric Pollution:** Types of atmospheric pollution, their causes and effects on human health. Available technologies for controlling pollution.
   b) **Industrial Waste:** Solid waste, effluents and waste gases produced by various industries. Available technologies for the treatment of industrial waste.

   c) Water pollution: causes, types and its remedies

   d) **Noise pollution:** Measurement of noise level. Effect of excessive noise on human health. Remedial measures.

Books Recommended:

1. Applied Thermodynamics for Engg Technologists by Eastop and McConkey
2. Power Plant Technology M. M. El-Wakil

MT- 383 METROLOGY & GAUGING

Objectives:

Enable the students to understand the type and use of measuring and inspection tools in production.

Course Outline:

1. Standards and Measurement Krypton 86 as Measurement Standard, Methods of Interferometery, Principle and Use of Optical Flat, Laser Beam as Measurement Standard.
2. System of Limits and Fits, Basic Terminology, Unilateral and Bilateral Tolerance Systems, Geometrical Tolerances. Standard Tolerances, Classes of Standard Fits, Hole Based and Shaft Based Systems, Grades of Fits.
3. Linear Measurement, Line and End Standards, Use of Slip Gauges, Dial Indicators and Surface Plates, Vernier Calipers, Micrometers and Height Gauges, Laser Based Equipments, Comparators.

4. Angular Measurements:
   Protractors, Sine Bars, Angle Gauges, Levels, Clinometers, Autocollimators, Taper Gauges,
5. Surface Texture
   Introduction and Units, Measurement with Light Wave interference, Mechanical Methods of Measurement, Waviness and Lay, Roughness, Value and Cutoff, Surface Texture Symbols, Preferred Roughness, Average Values.
6. Gauges and Gauging
   Introduction to Fixed Limit Gauges, Basic Terminology, Types, Gauge, Tolerance, Gauging Systems, Screw Thread and Pipe Thread Gauges, Mechanical Amplification Gauge Systems, Pneumatic Gauges, Electric and Electronic Gauges,
7. Coordinate Measuring Machines
   Introduction, Working Principles, Types, Applications, Advantages, Economic Consideration,

List of Practical:

1. Familiarization with the use of vernier calipers, inside and outside micrometers, height gauges, dial indicators and surface plates.
2. Calibration of vernier calipers, micrometers, height gauges and dial indicators with the help of slip gauges.
3. Familiarization with various types of comparators.
4. To practice the use of comparators.
5. To learn and practice the use of angle measuring devices (Protractors, sine bars, angle gauges, levels, clinometers and taper gauges).
6. To inspect the surface texture of given specimens using Auto Collimators.

7. Familiarization with the function of an interferometer and Inspect the given specimen with the help of interferometery.
8. To inspect the surface texture of given specimens using optical flats.
9. Familiarization with various types of fixed limit gauges and to learn their use,
10. To inspect different types of threads with the help of thread gauges.
11. To learn the use of various types of electric and electronic gauges.
12. To learn the use of various types of pneumatic gauges.
13. Familiarization with the parts and working of a Coordinate Measurement Machine.
14. To measure three-dimensional non-regular profiles of the given specimens and to define the profile characteristics.
15. Familiarization with the parts and use of toolmaker's microscope.
16. To prepare sketches of small parts with the help of toolmaker's microscope.

Books Recommended:

Text Books:

1. Hume K.J. ENGINEERING METROLOGY, Macdonald and Company, London,
2. Galyer J and Shotbolt C. METROLOGY FOR ENGINEERS. Cassell Ltd, London,

Reference Books:

1. Morris A. MEASUREMENT AND CALIBERATION FOR QUALITY ASSURANCE Prentice Hall, UK

MT 393 REFRIGERATION AND AIR CONDITIONING

Prerequisites: basic knowledge of thermodynamics.

Objectives:

Enable the student to be familiar with the mechanism of refrigeration & air conditioning and also make estimates of load of refrigeration or air conditioning.

Course Outline:

Refrigeration and Heat pump Cycles: Properties of refrigerants and brine. Carnot and Joule reverse cycles, Vapour-compression and vapour absorption cycles, Coefficient of performance, Efficiencies.
Refrigeration Machines: Cold air, vapour-compression, Steam-jet and absorption types Heat pumps, Domestic type, Auxiliaries and controls.

Application of Refrigeration: Cold storage, Ice-making, Dairying, Quick freezing air-conditioning, Layouts, Load calculation and performance.
Air-conditioning and Ventilation: Use of the psychrometric charts, Calculation of heat to be removed by an air-conditioning plant, Air-conditioning requirements for comfort and industrial processes.
Air conditioning equipments: window type, split type, package type, cooling towers, air washers, chillers, duct layout.

List of Experiment

1. Find the C.O.P. of refrigerator.
2. Effect of condensing temperature on the performance of a refrigerator.
3. Efficiency of a refrigerator
4. Construction of pressure enthalpy diagram for a vapor compression system refrigeration and its performance measurement.
5. To check the performance of a vapor compression system refrigerator by varying the heat input to the evaporator.
6. Representation of Properties of air on Psychrometric charts
7. Air conditioning cycle on charts.
8. Demonstration of domestic refrigerator
9. Demonstration of cooling tower
10. Demonstration of window type air conditioner
11. Demonstration of chiller AC plant.

Books Recommended:

Text Books.

1. Principles of Refrigeration by R. J. Dosset
2. Refrigeration and Air Conditioning by Jordan and Priester
3. Refrigeration and Air Conditioning by W.F. Stocker.
4. Refrigeration and Air Conditioning by CP Arora

Reference Books

1. ASHRAE Guide.

MT 412 TOTAL QUALITY MANAGEMENT

Prerequisites: Industrial Management

Objectives:

Enable the student :

- To know about the importance of quality & its basic concepts.
- To understand the principles of TQM.
- To learn the tools & techniques for quality improvements.
- Familiarization with quality management & environmental management systems.

Course Outline:

Quality

Introduction, quality concepts, significance of quality, Total quality, concept of TQM, Principles of TQM,.

Commitment and Leadership

Introduction, Commitment & policy, creating or changing the management culture, Effective leadership.

Charting / Planning

Introduction, Operation, Process/Flow charting (including some advance diagrams or charts etc.), Chart symbols, Purchasing parameters, Planning for JIT.

Design for quality

Introduction, Innovation, Quality function development and the house of quality.

Quality related costs

Prevention, Appraisal & failure costs, Models for quality costing.

Quality measurements

Significance, inspection planning, Gauging, Measurements.

Implementing TQM

TQM & Management of change, planning, The implementation of TQM, Sustained improvement.

Quality Management System (ISO 9000 series)

Significance, Documentation, Implementation & certification, Audits, Expected problems.

Environmental Management System (ISO 14000 series)

Significance, Documentation, Implementation & certification, Audits, Expected problems.

Text Books

1. Total quality control by A.V Feigenbaum.
2. Total quality Management by Oakland J.S
3. ISO 9000 series of standards & ISO 14000 series of standards.
4. Managing Engineering & Technology 4th Ed. by Lucy C. Morse, Daniel L. Babcock
5. Banga & Sharma Industrial Organization & Management.

Reference Books

1. Total Quality Management in action by Gitlow H.S & Gitlow S.J
2. Musa K ISO 9000 Ibrahim Publisher Lahore.
3. A Practical Guide for obtaining ISO 14000 certification by Kuhre W.L

MT 422 OCCUPATIONAL SAFETY & HEALTH

Pre-requisite: Safety Practices & procedures

Objectives:

Enable the students to know and apply safety standards rules etc in industry in preventing accidents etc.

Course Outline:

1. Classification of Health hazards.
   Physical, chemical, biological
2. Sources of risk
   Machinery Noise, Electrical failure, ventilation, lighting, radiation
3. Dangerous substances
   Classification, Entry & Exit routes, safe handling, Health & safety regulation & policy.
4. Safety Machining & Guarding
   Preventing Machining accidents, Machine guarding

5. Equipment & Machine handling
   Mechanical & Manual Handling, Access Equipment, Transport, Electricity & Electrical Equipment.

6. Fire
   Classification, fire protection, means of Escape, Actions to be taken.
7. Chemical safety
8. Personal protection.
9. Safety Management
   Accident prevention, health & safety training, communicating safety measures.

Books Recommended:

1. Holt A.S.J Principle of Health & safety at work. The institution of occupational safety & health. The caverdisk press Limited. UK 1999.
2. Patty F.A "Industrial Hygiene & Toxicology Vol-1 General Principles" Inter science Publishers New York.

ISLAMIC STUDIES
(Compulsory)

Objectives:

This course is aimed at:

1 To provide Basic information about Islamic Studies
2 To enhance understanding of the students regarding Islamic Civilization
3 To improve Students skill to perform prayers and other worships
4 To enhance the skill of the students for understanding of issues related to faith and religious life.

Detail of Courses:

Introduction to Quranic Studies

1) Basic Concepts of Quran
2) History of Quran
3) Uloom-ul -Quran

Study of Selected Text of Holly Quran

1) Verses of Surah Al-Baqra Related to Faith(Verse No-284-286)
2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
5) Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154)

Study of Selected Text of Holly Quran

1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
3) Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

1) Life of Muhammad Bin Abdullah (Before Prophet Hood)
2) Life of Holy Prophet (S.A.W) in Makkah
3) Important Lessons Derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

1) Life of Holy Prophet (S.A.W) in Madina
2) Important Events of Life Holy Prophet in Madina
3) Important Lessons Derived from the life of Holy Prophet in Madina

Introduction To Sunnah

1) Basic Concepts of Hadith
2) History of Hadith
3) Kinds of Hadith
4) Uloom –ul-Hadith

5) Sunnah & Hadith
6) Legal Position of Sunnah

Selected Study from Text of Hadith

Introduction To Islamic Law & Jurisprudence

1) Basic Concepts of Islamic Law & Jurisprudence
2) History & Importance of Islamic Law & Jurisprudence
3) Sources of Islamic Law & Jurisprudence
4) Nature of Differences in Islamic Law
5) Islam and Sectarianism

Islamic Culture & Civilization

1) Basic Concepts of Islamic Culture & Civilization
2) Historical Development of Islamic Culture & Civilization
3) Characteristics of Islamic Culture & Civilization
4) Islamic Culture & Civilization and Contemporary Issues

Islam & Science

1) Basic Concepts of Islam & Science
2) Contributions of Muslims in the Development of Science
3) Quranic & Science

Islamic Economic System

1) Basic Concepts of Islamic Economic System
2) Means of Distribution of wealth in Islamic Economics
3) Islamic Concept of Riba
4) Islamic Ways of Trade & Commerce

Political System of Islam

1) Basic Concepts of Islamic Political System
2) Islamic Concept of Sovereignty
3) Basic Institutions of Govt. in Islam

Islamic History

1) Period of Khlaft-E-Rashida
2) Period of Ummayyads
3) Period of Abbasids

Social System of Islam

1) Basic Concepts of Social System of Islam
2) Elements of Family
3) Ethical Values of Islam

Reference Books:

1) Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad
2) Hameed ullah Muhammad, "Muslim Conduct of State"
3) Hameed ullah Muhammad, 'Introduction to Islam
4) Mulana Muhammad Yousaf Islahi,"

5) Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
6) Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
7) Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
8) H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
9) Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

Annexure -B

Pakistan Studies (Compulsory)

Introduction/Objectives

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline

1. **Historical Perspective**
   a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
   b. Factors leading to Muslim separatism
   c. People and Land
      i. Indus Civilization
      ii. Muslim advent
      iii. Location and geo-physical features.
2. **Government and Politics in Pakistan**

   Political and constitutional phases:
   a. 1947-58
   b. 1958-71
   c. 1971-77
   d. 1977-88
   e. 1988-99
   f. 1999 onward
3. **Contemporary Pakistan**
   a. Economic institutions and issues
   b. Society and social structure
   c. Ethnicity
   d. Foreign policy of Pakistan and challenges
   e. Futuristic outlook of Pakistan

Books Recommended

1. Burki, Shahid Javed. *State & Society in Pakistan,* The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy.* Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development.* Lahore, 1994.
5. Wilcox, Wayne.*The Emergence of Banglades.,* Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota,* Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.

7. Amin, Tahir. *Ethno - National Movement in Pakistan,* Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development.* Kent England: WmDawson & sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh.* Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan,* Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan.* Boston: Houghton Mifflin, 1967.
12. Aziz, K.K. *Party, Politics in Pakistan,* Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, Pakistan Under Martial Law, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective.* Islamabad: National Commission on Historical and Cultural Research, 1993.

CH 132 COMMUNICATION SKILLS-I Theory 2 Prac. 0 Total 2

Objectives:

i.- To understand the importance and basic concepts of communication

ii.- To enhance the listening skills and to become active listener

iii.- To enhance the reading skills and to become active reader

iv.- To improve the writing skills in general

DESCRIPTION

This course is based upon lectures, group discussions, case studies and practice sessions.

Course Outlines:

1. Introduction to Communication
   - Importance, Theories, Barriers, Components
2. The Seven C's for Effective Communication
3. Listening Skills
   - Blocks, Thinking and Feeling
   - Notes Taking
   - Giving Feedback
4. Reading Skills
   - Active Reading Techniques
   - Skimming, General Reading and Careful Reading
5. Introduction to Writing Skills
   - Planning
   - Drafting and Editing
   - Emphasis and Connections
6. Grammar and Vocabulary
   - Technical and Business Vocabulary
   - Constructing Formal Sentences

Text Book:

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. EFFECTIVE BUSINESS COMMUNICATIONS. McGraw-Hill, USA (Latest Edition).

Reference Books:

1. Norman S. WE'RE IN BUSINESS. Longman Group Ltd., UK (Latest Edition).
2. Thomson A. J. and Martinet A. V. A PRACTICAL ENGLISH GRAMMAR. Oxford University Press, UK (Latest Edition).

RECOMMENDATIONS

The committee worked for two days and completed the task. The committee also proposed the following recommendation/ suggestion.

1. All other programs running currently in the name of B.Tech. in different institutions must be stopped and implementation of new program should be ensured immediately.

2. A separate technical university be constituted in each province to run and monitor the B.Tech. programs in the country.

3. The letter issued by HEC regarding the equivalency / compatibility of B.Tech. with B.Sc Engineering must be withdrawn immediately to remove the confusion. Because B.Tech. courses are implementation oriented and B.Sc Engineering courses are design and research oriented.

4. There should be an effective monitoring program throughout the country to monitor the private and public institutions to check the availability of staff and equipment.

5. Teaching Staff for B.Tech. recruited by institutes must be at least B.Sc Engineer.

6. Weekend and evening program running in private and public sector institutes / universities must be discouraged to maintain the quality of Technological Education.

7. As curriculum is based on annual system therefore semester system should be discouraged.

8. There is acute shortage of qualified staff and other infra-structural facilities in Government College of Technologies all over Pakistan. HEC must pursue with NAVTECH and provincial governments for provision of funds to GCTs for remedy of above mentioned shortages.

9. It is also felt that the faculty associated with the B.Tech education needs serious support for their up-gradation (qualifications and pay-scales) before the proposed four year structure is implemented across the country. The HEC should therefore offer incentive such as scholarships, training opportunities and provisions for postgraduate studies on priority basis in this regards. The implementation of the revised curriculum should be kept conditional to the infra-structure development.

10. There should be an option for the project submissions. If the industrial training is not possible.

11. As there is almost no industrial setup at Balochistan. the PEC should be made responsible to restrict industries out side Balochistan mandatory to accommodate the students of Balochistan.

12. NAVTEC (National & Vocational Technical Education commission) & HEC should be responsible to provide the financial support to the students have been enrolled in the B-Tech Program i.e Monthly Stipend/Industrial Projects/Industrial Training.

13. There should be a proper reorganizations for the B-Tech Pass outs.