



**SCHEME OF EXAMINATION FOR
FIFTH SEMESTER BACHELOR OF ENGINEERING
(ELECTRONICS ENGINEERING)**

Sub Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Internal	Univer sity	Internal	Univer sity	
BEENE501T	Electronics	Switching Theory &Automata	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE502T	Electronics	Microprocessor & Microcontroller	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE502P	Electronics	Microprocessor & Microcontroller	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE503T	Electronics	Analog Circuits & Design	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE503P	Electronics	Analog Circuits & Design	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE504T	Electronics	Communication Electronics	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE504P	Electronics	Communication Electronics	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE505T	Applied Science & Humanities	Industrial Economics & Enterpreneurship Development	4	0	0	4	4	0	0	4	20	80	0	0	100
Total			20	6	4	30	20	3	4	27	100	400	75	75	650



Rashtrasant Tukadoji Maharaj Nagpur University

Formerly Known as Nagpur University



SCHEME OF EXAMINATION FOR SIXTH SEMESTER BACHELOR OF ENGINEERING. (ELECTRONICS ENGINEERING)

Sub Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Internal	University	Internal	University	
BEENE601T	Electronics	Microwave Engineering	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE601P	Electronics	Microwave Engineering	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE602T	Electronics	Digital Signal processing	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE602P	Electronics	Digital Signal processing	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE603T	Electrical	Control System Engg.	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE604T	Electronics	Digital Communication	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE605T	Applied Science & Humanities	Functional English	2	0	1	3	2	0	1	3	10	40	0	0	50
BEENE606P	Electronics	Electronics Workshop Practice	0	2	0	2	0	2	0	2	0	0	25	25	50
BEENE607P	Electronics	Industrial Visit	0	2	0	2	Audit Course			0	0	0	G	0	0
Total			18	8	5	31	18	4	5	27	90	360	75	75	600

B. E. Fifth Semester

(Electronics Engg.)

SWITCHING THEORY & AUTOMATA

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE501T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study designing aspects of digital circuits.
 2. To study properties of partially ordered sets & lattices.
 3. To study minimization of Booleans function by using K-Map, tabulation method, functional decomposition, symmetric function.
 4. To study the diagnosis of switching circuits & methods for improving their reliability.
 5. To study various aspects of finite state machines.
 6. To elaborate the concept of synthesis of sequential circuits.
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Outcome:

After completing this course students shall be able to:

1. Demonstrate basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
 2. Find out structural properties by using Functional Decomposition & Symmetric functions.
 3. Describe designing aspects of logic circuits using threshold elements.
 4. Design combinational logic circuits, sequential logic circuits.
 5. Describe behavior, capabilities and structure of finite state machines and sequential machines.
 6. Describe diagnosis of faults of switching circuits & methods of improving their reliability.
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UNIT I: Switching algebra and Minimization of switching functions

(10)

Switching algebra and functions, Boolean algebra, Boolean functions, K-Map for 6 variables, Minimization of Booleans function using tabulation method, relation and lattices, Venn diagram, sets theory.

UNIT II: Functional decomposition and symmetric functions

(08)

Design of combinational logic circuits, contact networks, functional decomposition and symmetric functions

UNIT III: Threshold logic**(08)**

Threshold logic, threshold elements, capabilities and limitations of threshold logic, elementary properties, unate functions, synthesis of threshold functions, cascading of threshold elements.

UNIT IV: Finite state machine**(12)**

Finite state machine- Moore and Mealy synchronous sequential circuits, Design capabilities, Minimization and transformation of sequential machine, Sequence detector, Design of fundamental mode and pulse mode circuits

UNIT V: Structure of sequential machine**(12)**

Structure of sequential machine, lattice of closed partitions, state assignment using partitions, Reduction of output dependency, Input Independence and autonomous clock, homing sequence, synchronizing sequence, Adaptive Distinguishing experiments.

UNIT VI: Reliable design and fault diagnosis**(10)**

Reliable design and fault diagnosis, fault detection in combinational circuits, fault location experiments, fault detection by Boolean differences, path, sensitizing method, multiple fault detection using map method failure- tolerant design.

BOOKS:**Textbooks:**

1. Kohavi ZVI, 'Switching and Finite Automata Theory', 2nd Edition, TMH
2. Modern switching theory by S.C.lee

Reference Books:

1. M.Morris Mano, 'Digital Design', 3rd Edition, Pearson Education.
2. Donald D.Givone, 'Digital principles and Design', TMH.
3. Anand Kumar, 'Fundamentals of Digital Circuits' PHI.
4. RP Jain 'Modern Digital Electronics', 2nd Edition, TMH
5. Switching Theory & Logic Design by CVS Rao
6. FUNDAMENTALS OF SWITCHING THEORY AND LOGIC DESIGN, JAAKKO T. ASTOLA

B. E. Fifth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE502T/ BEECE502T/ BEETE502T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study fundamentals of microprocessor and microcontroller systems.
 2. To study architecture of microprocessor & to understand the concept of memory organization, stack memory, Assembly language programming.
 3. To study different interrupt techniques.
 4. To study interfacing of microprocessor & microcontroller with different peripheral devices.
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Outcome:

After completing this course students shall be able to:

1. Describe internal organization of 8086/8088 microprocessors & 8051 microcontrollers.
 2. Describe the concept of addressing modes and timing diagram of Microprocessor.
 3. Interface 8086 & 8051 with Keyboard/ Display, ADC/DAC, Stepper motor etc.
 4. Demonstrate the concept of interrupts and its use.
 5. Demonstrate the concept of Serial & parallel data communication
 6. Describe Handshaking concept and interfacing with peripheral devices.
 7. Describe the concept of DMA & Pentium.
 8. Describe 8087 Numeric coprocessor & its use in practical application.
 9. Interface various Hardware with microprocessor.
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Unit I: Intel 8086/8088 microprocessor & Programming:

(09)

8086/8088 microprocessor, Pin diagram, Architecture, features and operating modes, Clock generator 8284, memory organization & interfacing, Addressing modes, complete instruction set.

Unit II: 8086 & Peripheral Interfacing I:

(11)

Assembly language programming of 8086, Interrupt structure, I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Organization, Working modes, command words & interfacing.

Unit III: 8086 & Peripheral Interfacing II:

(10)

Programmable interval timer/counter 8254; Architecture, working modes, interfacing 8259 PIC, Organization, control words, interfacing, cascading of 8259's. Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.

Unit – IV: Numeric Co-processor & DMA Controller: (10)

8086 maximum mode pin diagram, Closely coupled & loosely coupled multiprocessor system, 8087 Numeric coprocessor, architecture, interfacing with 8086, instruction set. DMAC 8237, Architecture, interfacing & programming, Introduction to Pentium.

Unit – V: 8051 microcontroller & programming: (10)

Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051.

8051 Interrupt structure, Interrupt vector table with priorities, enabling & disabling of interrupts

Unit – VI: 8051 microcontroller interfacing: (10)

Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes, Assembly language programming examples, counter/timer programming in various modes. Serial communication, Operating modes, serial port control register, Baud rates. I/O expansion using 8255, Interfacing keyboard, LED display, ADC & DAC interface, stepper motor interface

Books:

Text Books:

1. Programming & Interfacing of 8086/8088, D.V. Hall, TMH.
2. Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson
3. M.A. Mazidi & J.G. Mazidi, the 8051 Microcontroller and Embedded system, 3rd Indian reprint, Pearson Education
4. The Intel Microprocessor 8086 & 80486 Pentium and Pentium Pro. Architecture Programming and Interfacing – Brey.

Reference Books:

1. Intel Reference Manuals, Microprocessors & Microcontrollers: Intel
2. Microcontrollers – Peatman, Mc Graw Hill.
3. Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.
4. 8086/8088 Microprocessors, Walter Triebel & Avtar Singh
5. Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh, P. R. Sridhar, PHI Publication.
6. The 8051 Microcontroller & Embedded Systems, Kenneth J. Ayala, Dhanvijay V. Gadre, CENGAGE Learning.

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE502P/ BEECE502P/ BEETE502P

[0 – 2 – 0 – 2]

Objectives:

1. To perform a practical based on microprocessor and microcontroller based system.
2. To study assembly language programming skills.
3. Interface different peripherals with microprocessor and microcontroller with its use.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate the concept of Assembly languages structure and programming.
2. Interface various peripherals with 8086 and 8051.
3. Simulate the programs on different software platforms.

Any TEN practicals are to be conducted.

List of Experiments:

1. Study of 8086 microprocessor.
2. Write and execute 8086 assembly Language Programs to multiply two 16 bit numbers.
3. Write and execute 8086 assembly Language Programs to divide 16 bit number by 8 bit number.
4. Write and execute 8086 assembly Language Programs to search a look-up table for a byte (make use of XLAT)
5. Write and execute 8086 assembly Language Programs to compare two strings (use String instructions)
6. Write and execute 8086 assembly Language Programs to arrange the data bytes in ascending/descending order.
7. Write and execute 8086 assembly Language Programs to generate Fibonacci series and store it from memory location 0050H.
8. Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
9. Write and execute 8051 assembly language program to exchange two data strings.
10. Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port.
11. Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED's.
12. Interface 8255 with 8086 microprocessor and write a program to rotate the stepper motor.
13. Interface 8253 with 8086 microprocessor and write a program to generate square waveform.

14. Interface 8279 with 8086 microprocessor and write a 8086 instructions to initialize 8279 (for a task as per the user's requirement).
15. Interface of ADC using 8255 with 8086 and write a program to convert analog signal input into its equivalent digital value and store it in memory locations.

Note: Few programs should be based on MASM / Simulator. Minimum 4 interfacing experiments should be conducted.

B. E. Fifth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE503T/ BEECE503T/BEETE503T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic characteristic, construction, open loop & close loop operations of Op-Amp.
2. To study linear and non linear applications of Op-Amp.
3. To study the design of Electronic Circuits for Oscillator, Multivibrator and Active Filters
4. To enable students to design regulated power supply using regulated ICs

Outcome:

After completing this course students shall be able to:

1. Describe basic differential Amplifier using transistor and its operation & characteristic.
2. Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
3. Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
4. Analyze and design amplifier circuits, oscillators, Filter, regulated power supply

Unit I: OP-Amp Fundamentals:

(8)

Block diagram of OP-Amp (Basic Building Blocks), Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting and Non-inverting configurations and design, concepts of virtual short and ground.

Unit II: OP-Amp Linear Applications:

(10)

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), Peak detector, Log and antilog amplifiers using OP-Amp & Transistor and analog multipliers.

Unit III: OP-Amp Non-Linear Applications: (12)

Comparators, Schmitt trigger, Comparator IC such as LM 339, Clipper and Clamper, Precision Rectifier, PLL

Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, Sample/Hold circuits, D/A (R/R) & A/D conversion circuits (Successive Approximation Method), design of ADC using 0804 ICs.

Unit IV: Design of Power supply system: (09)

Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78xx and 79xx, protection circuits for regulators, Design of SMPS (Buck & Boost)

Unit V: Design of sinusoidal oscillators & Function generator: (09)

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley, Colpitts oscillator, and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of function generators.

Unit VI: Design of Filters & Drivers: (12)

Advantages of active filters, Design of Butterworth Active Filter, Design of Active filter of LPF, HPF, BPF of 1st order, 2nd and higher order (up to 6th order) Butterworth filter.

Design of Relay driver circuit, Design of stepper motor control circuit, Design of Dc servo motor control circuit

Books:

Text Books:

1. Operational Amplifier and Applications: R. Gayakwad.
2. Monograph on Electronic circuit Design: Goyal & Khetan.
3. Designing with Op-Amps: Franco (Mc Graw Hill).

Ref Books:

1. Linear Integrated Circuits Manual I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Regulated Power supply Handbook. Texas Instruments.

4. Electronics: BJT's, FETS and Microcircuits – Anielo.
5. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

B. E. Fifth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25Marks

Subject Code: BEENE503P/ BEECE503P/BEETE503P

[0 – 2 – 0– 2]

Objectives:

1. To learn about various types of analog systems.
 2. To study the practical aspects of linear and non-linear applications of OP-AMP.
 3. To design the oscillators using OP-AMP and Transistors.
 4. To study frequency response of different circuits based on operational amplifier.
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Outcome:

At the end of the course the students shall be able to:

1. Gain a sound understanding of the operation, analysis and design of analog electronic circuits and systems
 2. Design linear and nonlinear applications of operational amplifier.
 3. Design the oscillators and other complex circuits using op amp ICs.
 4. Describe gain-bandwidth concept and frequency response of basic amplifiers.
-

Any TEN practicals are to be conducted

List of Experiments:

1. (A)Design Non-Inverting OP-AMP and measure the gain and plot the input/output waveforms.
(B)Design Inverting OP-AMP and measure the gain and plot the input/output waveforms.
2. Plot the Frequency response of Inverting and Non-inverting amplifiers.
3. Implementation of Op-Amp as adder & subtractor.
4. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
5. To design OP-AMP as Schmitt trigger for generating a waveform of specific pulse width.
6. To design OP-AMP as peak detector.
7. To design OP-AMP as Precision rectifier and plot the waveforms.
8. To Verify Op-amp parameters (1) CMRR (2) Slew Rate.
9. To Verify and simulate Clipper circuit using IC 741.

10. Design and verify Multivibrator circuits using IC 555.
11. To study Phase Lock Loop using IC 565.
12. To study OP-AMP as Clippers & Clampers.
13. Design RC oscillator using OP-AMP and calculate its frequency.
14. Design transistorized LC oscillator and calculate its frequency.
15. Design first & second order low pass Butterworth filter.
16. Design first & second order high pass Butterworth filter.
17. Design of series voltage regulators.
18. Design of Driver Circuit for DC servomotor/Relays.
19. Design of control circuit for stepper motor.

Note: Simulate results using simulation software for at least four experiments.

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE504T/ BEECE504T/BEETE504T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic concept of communication and different modulation system based on basic parameters.
 2. To study the concept of noise, properties & its effects.
 3. To study the AM, FM, PM process & compute modulation Index.
 4. To study the fundamentals of AM and FM Receivers.
 5. To develop knowledge about fundamentals of Broadband Communication Systems.
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Outcome:

At the end of the course the students shall be able to:

1. Demonstrate a basic understanding of the term bandwidth and its application in communications.
 2. Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and angle modulation and demodulation of analog signals etc.
 3. Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
 4. Compare different modulation techniques of Generation of FM (Direct & Indirect Method)
 5. Identify, formulate & solve communication engineering problems.
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Unit I: Amplitude (Linear) Modulation

(08)

Base band & Carrier communication, Introduction of amplitude modulation, Equation of AM, Generation of AM (DSBFC) and its spectrum, Modulation Index, Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Non linear generation, switching modulator, Ring modulator & its spectrum, SSBSC, ISB & VSB, their generation methods & Comparison, AM Broadcast technical standards.

Unit II: Angle Modulation

(12)

Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), Comparison of FM and PM.

Unit III: Pulse Modulation

(10)

Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Analog modulation: PAM PWM & PPM.

PCM – Generation & reconstruction, Bandwidth requirement of PCM. Differential PCM, Delta Modulation & Adaptive DM. (Only Block diagram treatment).

Unit IV: Noise (10)

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem Connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

Unit V: AM and FM Receivers (10)

Communication Receiver, Block Diagram & special Features

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Pre-emphasis, De-emphasis

AM Detection: Rectifier detection, Envelope detection, Demodulation of DSBSC: Synchronous detection, Demodulation of SSBSC.

FM Detection: Foster Seelay FM Detector & FM detection using PLL

Unit VI: Broadband Communication Links & Multiplexing: (10)

Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

Short and Medium Haul Systems: Coaxial Cables, Fiber optic links, Microwave Links, Tropospheric scatter Links.

Long Haul Systems: Submarine cables.

Books:

Text Books:

1. Kennedy & Devis : Electronic Communication Systems , Tata McGraw Hills Publication(Fourth Edition)
2. Dennis Roddy & Coolen - Electronic Communication, Pearson Education (Fourth Edition)
3. B. P. Lathi: Modern Digital and Analog. Communication Systems: Oxford Press Publication (Third Edition)

Reference Books:

1. Simon Haykin: Communication Systems, John Wiley & Sons (Fourth Edition)
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
3. Leon W.Couch, II: Digital and Analog Communication Systems, Pearson Education (Seventh Edition)
4. Electronic Communication Systems, Roy Blake, CENGAGE Learning.

B. E. Fifth Semester

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE504P/ BEECE504P/BEETE504P

[0 – 2 – 0 – 2]

Objectives:

1. To perform practical based on analog and digital modulation techniques.
 2. To study the analysis of AM and FM receivers.
 3. To study ASK, FSK and PSK techniques.
 4. To perform Matlab based practical for different modulation techniques.
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Outcome:

At the end of the course the students shall be able to:

1. Demonstrate different modulation techniques used in electronic communication system.
 2. Use the modulation techniques and modern communication tools necessary for various engineering applications.
 3. Evaluate fundamental communication system parameters, such as bandwidth power, signal to quantization noise ratio, data rate etc.
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Any TEN practicals are to be conducted

List of Practicals

1. To generate Amplitude Modulated wave using different techniques and plot its waveform.
2. To study different AM detection techniques.
3. To measure Noise Figure.
4. To generate Frequency Modulated wave using different techniques and plot its waveform.
5. To study different FM Detection Techniques.
6. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms. Observe the demodulated output.
7. To generate Pulse Width modulated signal and study PWM demodulation.
8. To generate Pulse Position modulated signal and study Pulse Position Demodulation.
9. To study Single side band (SSB) Transmission & Reception
10. To study Double Side Band (DSB) Transmission & Reception
11. To study generation of SSB-SC using balanced modulator
12. To study generation of DSB-SC signal.
13. To study DTMF Encoder Decoder
14. To perform Spectrum Analysis of AM & FM signals
15. To perform Time Division Multiplexing (TDM).
16. To study Pre-Emphasis and De-Emphasis
17. To study Super heterodyne Receiver

18. To study FM radio receiver circuit.
19. Simulation of Analog modulation techniques using MATLAB.
20. Simulation of Frequency modulation techniques using MATLAB.
21. To perform Pulse Code Modulation (PCM) using Simulation in MATLAB.

B. E. Sixth Semester
(Electronics Engg)
Microwave Engineering

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEENE601T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study the principles of the advanced microwave engineering.
2. To study the design of passive and active microwave components and microwave circuits including
Micro strip line, guided wave device
3. To study Klystron amplifier and oscillator.
4. To study magnetron & other devices.
5. To study the free space communication link and its mathematical analysis.

Outcome:

At the end of the course the students shall be able to:

1. Describe the use of active and passive microwave devices.
2. Analyze different UHF components with the help of scattering parameter.
3. Describe micro strip lines.
4. Demonstrate the use of different Klystrons, magnetron devices.
5. Analyze the different power distribution Tees.
6. Describe the basic communication link design, signal power budget, noise evaluation and link carrier to noise ratio.
7. Describe the transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

Unit I: Microwave Active Devices (O-type)

(10)

Interaction of electron beam with electromagnetic field, power transfer condition. Principles of working of two cavity and Reflex Klystrons, arrival time curve and oscillation conditions in Reflex klystrons, mode-frequency characteristics, Effect of repeller voltage variation on power and frequency of output. Slow wave structures, Principle and working of TWT amplifier & BWO Oscillator.

Unit II: Microwave Active Devices (M-type)**(10)**

Principle of working of M-type TWT, Magnetrons, Electron dynamics in planar and cylindrical Magnetrons, Cutoff magnetic field, phase focusing effect, mode operation, Mode separation techniques, Tuning of magnetron

Unit III: Transmission line**(10)**

Input impedance, Standing wave distribution, Quarter Wave and Stub Matching using Smith chart, losses in Transmission lines, Planar Transmission line types, Introduction - Types of MICs and their technology, Fabrication process of MMIC, Hybrid MICs.

Unit IV: Microwave Networks and passive Components**(10)**

Transmission line ports of microwave network, Scattering matrix, Properties of scattering matrix of reciprocal, nonreciprocal, loss-less, Passive networks, Examples of two, three and four port networks, wave guide components like attenuator. Principle of operation and properties of E-plane, H-plane Tee junctions of wave guides, Hybrid T, Directional couplers, Microwave resonators-rectangular, Excitation of wave guide and resonators .Principles of operation of non-reciprocal devices, properties of ferrites, Gytrators ,Isolators ,Circulator and phase shifters.

Unit V: Microwave Measurements**(10)**

Function of Tuning Probes, Detector mounts and Detector diode, Slotted line section and VSWR meter, Measurement of wave-guide impedance at load port by slotted line, Measurement of scattering matrix parameters, High, Medium and low-level power measurement techniques, Characteristics of bolometer, bolometer mounts, Power measurement bridges, Calorimetric method, Microwave frequency measurement techniques, calibrated resonators (transmission and absorption type), Network Analyzer and its use in measurements.

Unit VI: Microwave Solid State Devices and Application**(10)**

PIN diodes-Properties and applications, Microwave detector diodes-detection characteristics, Varactor diodes, Parametric amplifier fundamentals-Manley-Rowe Power relation, MASERS, Transferred electron devices, Gunn effect, Various modes of operation of Gunn oscillator, IMPATT, TRAPATT and BARITT.

Books:**Text Books:**

1. Samuel Y. Liao, 'Microwave Devices and Circuits', Pearson Education, 3rd Edition.
2. R. E. Collins: Foundations of Microwave Engineering, 2nd Edition, Wiley Publications.
3. R. Chatterjee, 'Elements of Microwave Engineering', Prentice, September 1986
4. D. M. Pozar: Microwave Engineering, 3rd Edition, Wiley Publications.

Reference Books:

1. Manojit Mitra, 'Microwave engineering', 3rd edition, Dhanpat Rai & Company.
2. Peter A. Rizzi, 'Microwave Engineering Passive Circuits', PHI, 1999.
3. Annapurna Das, Sisir Das, 'Microwave Engineering', April 1987, Tata Mc Graw Hill Publication.
4. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss , 'Microwave Principles', 4th edition, 1998.
5. G. S. Raghuvanshi, 'Microwave Engineering', CENGAGE Learning

B. E. Sixth Semester
(Electronics Engg)
Microwave Engineering

Duration: 2 Hrs.
College Assessment: 25 Marks
University Assessment: 25 Marks

Subject Code: BEENE601P

[0 – 2 – 0 – 2]

Objectives:

1. Goal of this course is to understand the practical concept of microwave engineering 2.
To Understand different Power distribution Waveguide and Scattering Matrix.
 3. To know about Microwave and its Application.
 4. To Study different Microwave Filters.
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Outcome:

At the end of the course the students shall be able to:

1. Describe working of microwave bench.
2. Measure power & VSWR of microwave component.
3. Analyze the S-parameter of microwave component.

Minimum TEN experiments to be performed

LIST OF EXPERIMENTS:

1. Study the characteristics of Klystron Tube and to determine its electronic tuning range.
2. To determine the frequency and wavelength in a rectangular waveguide working on TE₁₀ mode.
3. To determine the Standing Wave-Ratio and reflection coefficient.
4. To study the V-I characteristics of Gunn Diode.
5. To study the following characteristics of Gunn Diode.
 - (a) Output power and frequency as a function of voltage.
 - (b) Square wave modulation through PIN diode.
6. Study the function of Magic Tee by measuring the following parameters.
 - (a) Measurement of VSWR at different ports and
 - (b) Measurement of isolation and coupling coefficient.
7. Study the function of Isolator / Circulator by measuring the following parameters.
 - (a) Input VSWR measurement of Isolator / Circulator.
 - (b) Measurement of insertion loss and isolation.
8. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
 - (a) Input VSWR measurement.

- (b) Measurement of insertion loss and attenuation.
- 10. Study the function of Multi Hole Directional Coupler by measuring the following parameters.
 - (a) To measure main line and auxiliary line VSWR.
 - (b) To measure the coupling factor and directivity.
- 11. Study of a network analyzer and measurements using it.
- 12. Verification of port characteristics of Microwave Tees (E, H, E-H planes)
- 13. Verification of port characteristics of Directional Coupler, study of Coupling factor, Insertion loss and Directivity.
- 14. To plot the radiation pattern of Horn Antenna and calculate its Antenna Gain and Beam width.
- 15. Study of Transmission line Characteristics etc. (Based on Simulation)

Note: At least four of the following experiments should be simulated with the help of any RF simulation software (EKO / HFSS / IE3D / Microwave Office / Microwave Studio or any other similar software)

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL SIGNAL PROCESSING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE602T/ BEECE602T/ BEETE602T

[4 – 0 – 1 – 5]

Objectives:

1. To study the basic concepts of digital signal processing.
 2. To study analysis and processing of signals for different kind of applications and retrieval of information from signals.
 3. To understand the physical significance of circular convolution and its relation with linear convolution.
 4. To study designing of digital filters and its realization.
 5. To study analysis of signals using the discrete Fourier transform (DFT) and Z-Transform.
 6. To study behavior of discrete time systems using Z-Transform.
-

Outcome:

By the end of the course the students shall be able to:

1. Represent discrete-time signals analytically and visualize them in the time domain.
 2. Meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
 3. Design and implement digital filter for various applications.
 4. Describe various transforms for analysis of signals and systems.
 5. Describe the concept of multi rate signal processing and how to apply it for the wavelet transform.
-

Unit I: Introduction:

(08)

Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data.

Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

Unit II: Z- Transforms:

(08)

The Z-transform: Definition, properties of the region of convergence for the Z-transform, Z-transform properties, Inverse Z-transform, Parseval's theorem, unilateral Z-transform.

Unit III: Discrete and Fast Fourier Transforms

(12)

Definition and properties of DFT, IDFT, Relation between DFT and Z-Transform, Radix-2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

Unit IV: IIR Filter Design & Realization

(12)

Filter design methods – Approximation of derivatives, Impulse invariance, bilinear transformation, characteristics & designing of Butterworth, Chebyshev filters, frequency transformations, IIR filter structures-Direct form I-II, transpose form, parallel form, cascade, Lattice and Lattice-ladder structures.

Unit V: FIR Filter Design & Realization

(12)

Symmetric and antisymmetric FIR filters, Linear phase FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hanning, Hamming & Blackman), frequency sampling method, FIR differentiators, FIR filter structures.

Unit VI: Multirate DSP

(08)

Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by rational factor I/D, Sub band coding of speech signals and its applications, introduction to wavelet & wavelet transform, Introduction to DSP architecture TMS 320.

Books:

Text Books:

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.
2. A.V. Oppenheim, R.W. Schaffer, "Discrete Time Signal Processing", Pearson Education.
3. Rabiner Gold "Theory and Application of DSP", PHI
4. Texas Instruments and Analog Devices DSP Chip Manuals.

Reference books:

1. Digital signal processing- A practical approach Second Edition, 2002. .E. C. Ifeachar, B. W. Jarvis Pearson Education
2. Sanjit K. Mitra , 'Digital Signal Processing – A Computer based approach'
3. S. salivahanan, A Vallavaraj, C. Gnanapriya , 'Digital Signal Processing', 2nd Edition McGraw Hill.
4. A. Nagoor Kani, 'Digital Signal Processing', 2nd Edition McGraw Hill.
5. P. Ramesh Babu, 'Digital Signal Processing' Scitech

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL SIGNAL PROCESSING

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE602P/ BEECE602P/ BEETE602P

[0 – 2 – 0 – 2]

Objectives:

1. To understand principle & working of digital signal processing for various applications.
 2. To understand Z transforms and discrete time Fourier transforms for the analysis of digital signals and systems.
 3. To design and implement FIR & IIR filter and analysis of their frequency response
-

Outcome:

At the end of the course the students shall be able to:

1. Analyze and process the signals in the discrete domain.
 2. Design the filters to suit requirements of specific applications.
 3. Apply the techniques, skills, and modern engineering tools like MATLAB and digital processors.
-

Any TEN practicals are to be conducted

LIST OF EXPERIMENTS

1. To plot and represent following basic discrete time signals using MATLAB functions. :
Unit impulse, unit step, ramp, real and complex exponential and its representations.
2. To plot linear convolution of discrete signals using MATLAB functions.
3. Write a program to compute cross-correlation and auto-correlation of the given sequences with corresponding plot.
4. Write a program to test stability of given discrete- time system.
5. To find Z transform of discrete time signal and its ROC with corresponding plot.
6. To find inverse Z transform of given discrete time signal.
7. Write a program to find frequency response of given system.
8. To compute DFT and IDFT of discrete time signals.
9. Write a program to find FFT and IFFT of given sequences.
10. Compute linear and circular convolution using DFT / IDFT method.

11. Designing of Digital IIR filter using MATLAB functions.
12. Designing of Digital FIR filter using window.
13. Designing of Digital FIR filter using GUI tool box.
14. To Study DSP Processor using TMS 5416 and TMS 6713 starter kits.
15. To perform linear convolution and circular convolution on Processor kit.
16. To designing and implementation of High pass filter on DSP processor.

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

CONTROL SYSTEM ENGINEERING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE603T/ BEECE603T/ BEETE603T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study the fundamental concepts of Control systems and mathematical modeling of the system.
2. To study the concept of time response and frequency response of the system.
3. To study controllers & compensators.
4. To study the basics of stability analysis of the system.

Outcome:

At the end of the course the students shall be able to:

1. Analyze various control systems.
 2. Represent the mathematical model of a system.
 3. Determine the response of different order systems for various step inputs.
 4. Analyze the stability of the system using Root locus. Bode plot, Nyquist plot.
 5. Obtain transfer function of systems using signal flow graph.
 6. Apply the state variable approach in design.
-

Unit I: Introduction and Modeling of control system

(11)

Introduction to need for automation and automatic control, use of feedback, Broad spectrum of system application. Mathematical modeling, Differential equations, transfer functions, block diagram, signal flow graphs, Effect of feedback on parameter variation, disturbance signal, servomechanisms. Control system components, Electrical, Electromechanical. Their functional analysis and input, output representation.

UNIT-II: Time Domain analysis

(09)

Time response of the system, first order & second order system, (standard inputs) concept of gain & time constant, steady state error, type of control system, approximate method for higher order system. Principles of P,PI,PD,PID controllers.

UNIT-III: Stability & Root Locus method**(11)**

Stability: Stability of control systems, conditions of stability, characteristic equation, Routh Hurwitz criterion, special cases for determining relative stability.

Root Locus method: Root location and its effect on time response, elementary idea of Root Locus, effect of adding pole and zero and proximity of imaginary axis.

UNIT-IV: Frequency response analysis**(11)**

Frequency response method of analysing linear system, Nyquist & Bode Plot, stability & accuracy analysis from frequency response, open loop & closed loop frequency response.

Nyquist criteria, effect of variation of gain & addition of poles & zeros on response plot, stability margin in frequency response.

UNIT-V: Compensators**(08)**

Needs of compensations, lead compensations, Lag compensations, Lead-Lag compensations (theoretical concepts)

Overview of various transducers with their signal conditioning systems.

UNIT-VI: State variable approach**(10)**

State variable method of analysis, state choice of state representation of vector matrix differential equation, standard form, relation between transfer function and state variable.

Books:**Text Books:**

1. Control Systems Engineering, I.J. Nagrath, M. Gopal
2. Modern Control system (II Edition) – Katsuhiko Ogata
3. Control systems by Smarajit Ghosh (second Edition, Pearson)

Reference Book:

1. Automatic Control system (II Edition) – Benjamin C, Kuo, PHI
2. Modern Control System, Drof, Bishop, Wesly Publication
3. Control system Engineering, S.K. Bhattacharya, Pearson Edu.

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL COMMUNICATION

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE604T/ BEECE604T/ BEETE604T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study basic components of digital communication systems.
 2. To understand the designing aspects of optimum receivers for digital modulation techniques.
 3. To study the analysis of error performance of digital modulation techniques.
 4. To study the designing of digital communication systems under given power, spectral and error performance constraint
-

Outcome:

After completing this course students shall be able to:

1. Explain the working principles of basic building blocks of a digital communication system.
 2. Describe a random process in terms of its mean and correlation functions and characterize special Gaussian and Rayleigh distributions.
 3. Explain receiver techniques for detection of a signal in AWGN channel
 4. Describe digital modulation techniques.
 5. Demonstrate the concept of coding and decoding techniques.
 6. Model digital communication systems using appropriate mathematical techniques.
 7. Describe spread spectrum analysis.
-

UNIT-I:-Digital Communication Concept

(10)

Review of Random variables, PDFs & CDFs, Central limit Theorem. Model of digital communication system, Gram Schmitt Orthogonalization procedure, signal space concept, Geometric interpretation of signals, probability of error, correlation receiver, matched filter receiver.

UNIT-II: - Source & Waveform Coding Methods

(10)

Source coding Theorem, Huffman Coding, L-Z encoding algorithm, rate distortion theory for optimum quantization, scalar & vector quantization,.

Waveform coding methods: ADPCM, Adaptive Sub-Band & Transform coding, LP & CELP coding.

UNIT-III:-Digital Modulation Techniques

(10)

Coherent Binary: QPSK, MSK, Gaussian MSK, DPSK, Memory less modulation methods, linear modulation with memory, nonlinear modulation methods with memory: CPFSK, CPM.

UNIT-IV:-Channel Coding (PART-1)

(10)

Introduction to Galois field, Construction of Galois field GF (2^m) & its basic properties. Types of error control: Forward error correction (FEC), Automatic repeat request system (ARQ). Convolution encoding and decoding distance properties, Viterbi algorithm and Fano algorithm.

UNIT-V: - Channel Coding (PART-II)

(10)

Trellis coded modulation, Introduction to Turbo coding, & Reed Solomon Codes: encoding & decoding, Low density parity check coding (LDPC)

UNIT-VI:

(10)

Spread - Spectrum methods: - Study of PN sequences, direct sequence methods, Frequency hop methods, slow and fast frequency hop, performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA, Introduction to OFDM

Books:

Text Books:

1. Digital communication: John G Prokis (TMG)
2. Digital communication: Simon Haykin (WEP)

Reference Books:

1. Lathi B.P. - Modern Digital and Analog communications systems - PRISM Indian Ed.
2. Digital Communication: J.S.Chitode
3. Digital Communication (Fundamentals & applications): Bernard Scalr
4. Introduction to Error Control Codes: Salvatore Gravano
5. OFDM For wireless communication systems: Ramjee Prasad
6. Modern Communication systems (Principles and application): Leon W. Couch II (PHI)
7. Error Control Coding: Shu Lin & Daniel J.Costello

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester , Electronics
Engineering

BEENE605T

Functional English

Sr. No.	Subject Code	Subject	Workload				Credit				Marks			
			<i>Lecture</i>	<i>Practical</i>	<i>Tutorial</i>	<i>Total Hrs/Week</i>	<i>Lecture</i>	<i>Practical</i>	<i>Tutorial</i>	Total	Theory		Practical	
											<i>Sessional</i>	<i>University</i>	<i>Sessional</i>	<i>University</i>
1	BEENE605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-
													Total Marks	
													50	

Syllabus:

Unit 1. Functional Grammar: (4 Hours) (3+3+4=10)

Common errors , Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs)

Unit II. English for Competitive Exams & Interview Techniques: (6 Hours) (3+3+4=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III

(A) Formal Correspondence (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: (4 Hours)

[Four fictional & four non-fictional unseen texts]

Unit 1V. Technical & Scientific Writing: (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal, Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober, Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

Electronics Workshop Practice

Duration: 2 Hrs.

College Assessment: 25Marks

University Assessment: 25 Marks

Subject Code: BEECE606P/ BEETE606P/ BEENE606P

[0 – 2 – 0 – 2]

Objectives:

1. To make students familiar with measuring instruments like CRO, DSO and Signal Generator.
2. To make students familiar with Interfacing Peripheral with computer.
3. To understand PCB Designing process
4. To enable students to design & fabricate their own Hardware.

Outcome:

At the end of the course the students shall be able

- to:
1. Use DSO and Spectrum Analyzer.
 2. Interface peripherals with computer.
 3. Design PCB using PCB designing software.
 4. Design & fabricate mini project.

Practical 1: Study of Functioning of Spectrum Analyzer and Digital Storage oscilloscope. Hrs.)	(2
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Practical 2: Study of different Electronic components. Hrs.)	(2
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Practical 3: Printed Circuit Boards (PCB): Hrs.)	(4
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Types, Layout procedure, artwork, Fabrication (In this, fabrications of small circuit Using discrete component on single side PCB is expected).

Practical 4: Interfacing of displays (LCD, LED, 7 Segment) with PCs Hrs.)	(2
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Practical 5: Hardware Mini Project Hrs.)	(14
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- Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog **application circuit**.
- Mini Project work should be carried out by a group of maximum **three** students.
- Student should use standard software available for drawing circuit schematic, simulating the design and PCB (**single/double sided**) layout of circuit.

- Project report should consist of details of work carried out including **layouts, circuits, datasheets, list of components, cost** .

Reference Books:

- 1 Electronic Instruments and Instrumentation Technology
2. A course in Electrical and Electronics Measurements and Instrumentation - A.K. Sawhney - Dhanpat Rai & Co.
3. Electronic Components and Materials - Dr. Madhuri A. Joshi - Shroff Publications Third Edition
4. Electrical and Electronic Measurements –Banerjee, PHI
5. Introduction to Measurements and Instrumentation, 4th edition- Ghosh PHI
6. Electronic Instrumentation and Measurement Techniques, W.D. Copper, PHI

Web Resources: Refer online datasheets

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

Industrial Visit

Duration: 2 Hrs.

College Assessment: G (Grade)

Subject Code: BEENE607P /BEECE607P/ BEETE607P

[0 – 2 – 0 – 2]

Objectives:

To provide industry exposure to students.

Outcome:

The students shall be able to apply this knowledge during their project and may be useful in future.

In industrial visit it is expected that

1. Student should visit the industry.
2. Based on their interaction, experience during this Industrial visit they should prepare technical report with photograph and certificate from industry.

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: FIFTH
BRANCH: COMPUTER ENGINEERING

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/W week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BECME501T	Theory of Computation	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BECME502T	Computer Architecture Organization	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BECME503T	TCP/IP and Internet	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BECME503P	TCP/IP and Internet Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BECME504T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BECME504P	Computer Graphics Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BECME505T	Industrial Economics and Enterprenurship Development	4	-	-	4	4	-	-	4	20	80	-	-	100
8	BECME506P	Computer Lab -III	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	20	6	4	30	20	4	4	28	100	400	75	75	650

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: SIXTH
BRANCH: COMPUTER ENGINEERING

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/W week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BECME601T	System Software	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BECME602T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BECME602P	Design and Analysis of Algorithms Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
4	BECME603T	Database Management System	4	-	1	5	4	-	1	5	20	80	-	-	100
5	BECME603P	Database Management System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
6	BECME604T	Software Engineering & Project Management	3	-	1	4	3	-	1	4	20	80	-	-	100
7	BECME604P	Software Engineering & Project Management Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
8	BECME605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
9	BECME606P	Mini Project & Industrial Visit	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	17	8	5	30	17	5	5	27	90	360	100	100	650

Syllabus of FIFTH SEMESTER
B.E. (Computer Engineering)
R. T. M. Nagpur University Nagpur

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: FIFTH
BRANCH: COMPUTER ENGINEERING

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/W week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BECME501T	Theory of Computation	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BECME502T	Computer Architecture Organization	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BECME503T	TCP/IP and Internet	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BECME503P	TCP/IP and Internet Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BECME504T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BECME504P	Computer Graphics Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BECME505T	Industrial Economics and Enterprenurship Development	4	-	-	4	4	-	-	4	20	80	-	-	100
8	BECME506P	Computer Lab -III	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	20	6	4	30	20	4	4	28	100	400	75	75	650

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Syllabus of B. E 5th Semester Computer Engineering

BECME501T Theory of Computation

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME501T	Theory of Computation	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

Unit I:

Strings, Alphabet, Language operations, Finite state machine definitions, Finite automation model, Acceptance of strings and language, Non deterministic finite automation, Deterministic finite automation, Equivalence between NFA and DFA, Conversion of NFA into DFA, Minimization of FSM, Equivalence between two FSM's Moore and Mealy machines

Unit II:

Regular sets, Regular expressions, Identity rules, Manipulation rules, Manipulation of regular expressions, Equivalence between RE and FA, Inter conversion, Pumping lemma, Closure properties of regular sets, Chomsky hierarchy of languages, Regular grammars, Right linear and left linear grammars, Equivalence between regular linear programming and FA, Inter conversion between RE and RG.

Unit III:

Context free grammar, Derivation trees, Chomsky normal form, Greibach normal form, Push down automata, Definition, Model acceptance of CFL, Equivalence of CFL and PDA, Inter conversion, Closure properties of CFL(Proofs omitted), Pumping Lemma of CFL, Introduction of DCFL and DPDA

Unit IV:

Turing Machine: Definition, Model of TM, Design of TM, Universal Turing Machine, Computable function, Recursive enumerable language, Types of TM's, Linear bounded automata and Context sensitive language, Counter machine

Unit V:

Decidability and Undecidability of problems, Properties of recursive & recursively enumerable languages, Halting problems, Post correspondence problem, Ackerman function, and Church's hypothesis.

Unit VI:

Recursive Function: Basic functions and operations on them, Bounded Minimalization, Primitive recursive function, μ -recursive function, Primitive recursive predicates, Mod and Div functions, Unbounded Minimization, Equivalence of Turing Computable function and μ -recursive function.

Text Books:

1. Introduction to Theory of Computation 2nd Edition, by Sipser, Cengage publications
2. Introduction to Automata Theory, Languages and Computation by J. E. Hopcraft, R. Motwani, J. D Ullman, second Edition, Pearson Education, Aisa

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2. An Introduction to Formal Languages and Automata by Peter Linz
3. Introduction to Languages and the theory of Automata by John Martin, Third Edition(TM)

Reference Books:

1. Theory of Computer Science, Automata, Languages and Computation by K. L. P. Mishra and N. Chandrasekaran, Third Edition, PHI Learning.
2. Elements of Theory of Computation by Lewis H.P and Papadimitriou C.H.

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Syllabus of B. E 5th Semester Computer Engineering

BECME502T Computer Architecture Organization

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME502T	Computer Architecture Organization	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

Unit I: Computer Evaluation and Arithmetic

A Brief History of computers, Designing for Performance, Von Neumann Architecture, Computer Components, Interconnection Structures, Bus Interconnection, Scalar Data Types, Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2's Complement method for multiplication, Booths Algorithm, Hardware Implementation, Division, Restoring and Non Restoring algorithms, Floating point representations, IEEE standards, Floating point arithmetic.

Unit II: Processor Design

Machine Instruction characteristics, types of operands, types of operations, Addressing, Instruction formats, Processor organization, Register Organization, Instruction cycles, Instruction pipelining, ALU – Combinational ALUs and Sequential ALUs, RISC Architecture.

Unit III: Control Design

Single Bus Organization, Control Unit Operations: Instruction sequencing, Micro operations and Register Transfer. Hardwired Control : Design methods – State table and classical method, Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts, Microinstructions and micro- program sequencing

Unit IV: Memory Organization

Characteristics of memory systems, Internal and External Memory, Types of memories: ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM, SDRAM, RDRAM High-Speed Memories: Cache Memory, Organization and Mapping Techniques, Virtual Memory: Main Memory allocation, Segmentation, Paging, Address Translation. Secondary Storage: RAID, Optical memory, CDROM, DVD, USB-1.1, 2.0 and 3.0.

Unit V: I/O Organization

Input/Output Systems, Programmed I/O, Interrupt Driven I/O, I/O channels, Direct Memory Access (DMA), Buses and standard Interfaces: Synchronous, Asynchronous, Parallel, Serial, PCI, SCSI, USB Ports Working mechanisms of Peripherals: Keyboard, Mouse, Scanners, Video Displays, Touch Screen panel, Dot Matrix, Desk-jet and Laser Printers.

Unit VI: Parallel Organizations

Superscalar Processors, Multiple Processor Organizations, Symmetric Multiprocessors, Clusters, Non-uniform Memory Access , Vector Computations, Bus allocation Schemes. RISC: Instruction execution characteristics, use of large register file, compiler based register optimization, RISC architecture, pipelining. RISC vs. CISC

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Syllabus of B. E 5th Semester Computer Engineering

Text Books:

1. W. Stallings, "Computer Organization and Architecture: Designing for performance", 6th Edition, Prentice Hall of India, 2003, ISBN 81 – 203 – 2103 – 0
2. J. P. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0 – 07 – 100479 – 3
3. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill.

Reference Books:

1. William Stallings, "Computer Organization and Architecture: principles of structure and function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 – 02 – 946297 – 5 (Chapter: 2,3,4,5,7,8,9,10,11,12,13,14).
2. A. Tanenbaum, "Structured Computer Organization", 4th Ed, Prentice Hall of India, 1991 ISBN 81 – 203 – 1553 – 7 (Chapter: 1,4,5,6,8).
3. G. George, "Computer Organization: Hardware and Software", 2nd Edition, Prentice Hall of India, 1986 (Chapter: 3,4,5).
4. D. Paterson, J. Hennesy, "Computer Organization and Design: The Hardware Software Interface", 2nd edition, Morgan Kauffman, 2000 ISBN 981 – 4033 – 588.

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BECME503T TCP/IP and Internet

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME503T	TCP/IP and Internet	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

Unit 1:

Introduction & Overview: Comparison of OSI & TCP/IP model, Internetworking concepts & architecture model, NAP, ISP, RFC, Internet standards, Internet Backbone, Underlying Technologies: Wired LAN, Wireless LAN'S, Point-to-point WAN'S, Switched WAN'S.

Unit 2:

Internet Protocols: IPV4 Address: Classful, Classless, CIDR, Special address, NAT, Delivery & forwarding of IP Packets, IP Datagram, Fragmentation, ARP, RARP. IPV6 Address: Addressing, Packet Format, Transition from IPV4 to IPV6.

Unit 3:

Internet Control Message Protocols: ICMPv4, ICMPV6. **Routing Protocols:** RIP, OSPF & BGP.

Unit 4:

Mobile IP: Addressing, agents, phases, problems in Mobile IP, Multicasting & multicast routing protocols: IGMP, MOSPF, DVMRP and CBT.

Unit 5:

Transport Layer Protocol Services: UDP: Services, Congestion control, Encapsulation & De-capsulation, Multicasting & De-multicasting, and Application. TCP: Services, Features, Segment Format, TCP Connection State Transition Diagram, Windows in TCP, Flow control, Error control, Congestion Control, TCP timer's option, SCTP. Socket concepts and Socket programming.

Unit 6:

Auto Configuration & Applications: DHCP, DNS, Telnet, SSH, FTP, TFTP, HTTP and Electronic Mail: SMTP, POP3, MIME, and IMAP.

Text Book:

1. TCP/IP & Protocol Suite, 4th Edition by Behrouz A. Forouzan, TMH Publication.
2. Computer Networking Essential, Debra LittleJohn Shinder, Cisco Press.

Reference Books:

1. Internetworking with TCP/IP principles, Protocol & Architecture by Douglas E. Comer, PHI Publication
2. An Engineering approach to Computer Networking by Srinivasan. Keshav, Pearson education
3. Design and Analysis of Communication Networks By V. Ahuja , McGraw Hill Publication
4. Cisco TCP/IP Routing Professional Reference Third Edition, by Chris Lewis, Cisco Press

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Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME503P	TCP/IP and Internet Lab	-	2	-	2	-	1	-	1	-	-	25	25	50

BECME503P TCP/IP and Internet Lab

Syllabus:

Practicals Based on Syllabus of **BECME503T**

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BECME504T Computer Graphics

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME504T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

Unit I:

Geometry and line generation: points, lines, planes, pixels and frames buffers, types of display devices and its architecture DDA and Bresenham's algorithms for line generation, Bresenham's algorithm for circle, ellips generation, aliasing, anti-aliasing and its techniques.

Unit II:

Graphics primitives: Display files, algorithms for polygon generation, polygon filling algorithms: Simple ordered Edge list, Edge fill, Fence fill, Edge flag, Seed fill, Scan line Seed fill, NDC (normalized device co-ordinates).

Unit III:

Segment tables: operations on segments, data structures for segments and display files, Windowing and clipping: window, viewport, viewing transformations, clipping line : Cohen-Sutherland, Cyrus-Beck, Mid-point subdivision and Polygon clipping(Sutherland- Hodgeman)

Unit IV:

2D transformations: scaling, rotation, translation, rotation about arbitrary point, reflections, shearing. 3D

Graphics: 3D Transformation, parallel, perspective and isometric projections, 3D Transformations.

Unit V:

Hidden surfaces and line removal: Painter's, Z-buffer, Warnock's, Back-face Removal algorithm, Curves and surfaces: Methods of interpolation, Bezier and B-splines, surface rendering methods: Gouraud Shading, Phong Shading, Constant Intensity Shading, Fast Shading.

Unit VI:

Color Models and Color Application: Properties of light, standard primaries, chromaticity Diagram, Intuitive color concept RGB, YIQ CMY, HSK, color models & their conversion, color selection & applications. Animation: Design of Animation sequences, animation Function, Raster animation, animation language, Key-Frame System, motion Specification.

Text Books:

1. Procedural elements for computer graphics by David F. Rogers, Mc-Graw Hill.
2. Computer Graphics 'C' Version, Second Edition By Donald Hearn & M.Pauline Baker. Pearson publication
3. Mathematical elements for computer graphics by David Rogers and J. Alan Adams. Tata Mcgraw Hill Education Private Limited
4. Computer graphics principles and practice by Foley, Vandam, Feiner & Huges Addison Wesley
5. Principles of interactive computer graphics by Newman & Sproul.

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BECME504P Computer Graphics Lab

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME504P	Computer Graphics Lab	-	2	-	2	-	1	-	1	-	-	25	25	50

Syllabus:

Practical based on Syllabus of BECME504T

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BECME505T Industrial Economics and Entrepreneurship Development

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME505T	Industrial Economics and Entrepreneurship Development	4	-	-	4	4	-	-	4	20	80	-	-	100

Syllabus:

Unit I :

Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

Unit II:

Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration-forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization. Business cycles, optimum size of firm.

Unit III:

The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Capital formation, Inflation, Recession and stagnation, Inclusive growth, Public-Private partnership for development, Multiplier effect, Accelerator effect.

Unit IV:

Entrepreneurship meaning, Major Motives Influencing an Entrepreneur, Factors Affecting Entrepreneurial Growth. Project Formulation, Product development, Market Survey and Research, Demand forecasting techniques, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit V:

Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Direct, Indirect Taxes.

Unit VI:

Sickness in small business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, safeguard measures against variation in currency value, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS

1. Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

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2. Modern Economic Theory By, K.K. Dewett. S.Chand.
3. Industrial Economics. By, Jagdish Sheth, Pearson Publication.
4. “Entrepreneurial Development” By, S.S.Khanka S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
5. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.
6. Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.
7. Entrepreneurial Development. By, S.Anil Kumar. New Age International.
8. Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:

1. Business Economics. By, K.Rajgopalchar. Atalantic Publishers.
2. Microeconomics. By, Robert Pindyk
3. Business Economics. By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.
4. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
5. Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

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BECME506P Computer Lab -III

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME506P	Computer Lab -III	-	2	-	2	-	1	-	1	-	-	25	25	50

Syllabus

Practicals should be performed based on **Core and Advance Java**. Sample List is provided.

1. A) Write a program to sort 'n' numbers pass through command line. Use user defined array to store command line argument and print sorted data.
1. B) Write a program to multiply two matrices which are auto-initialized in class, print the resultant matrix in matrix form.
2. A) Write a program to perform multiplication of TWO Matrices using interactive input.
2. B) Write a Program to calculate the trace of a matrix using interactive input.
3. A) Create a class Stack and implement all stack related operations such as push (), pop (), peep (), change ().
3. B) Write a program to implement all operations related with circular queue.
4. Design a class College with data members name, year, branches and method cprint(). Derive a class Employee from College having data members e_id, e_name, e_add and basic_pay, and methods getData(), eprint() and calSalary() to calculate salary of employee. Design an Employee Array to demonstrate the use of above classes for 5 employees.
5. Write a program to implement Abstract class Shape with one abstract method area() and one non static method show(). Create class Triangle, Rectangle and Circle extending abstract class Shape to calculate its area.
6. Design an interface Shape with abstract methods area() and volume(). Create class Cube and Sphere implementing interface Shape to calculate area and volume of cube and sphere.
7. Create package Comp containing Complex class having proper Complex Constructor. Create another package ComplexCal with CompC class extending the features of Complex class which contain suitable methods for performing addition and subtraction of TWO Complex Objects. Similarly create Dist package with Distance class having proper constructor. Create another package DistanceCal with DistD class extending the features of Distance class to perform addition and subtraction of TWO Complex objects. Design class CompDistDemo to demonstrate the use of all above classes and packages.
8. Write a Database application that allows user to Insert, Update, Delete values in a Table and manages appropriate exception Handling when wrong values are entered.
9. Design class StringT with methods getString() & putString(). Derive class String manipulator with methods countchar, countvowel & Encrypt. Encrypt will apply Caesar cipher using circular shift. Demonstrate all above classes & object in class stringDemo.
10. Write an HTML page which inputs the below mentioned fields and invoke the java servlet program which enters the fields in the database table Fields: Roll_no, Name, Department, Email_id, Mobile_no.
11. Write an **Applet program** to draw a ball at the center of Applet window of **size 40*40** and **configure** the color of the ball through the parameters passed from the **HTML file**.
12. Write a program that implements a simple client/server application. The client sends data to a server the server receives the data, uses it to produce a result and then sends the result back to the client. The client

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displays the result on the console. For ex the data send from the client is a numbers and the result produce by the server is the addition of that number.

13. Develop an application of online songs library through which user can make search of a song by different category like movie name, singer name, actor, actress, year etc... Make suitable assumption in design with brief description .Develop using JSP.
14. Create a Java Bean to store information about person. The details of person (person name, person age, person height, etc.) are stored in person database table. After the person is authenticated, his/her personal details are transferred from the database table (person) to Java Bean (Person) and the details are displayed in proper format using this Person Java Bean. The Java Bean is stored in session scope. Use MVC architecture for this purpose.
15. Develop an application using JSP and JDBC to receive user name and password from client and validate it using the data from the data base.

Syllabus of SIXTH SEMESTER
B.E. (Computer Engineering)
R. T. M. Nagpur University Nagpur

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: SIXTH
BRANCH: COMPUTER ENGINEERING

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/W week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BECME601T	System Software	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BECME602T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BECME602P	Design and Analysis of Algorithms Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
4	BECME603T	Database Management System	4	-	1	5	4	-	1	5	20	80	-	-	100
5	BECME603P	Database Management System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
6	BECME604T	Software Engineering & Project Management	3	-	1	4	3	-	1	4	20	80	-	-	100
7	BECME604P	Software Engineering & Project Management Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
8	BECME605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
9	BECME606P	Mini Project & Industrial Visit	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	17	8	5	30	17	5	5	27	90	360	100	100	650

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BECME601T System Software

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME601T	System Software	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

UNIT I: System Software and Assemblers:

Definition, Components of system software, Evolution of system software, Language translators, Machine Structure, Machine Language, And Assembly Language instructions, Assemblers ,Structure of an assembler, Design of two pass assembler and Single Pass assembler Table\of incomplete instruction, back patching. Data structures used for design of assembler, Design and Implementation of two pass assembler, Error handling and Symbol Table management , Handling constants, literals, labels and Procedures, One pass assembler design and comparison with two pass assembler design, Cross assembler.

UNIT II: Macro processor

Macro language and macro processor, macro instructions, features of macro facility, macro instruction arguments, conditional macro expansion, macro call within macros, macros instructions defining macros, Implementation.

UNIT III: Linkers and Loaders:

Basic Loader functions, Loader schemes, “Compiler and go” Loaders, general Loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, other loader schemes Binders, linking loaders, Overlays, Dynamic Binders, Design of an absolute Loaders, Design of a Direct – Linking loaders.

UNIT IV: Compiler:

Basic Compiler Function Compiler phases - Lexical Analysis – NFA and DFA, Syntax analysis Grammars, Introduction to Top down v/s bottom up parsing, Semantic Analysis and SDT and dependency trees Intermediate code generation –three address code intermediate code forms, Compiler-Compilers. Compiler generation tools – LEX and YACC. Interpreters.

UNIT V: Unix Device Drivers:

Definition, Anatomy and types, Device Programming, Installation and Incorporation of driver routines, Basic device driver operation, Implementation with Line printer, Comparative study between device drivers for Unix and Windows.

UNIT VI: Case study of Intel®64 and IA-32 Processors

Basic architecture, notational conventions, brief history of Intel® 64 and IA-32 Architecture, Intel NetBurst® Micro-architecture, specific advances. Basic execution environment: Modes of operation, overview of the basic execution environment, memory organization, basic program execution registers, instruction pointer, operand-size and address-size attributes, operand addressing.

Text Books:-

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.
2. System Programming by Leland Beck, Pearson Ed.
3. D. M. Dhamdere : “Systems programming and operating system”, Tata McGraw Hill
4. Unix device drives by George Pajani, Pearson Education.

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Reference Books: -

1. Device Drives for Windows by Norton, Add Wesley.
2. Intel®64 and IA-32 Architectures Software Developer's Manual Volume1: Basic Architecture.
3. The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286,80386,80486, Pentium and Pentium PRO Processor by Barry B. Brey, 4th Edition, Prentice- Hall.

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BECME602T Design and Analysis of Algorithms

	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME602T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

Unit I:

Introduction to Iteration, Design Issues, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Mathematical foundations, summation of arithmetic and geometric series, bound summations using integration, Design using Recursion.

Unit II:

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, External Sorting, lower bound proof, elementary and advanced data structures with operations on them and their time complexity.

Unit III:

Greedy method – Basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path.

Divide and conquer - Basic strategy, binary search, Quick sort, Merge sort, Fast Fourier Transform.

Unit IV:

Dynamic Programming - Basic strategy, multistage graphs, all pair shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

Unit V:

Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen’s problem, Graph coloring, Hamiltonian cycles.

Unit VI:

NP-hard and NP -complete problems, basic concepts, non deterministic algorithms, NP-hard and NP complete, Cook’s Theorem, decision and optimization problems, polynomial reduction.

TEXT BOOKS

1. “Fundamentals of Computer Algorithms”, Horowitz, Sahani, Rajsekharan, Galgotia Publications.

REFERENCE BOOKS

1. “Introduction to Algorithms”, Thomas H. Cormen , 3rd Edition, Prentice Hall of India.
2. “Fundamentals of Algorithms”, Brassard and Bratley, Prentice Hall.
3. “Analysis and Design of Computer Algorithms”, A.V. Aho, J. E. Hopcroft, J.D. Ullman, Addison Wesley.
4. “Foundations of Algorithms”, Shailesh R Sathe, Penram.
5. “Design and Analysis of Algorithms”, Dave and Dave, Pearson Education.

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BECME602P Design and Analysis of Algorithms Lab

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME602P	Design and Analysis of Algorithms Lab	-	2	-	2	-	1	-	1	-	-	25	25	50

Syllabus:

Practical Based on Syllabus of BECME602T

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BECME603T Database Management System

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME603T	Database Management System	4	-	1	5	4	-	1	5	20	80	-	-	100

Syllabus:

UNIT I: Introduction to Database Systems

Database Systems: Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, DBMS Architecture, Functions of DBMS, Formal relational query languages: Relational Algebra, Tuple Relational calculus, Domain Relational Calculus.

UNIT II: Relational Database Manipulation

Introduction to SQL: SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Null values, Aggregate functions, Nested Sub-queries, Modifications of the Databases Intermediate SQL: Join Expressions, Views, Integrity Constraints, SQL Data types and Schemas, Authorization. Advanced SQL: Dynamic SQL and Embedded SQL, PL/SQL Functions and Procedures,. QUEL: data definition, data manipulation, embedded data manipulation language. QBE: Basic data retrieval, aggregation, categorization, updates.

UNIT III: Data Models and Relational Database Design

Evolution of Data Models, Entity Relationship Model, Development of ER Diagrams, Extended Entity Relationship Model. Relational model: Logical View of Data, Keys, Integrity Rules, Relational set operators, Data Dictionary and System Catalog, Indexes, Codd's Relational Database Rules. Normalization of Database Tables: Need and Significance, the normal forms - 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, normalization & database design, renormalization.

UNIT IV: Query Processing and Query Optimization

Overview of Query Processing, Measures of Query cost, Selection Operation, Sorting, Join Operation, Other Operations, and Evaluation of Expressions. Overview of Query Optimization, Transformation of Relational Expressions, Estimating Statistics of Expression results, Choice of Evaluation Plans, Materialized Views

Unit V: Transaction Management & Concurrency Control

Transactions: Concept, Transaction Model, Transaction atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation Levels and Implementations. Concurrency Controls: Lock Based Protocol, Deadlock Handling, Time-stamp Based Protocols, and Validation Based Protocols. Recovery : Failure Classification, Log Based Recovery, Advanced Recovery Techniques.

UNIT VI: Distributed Database

Introduction, data distribution, object naming, distributed query processing, consistency, concurrency control, distributed commitment and recovery, deadlocks, security and protection in DDBMS, homogenous and heterogeneous systems.

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Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill (SIE), 2013.
2. Desai Bipin, Introduction to Database System, Galgotia Publications, 2003

Reference Books:

1. Alexis Leon and Mathews Leon, Database Management Systems, Vikas Publishing, 2008.
2. Ramez Elmasri and Shamkant Navathe, Database Systems - Models, Languages, Design and Application Programming, 6th Edition, Pearson Education, 2009.
3. Carlos Coronel, Steven Morris and Peter Rob, Database Principles – Fundamentals of Design Implementation and Management, 9th Edition, Cengage Learning, 2013.
4. Hector-Garcia Molina, Jeffrey Ullman and Jeniffer Widom, Database Systems – the Complete Book, 2nd Edition, Pearson Education, 2014.

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BECME603P Database Management System Lab

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME603P	Database Management System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50

Syllabus

Practicals based on syllabus of **BECME603T**

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BECME604T Software Engineering & Project Management

Sr. No.	Subject Code	Subject	Workload				Credit				Marks					
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks	
											Sessional	University	Sessional	University		
1	BECME604T	Software Engineering & Project Management	3	-	1	4	3	-	1	4		20	80	-	-	100

Syllabus:

Unit I: Introduction to Software Engineering

Evolving role of software, software characteristics, software myths, Software Process, Software Engineering, Software process, software development phases, Process Models: Waterfall Model, Prototype model, RAD model, Evolutionary Models: Incremental model, Spiral Model, WINWIN spiral model, Concurrent, Agile Process models: Agile process, Extreme programming.

Unit II: Requirements Engineering

System Engineering: Hierarchy, Business Process and Product Engineering: Overview, Requirements Engineering, Initiating the process, Eliciting Requirements, Building the Requirements Model, Negotiating, Validating requirements, Requirements Analysis, Scenario-Based Analysis, Requirements Modeling strategies, Flow-Oriented Modeling, Class based modeling, SRS.

Unit III: Design Engineering

Design Process, Design Principles, and Concepts, Effective Modular design, The Design Model: Data, Architectural, and Interface Design.

Architectural Design: Software Architecture, Architectural Styles, Architectural Design, User Interface Design: Rules, User Interface Analysis and Design, Applying Interface Design Steps, Issues, Component- level Design.

Unit IV: Testing

Testing Tactics: Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, Black Box Testing.

Testing Strategies: A Strategic approach to Software Testing, Strategic Issues, Testing Strategy for Conventional Software: Unit Testing, Integration Testing, Validation Testing, Debugging.

Unit V: Project Management Concepts

Management Spectrum: people, product, process, project, Critical practices, Process and project

Metrics: Metrics in process and project domains, software measurement, metrics for software quality, Estimation for software project: project planning objectives, software scope and feasibility, resources, Decomposition Techniques, Empirical Estimation Models, Specialized Estimation techniques, Make by decision.

Unit VI: Project Planning

Risk Management: Reactive versus Proactive Software Risk, Risk Identification, Risk projection, Risk refinement, Risk mitigation, monitoring & management, The RMMM plan.

Project Scheduling: Task set for software project, defining a task network, scheduling, earned value analysis, Software Quality: Software Quality Factors, Software Quality Assurance (SQA) : SQA Activities, Software reviews, FTR, Software reliability, Software configuration management: software configuration management, the SCM Repository, SCM process.

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Engineering

Text Books:

1. Pressman R., "Software Engineering, A Practitioners Approach", 5th Edition, Tata McGraw Hill Publication.
2. Pressman R., "Software Engineering, A Practitioners Approach", 7th Edition, Tata McGraw Hill Publication.

Reference Books:

1. Mall R., "Fundamentals of Software Engineering", Second Edition, Prentice Hall India, 2004, ISBN 81 -203-2445-5
2. Vliet H., "Software Engineering Principles and Practices", Second Edition, John Wiley and Sons, ISBN 9971-51-357-9
3. Sommerville "Software Engineering" 8th Edition, Person Education
4. Behfarooz A:, Hudson F., "Software Engineering Fundamentals", Oxford University Press, 2002, ISBN 0-19-510539-7

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Engineering

BECME604P Software Engineering & Project Management Lab

Sr. No.	Subject Code	Subject	Workload				Credit				Marks					
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks	
											Sessional	University	Sessional	University		
1	BECME604P	Software Engineering & Project Management Lab	-	2	-	2	-	1	-	1	-		-	25	25	50

Syllabus:

Practicals based on syllabus of **BECME604T**.

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Engineering

BECME605T **Functional English**

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50

Syllabus:

Unit 1. Functional Grammar: (4 Hours) (3+3+4=10)

Common errors , Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs)

Unit II. English for Competitive Exams & Interview Techniques: (6 Hours) (3+3+4=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III

(A) Formal Correspondence (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: (4 Hours)

[Four fictional & four non-fictional unseen texts]

Unit 1V. Technical & Scientific Writing: (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal, Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober, Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Engineering

BEIT606P

Mini Project & Industrial Visit

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECME606P	Mini Project & Industrial Visit	-	2	-	2	-	2	-	2	-	-	25	25	50

Syllabus:

Course Objective:

1. To develop an understanding of applications in real life
2. To develop research skills of students
3. To help the students in exploring career opportunities in their areas of interest
4. To give an insight into the overall functioning of the organizations where students visited
5. To develop Industry Institute Interaction
6. To provide means to immerse students in actual supervised professional experiences

Constraints:

1. Students shall work in groups of 4-5 each and work on small application or research based / Industry Oriented real time problems.
2. Local Mentor and Industry mentor shall work in coordination
3. Industry visit should be planned to explore students about real time problems
4. Students shall work on providing solutions to identified problems
5. Detailed reports are expected to be submitted at the end using Standard Technical Writing Tool
6. Evaluation should be done based on feedback of Local and Industry Mentor

Expected Outcome:

1. Real Time Problem Identification
2. Requirement analysis and identification of relevant data sources
3. Literature survey / Industrial survey
4. Overall Project development as per the phases of SDLC

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: FIFTH (C.B.S.)

BRANCH: COMPUTER TECHNOLOGY

Code	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni	
1 BECT301T	Object Oriented Modeling	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECT301P	Object Oriented Modeling Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECT302T	Database Management System	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECT302P	Database Management System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECT303T	Operating system	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECT303P	Operating Systems Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7 BECT304T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
8 BECT304P	Design and Analysis of Algorithms lab	-	2	-	2	-	1	-	1	-	-	25	25	50
9 BECT305T	Data Communication	3	-	1	4	3	-	1	4	20	80	-	-	100
	Total	19	8	5	32	19	4	5	28	100	400	100	100	700

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: SIXTH (C.B.S.)

BRANCH: COMPUTER TECHNOLOGY

Code	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni	
1 BECT306T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECT306P	Computer Graphics lab	-	2	-	2	-	1	-	1	-	-	25	25	50
3 BECT307T	Computer network	4	-	1	5	4	-	1	5	20	80	-	-	100
4 BECT307P	Computer network lab	-	2	-	2	-	1	-	1	-	-	25	25	50
5 BECT308T	Software Engineering and Project Management	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECT308P	Software Engineering and Project Management Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7 BECT309T	Embedded System Design	3		1	4	3	-	1	4	20	80	-	-	100
8 BECT310T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
9 BECT311P	Mini project	-	2	-	2	-	4	-	4	-	-	25	25	50
Total		17	8	5	30	17	7	5	29	90	360	100	100	650

SYLLABUS: V SEMESTER (Computer Technology) (C.B.S.)

BECT301T: Object Oriented Modeling

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, importance of modeling, principles of modeling, object oriented modeling, ***Aggregation and association, Generalization***, Introduction to UML, conceptual model of the UML, Architecture.

Unit II: Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Unit III: Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine, Process and thread, Event and signals, Time diagram, interaction diagram, ***Dataflow diagram***, Package diagram, ***sequence diagram, E-R diagram***.

Unit IV: Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Unit V: The Unified process: use case driven, architecture centric, iterative, and incremental. Use case driven process: why use case, capturing use cases, analysis, design, and implementation to realize the use cases, testing the use cases.

Unit VI: Architecture-centric process: architecture in brief, why we need architecture, use cases and architecture, the steps to architecture, an architecture description. Case Study: The Unified Library application.

Text Books:

1. The Unified Modeling Language User Guide by Grady Booch, James Rumbaugh, Ivar Jacobson 2nd Edition, Pearson Education.
2. UML 2 Toolkit by Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado WILEY-Dreamtech India Pvt. Ltd.
3. The Unified Software Development Process by Ivar Jacobson, Grady Booch, James Rumbaugh, Pearson Education

Reference Books:

1. Fundamentals of Object Oriented Design in UML by Meilir Page-Jones Pearson Education.
2. Modeling Software Systems Using UML2 by Pascal Roques WILEY-Dreamtech India Pvt. Ltd
3. Practical Object-Oriented Design with UML by Mark Priestley TATA McGrawHill

BECT301P: Object Oriented Modeling lab: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT302T: Database Management System

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Syllabus

UNIT-I

Introduction to IMs, Introduction to DBMS, architecture, role of database administrator, data dictionary, Traditional Models, three-level architecture, hierarchical model, network model and relational model.

UNIT-II

Relational Database design, **ER modeling**, relational algebra, Tuple relation calculus, Domain relational calculus. Functional Dependencies, Normalization

UNIT-III

PL/SQL Concept. Physical and logical hierarchy. Concept of index, B-trees, hash index, function index, bitmap index, **trigger and assertions**.

UNIT-IV

Overview, measures of query cost, **query optimization**, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views.

UNIT-V

Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two-Phase Commit protocol, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking.

UNIT-VI

Recovery System: failure classification, recovery and atomicity, log based recovery, checkpoints, buffer management, advanced recovery techniques. Introduction to **various** Sql databases.

TextBooks:

1. Database System Concepts by Silberschatz , Henry F. Korth , S. Sudarshan, Tata McGraw Hill, Fifth Edition
2. Fundamentals of Database Systems – Elmasiri and Navathe, Addison Wesley, 2000.
3. An introduction to Database Systems, C J Date - Wesley

Reference Books:

1. Database Management Systems - by Raghu Ramakrishnan and Johannes Gehrke, Tata McGraw Hill Publication, Third Edition

BECT302P: Database Management System lab: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT303T: Operating system

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory)	5	100	20	80	100
1 hr (Tutorial)					

Unit I: Introduction: Definition, Functions of Operating Systems, Evolution of Operating Systems, Types of OS, Structural overview, System calls, Process Concept, Process States, Process Scheduling, Operations on Processes, Types of scheduler, Context switch, Threads Overview, Multithreading Models, Threading issues. Examples of WINDOWS Server & LINUX.

Unit II: CPU Scheduling Concepts, Scheduling Criteria and Algorithms. Process Synchronization: The Critical-Section Problem, software and hardware solution, Semaphores, Monitors, Classical inter process communication problems.

Unit III: Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock, Goals of Protection.

Unit IV: Memory Management: Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Segmentation with paging, demand paging, page Faults and instruction restart, page replacement algorithms, working sets, Locality. Virtual Memory Management: Background, Demand Paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing.

Unit V: File System: Directory Structure, File-System Mounting, File Sharing & Protection. File-System Structure, File-System Implementation. Directory Implementation, Disk space management and space allocation strategies File Recovery, disk arm scheduling strategies.

Unit VI: I/O Systems :Overview, I/O Hardware, Application I/O Interface, and Kernel I/O Subsystem. Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Books:

1. Operating System concepts by Silberchatz & Galvin, Addison Wesley, 6th edition.
2. Modern Operating Systems by Tanenbaum, 2nd edition Pearson Education.

Reference Books:

1. Operating System concepts and design by Milan Milenkovic McGraw-Hill
2. Operating Systems by William Stallings
3. Operating Systems by D M Dhamdhere

BECT303P: Operating system lab: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT304T: Design & Analysis of Algorithms

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT-I

Mathematical foundations, summation of arithmetic and geometric series, n , n^2 , bounding summations using integration, recurrence relations, solutions of recurrence relations using technique of characteristic equation, Complexity calculation of various standard functions, principles of designing algorithms

UNIT-II

*Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, application of amortized analysis, advanced data structures like Fibonacci heap, disjoint set representation, and their applications, **Divide and conquer basic strategy, binary search, quick sort, merge sort, matrix operations, Multiplication Algorithm***

UNIT-III

Greedy method – basic strategy, Knapsack Problem, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path, Optimal Search Patterns.

UNIT-IV

Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem, Longest Common Subsequence, *0/1 Knapsack problem.*

UNIT-V

Connected components, Backtracking basic strategy, 8-Queen's problem, *sum of subsets, Knight tour's problem*, graph coloring, Hamiltonian cycles etc, Introduction to Approximation algorithm.

UNIT-VI

NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, decision and optimization problems, graph based problems on NP Principle.

Text Books:

1. Introduction to Algorithms By Thomas H. Cormen et.al. Prentice Hall of India.
2. Design & Analysis of Algorithms By Parag Himanshu Dave, Himanshu Bhalchandra Dave, second Edition, Pearson Publication.
3. Computer Algorithms- Introduction to Design and Analysis By Sara Baase, Allen Van Gelder, Third Edition, Pearson Publication.
4. The Design and Analysis of Algorithms By Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman, Pearson Publication.

Reference Books:

1. Computer Algorithms By Horowitz, Sahani, Rajsekharan, Galgotia Publications Pvt.

BECT304P: Design & Analysis of Algorithms Lab: Practical will be based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT305T: Data Communication

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

UNIT - 1

Analog and digital signals; periodic and non periodic signals analog signals time and frequency domains; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

UNIT - 2

Signal conversions: digital-to-digital conversion, digital-to-analog conversion, analog to digital conversion ,analog-to-analog conversion in detail.

UNIT - 3

COMMUNICATION MEDIA: guided media and unguided media, Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony

UNIT - 4

Multiplexing and Spread Spectrum, frequency division multiplexing (FDM). Time division multiplexing (TDM): inverse multiplexing, wave-division multiplexing, FHSS AND DSSS multiplexing applications: the telephone system: Common carrier services and hierarchies, Analog services, Digital Services; DIGITAL SUBSCRIBER LINE (DSL): ADSL, RADSL, HSDL, SDSL, VDSL

UNIT - 5

Multimedia: Digitizing Audio and Video, Compression of Audio and Video, Real Time Interactive Audio/Video, RTP, HTTP and WWW.

UNIT - 6

DATA COMPRESSION: Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, JPEG, MPEG

Text / Reference Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 4thEdition, Tata McGraw Hill
2. Understanding Data Communications and Networks by William A. Shay, 2nd Edition, Vikas Publishing House.
3. Electronic communication Systems by Kennedy.

SEMESTER: SIXTH (C.B.S.)
BRANCH: COMPUTER TECHNOLOGY

BECT306T: Computer Graphics

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Computer Graphics

Overview of Computer Graphics, Computer Graphics Application and Software, Graphics Areas, Graphics Pipeline, Graphics API's, Hardcopy Technologies, Display Technologies – Raster scan Display System, Video Controller – Vector scan display system, Random Scan Display Processor, Input Devices for Operator Interaction,

UNIT II

Basic Raster Graphics Algorithms for Drawing 2D primitives, aliasing and antialiasing, Polygon filling methods: Scan Conversion Algorithms: Simple Ordered edge list, Edge Fill, Fence fill and Edge Flag Algorithm. ,Seed fill Algorithms: Simple and Scan Line Seed Fill Algorithm, Halftoning techniques

UNIT III

2D Clipping algorithms for regular and irregular windows: Sutherland Cohen Outcode, Sutherland Cohen Subdivision, Mid-Point subdivision, Cyrus Beck and Sutherland Hodgman, Cohen-Sutherland Polygon clipping Algorithm. Clipping about Concave regions.

Curves and Surfaces: Polygon Mesh, Parametric Cubic Curves, Parametric Bicubic Surfaces, Quadratic Surface, Bezier Curves and B-spline curves.

UNIT IV

*2D Transformations, Translation, Rotation, Reflection, Scaling, Shearing Combined Transformation, Rotation and Reflection about an Arbitrary Line. Normalized Device Coordinates and Viewing Transformations. **Homogeneous coordinate system.***

UNIT V

3D System Basics and 3D Transformations, 3D graphics projections, parallel, perspective, viewing transformations. 3D graphics hidden surfaces and line removal, painter's algorithm, Z - buffers, Warnock's algorithm.

UNIT VI

Graphics Programming using OPENGL: Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing matrix specifications, a few examples and demos of OpenGL programs.

Text Books:

1. Fundamentals of Computer Graphics, Peter Shirley and Steve Marschner, Third Edition.
2. Procedural Elements of Computer Graphics III Edition, Rogers, McGraw Hill.
3. Computer Graphics - Principles and Practice, J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Second Edition in C, Pearson Education.
4. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Fourth Edition, Pearson Education.
5. Computer Graphics, Hearn and Baker, PHI, India

BECT306P: Computer GraphicsLab: Practical will be based on above syllabus.

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs	1	50	25	25	50

(Practical)					
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BECT307T Computer Networks

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to Networks –,Components and categories ,Types of connections ,Topologies – ,Protocols and standards ,ISO / OSI model ***and TCP/IP model***,Transmission media ,Coaxial cable , Fiber optics , Line coding ,Modems . RS232interfacing sequences.

UNIT II

DATA LINK LAYER

Error – Detection and correction, Parity, LRC, CRC, Hamming code, Flow Control and error control , Stop and wait , Go back-N ,ARQ – Selective repeat ARQ –Sliding window , HDLC –,LAN – Ethernet IEEE 802.3 , IEEE 802.4 , IEEE 802.5.

MEDIUM ACCESS SUBLAYER

Channel allocation in LAN’s and MAN’s Network: Protocols-persistent and Non Persistent CSMA, CSMA with collision detection, binary countdown, Limited Contention protocol.

UNIT III

NETWORK LAYER

Internetworks – Packet switching and datagram approach ,IP addressing methods ,Subnetting , Routing ,Distance vector routing , Link state routing , Routers, ***Congestion control.***

UNIT IV

TRANSPORT LAYER

Duties of transport layer, Multiplexing – Demultiplexing, Sockets, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Quality of Services (QOS) – Integrated services.

UNIT V

APPLICATION LAYER

DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

UNIT VI

ISDN services &ATM ; DSL technology, Sonet.Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN’s, Cellular telephony & Satellite network.

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “ – TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
3. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education

Reference Books:

1. Kurose and Rose – “Computer networking -A top down approach featuring the internet” – Pearson Education
2. Leon, Garica, Widjaja – “Communication Networks” – TMH

BECT307P: Computer NetworksLab: Practical will be based on above syllabus.

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT308T:Software Engineering & Project Management

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT - I

Introduction: Software Characteristics, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

UNIT - II

Software Engineering Principles and Practice: Communication, planning and modeling practices, System engineering and modeling, Business process engineering, Requirements Engineering

UNIT - III

Software Analysis & Design :Modeling Approaches, Data Modeling, Object-Oriented Modelling, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, Design Model, Pattern-Based Software design Design Concepts : Abstraction Architecture, pattern modularity, information hiding, design classes, refactoring.

UNIT - IV

Software Testing :Testing Fundamentals , Black-Box Testing, White-Box Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging.

UNIT - V

An overview, Software Quality, A Framework for Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance. Project management – the management spectrum, Metrics for process & project – Software measurement, Metrics for software quality, Project scheduling.

UNIT - VI

Risk management – Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management – Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Statistical Software Quality Assurance, Software Reliability, Change Management – Software Configuration Management, SCM Repository, SCM Process, Reengineering – Software reengineering, Reverse engineering, Restructuring, Forward Engineering

Text Books:

1. Software Engineering-A Practitioner's Approach (Sixth Edition)-Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Sommerville (Pearson Education)
3. Software Engineering : Theory and Practice (Fourth Edition) – Pfleeger (Pearson Education)
4. Software Engineering- Mishra /Mohanty (Pearson Education)

Reference Books:

1. Software Engineering-Schaum's Series (TMH)
2. Software Project Management - Sanjay Mohapatra (Cengage Learning)
3. Software Engineering for Students –(Fourth Edition) – Bell (Pearson Education)

BECT308P: Software Engineering & Project Management Lab: Practical will be based on above syllabus.

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

BECT309T: Embedded System Design

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

UNIT - 1

Introduction to an embedded systems design: Microcontroller, Memory Devices, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES, *embedding software on target machine.*

UNIT - 2

Inter Process Communication And Synchronization: Tasks and Threads, SharedData problem, Use of semaphore(s), Priority inversion problem and deadlocksituations, Inter process communications using signals, Semaphore flag or mutex asresource key, Message queues, Mailboxes, Pipes, Virtual (Logical) sockets, Remote Procedure Calls (RPCs).

UNIT – 3

Introduction to real time operating systems: Real Time Operating Systems: OS Services, I/O Subsystems, Interrupt Routines in RTOS Environment, RTOS Task Scheduling model, Interrupt Latency and Response times of the tasks. Case study of embedded systems

UNIT - 4

Overview of Microcontroller: Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, Single-bit instruction programming, Programming of 8051 Timers, Counter Programming

UNIT - 5

Communication with 8051: Basics of Communication, Overview of RS-232, I²C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Programming of External hardware interrupts, Programming of the serial communication interrupts, Interrupt priority in the 8051

UNIT - 6

Interfacing with 8051: Interfacing an LCD to the 8051, 8051 interfacing to ADC, Sensors, Interfacing a Stepper Motor, 8051 interfacing to the keyboard, Interfacing a DAC to the 8051, 8255 Interfacing with 8031/51, 8051/31 interfacing to external memory

Text / Reference Books:

1. Raj Kamal, "Embedded Systems", TMH, 2004.
2. M.A. Mazidi and J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", PHI, 2004.
3. David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
4. K.J. Ayala, "The 8051 Microcontroller", Penram International, 1991.
5. Dr. Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", Jaico Press
6. Dr. Prasad, "Embedded Real Time System", Wiley Dreamtech, 2004.

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester Computer Technology

BECT310T **Functional English**

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECT310T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50

Syllabus

Total Credits: 02

Teaching Scheme

Theory: 2 hrs per week

Duration of University Examination :2 hrs

Examination Scheme

T (University): 40 marks

T (Internal): 10 marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTES/TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure

Unit 1. Functional Grammar:

(4 hours)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs.

[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

Unit II. English for Competitive Exams & Interview Techniques:

(6 hours)

IPA (vowel & consonant phonemes), Word building (**English** words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment : [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III. Formal Correspondence

(4 hours)

Business Letters, e-mail etiquettes [Orders, Complaints , Enquiries, Job applications and Resume Writing ,Writing Memorandum, Circulars, notices]

Unit IV. Analytical comprehension:

(4 hours)

[Four fictional & four non-fictional unseen texts]

Unit V. Technical & Scientific Writing:

(6 hours)

Features of Technical Writing, Writing Scientific Projects, Technical Report writing, Writing Manuals, Writing Project Proposals, Writing Research papers.

Assignment: (Any one project/review as assignment)

RECOMMENDED BOOKS

- **Reference Books:**

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-

3. *The Cambridge Encyclopedia of the English Language* by David Crystal , Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober , Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks
 Written Examination: 05 marks
 Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

Rastrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
B.E. (POWER ENGINEERING): FIFTH SEMESTER
Syllabus

BEPOE501T: THERMAL POWER STATION LAYOUT - COMMON AUXILIARIES AND SAFETY

Credits: 04

Teaching Scheme

Lectures: 3 hours/week

Tutorial: 1Hour/week

Examination Scheme

Duration of paper: 3 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course objectives: The course includes the aspects of TPS layout & components of balance of plant. The student should understand the concepts of various power plant schemes, layout of various systems and associated equipments & the aspects of environmental pollution due to power plants.

Unit I [8 Hrs.]

COAL TO ELECTRICITY, Overall process flow in Thermal Power Plant, Brief description of equipments and schemes of Thermal Power Plant. SITE SELECTION & LAYOUT CONSIDERATIONS FOR THERMAL POWER PLANTS, Site availability, availability of raw material, Fuel, Water, load center, Transport facilities, Pit-head station, Air pollution, Topography. General layout of power stations, Block diagram of various layouts, location of main equipments, layouts of Boiler, Turbine and Generator and their auxiliaries, merits and demerits.

Unit II [8 Hrs.]

COAL HANDLING PLANT. Different modes of coal delivery, wagon tippers, MGR system, Coal yard arrangement, Coal stocking including safety and fire prevention, Coal claiming, Crushers, Conveyors, Magnetic separators, Metal detectors, Samples and bunkers

Unit III [8 Hrs.]

ASH HANDLING PLANT & OIL HANDLING PLANT- Bottom ash disposal system, Bottom ash hoppers arrangement design, Clinker grinder, Jet pumps, Dry system, Slurry system., FLY ASH DISPOSAL SYSTEM, Slurry and pneumatic as disposal system. Working principle, description of ash disposal, Ash slurry pumps, Slurry pipelines, Ash dykes, Ponds, Dry air silos. OIL HANDLING PLANT: Oil delivery methods, Decapitating, Storage tank considerations, Oil transfer pumps, Oil heaters, Steam tracing, Typical layout, Types of oils used for Boilers for firing.

Unit IV [8 Hrs.]

WATER TREATMENT PLANT & CIRCULATION/COOLING WATER SYSTEM., Impurities in Raw water, effects of contaminants, water treatment methodologies, softening, demineralization, layout of water treatment plant. Circulating/Cooling Water System, Open loop, closed loop system, chlorinating and other chemical dosing, cleaning filters, air pumps, types and construction. CW pipelines including butterfly valves.

Unit V [8 Hrs.]

POWER PLANT SAFETY - Industrial Safety and hazards Industrial hazards, Protective clothing and equipment, Safe working practices in power plant, permit to work system, safety movements and storage of materials, housekeeping, safety rules and regulations. Accidents - Causes and factors, cost of accidents, accident prevention, accident investigating, reporting and records. Fire Fighting- Fundamentals of Fire, different classification and types of fire, different types of fire extinguishers for different classes of fire, fire fighting systems in power plants. First Aid - Basic of first aid, how injuries are caused in lifting, falls, first aid in case of electrical shock, artificial respiration.

Unit VI [8 Hrs.]

Thermal Power Plant & pollution aspects - Pollution from Thermal Power Plant and control methods, Instrumentation for pollution control. Legal aspects, legislation, Laws of Pollution Control Board (State, Central) Air quality standards, Water quality standards. Environmental Impact assessment.

REF. BOOKS -

NPTI PUBLICATIONS

Power Plant Engg. – Dhomkundwar

Power Plant Engg. - G. R. Nagpal

Power Plant Engg. - H. S. Keswani

Power Plant Engg. - Frederick and T. Merse

NTPC Manuals.

Environmental Management in Power Sector - NPTI Publication

Environmental Engg. - S. K. Gar

Environmental Pollution Control Engg. - C. S. Rao

BEPOE502T (BEME502T): DESIGN OF MACHINES ELEMENTS (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the basic machine element design. It includes the procedure of design (w.r.t. basic failures) under various loading conditions. Students shall understand design of various mechanical joints, machine components such as shaft, keys, brakes clutches, power screws etc. Apart from this, students shall learn spring design & pressure vessel design. At the end of this course, students will get familiar with design of these mechanical components under various loading conditions.

UNIT – I

[12 Hrs.]

Introduction to Mechanical Engineering Design, Design methods, Aesthetic and Ergonomics Consideration in design, Material properties and their uses in design, Basic principles of Machine Design, Modes of failures, I. S. codes, Preferred Series and numbers. Design of Knuckle joint, Socket & Spigot type cotter joint. Design of riveted joint.

UNIT – II

[12 Hrs.]

Design of bolted and welded joints under axial and eccentric loading conditions. Design of Brackets & Levers.

Design of Cylinder & Pressure Vessels: Types of pressure vessel, stresses induced in pressure vessel, Lamé's, Clavarino's and Bernie's equations. Design of cylindrical & spherical pressure vessels. Design of nut, bolt, gasket & covers for pressure vessel.

UNIT – III

[12 Hrs.]

Design of shaft for power transmission, static and fatigue criteria for shaft design, ASME codes for shaft design, Design of keys.

Design of Springs: Spring material, Helical compression & tension springs under static and variable loads, Leaf spring, Laminated Springs.

UNIT – IV

[12 Hrs.]

Design of power screw: Thread forms, multiple threaded screws, terminology of power screw, design of screw jack.

Design of clutches and brakes: Single and multiple plate clutch, constant wear and constant pressure theory for plate clutches, Internal and external shoe brakes.

TEXT BOOKS:

1. Design of Machine Elements, B.D.Shiwalkar, Central Techno Publications
2. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill Pub.
3. Mechanical Engineering Design, J. E. Shigley, McGraw Hill.
4. Design Data Book, B.D.Shiwalkar, Central Techno Publications.

5. Design Data Book, PSG.
6. Design Data Handbook Book, K. Mahadevan, CBS Publishers.
7. Mechanical Design of Machine Elements & Machines, J.A.Collins, Wiley India
8. Machine Components Design, Robert C., Juvinall & Kurt M. Marshek, Wiley India
9. Machine Design, U.C. Jindal, Pearson Publications
10. Machine Design : An Integrated Approach, Robert L Norton, Pearson Publications
11. Machine Design Fundamental and Applications, P.C. Gope, PHI Learning.
12. Design of Machine Elements, Sharma C.S. & Purohit K, PHI Learning.

REFERENCE BOOKS:

1. Design of Machine Elements, Spotts M. F. and Shoup T. E., Pearson Publications.
2. Machine Design, Black P. H. and O. Eugene Adams, McGraw Hill Book Co Inc.

BEPOE503T (BEME 602T): CONTROL SYSTEMS ENGINEERING

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes:

This course is formulated to familiarize the students with concepts related to the operation, analysis and stabilization of control systems. The main objective of this course is to make understanding of various control systems and its stability analysis using analytical and graphical techniques, to understand the concepts of Time Domain and Frequency Domain analysis of control system, Mathematical modeling and Transfer function of engineering systems. At the end of this course, student will be able to understand various control systems & their stability analysis.

UNIT – I

[8 Hrs.]

Control System controls: Study of Control System components such as hydraulic actuators, Servomechanism D.C. and A.C. motor, liquid level control, Automobile Power Steering Control, Speed Control, Position control of Robotic Manipulator etc. Study and Analysis of performance characteristics, the concept of various types of system like machine tools, Prime movers, system generators, etc.

Modeling of Mechanical System: Basic Elements of Control System – Open loop and Closed loop systems – Differential equation – Laplace Transform – Transfer function, Modeling of physical system like Translational, rotational mechanical systems, Electric systems, Electronic system and Electro-mechanical system. Concept of transfer function & its determination for physical systems.

UNIT – II

[8 Hrs.]

Transfer Function system Representation through Block Diagram and Signal Flow Graph: Block Diagram representation, Reduction Techniques for single and multiple input/output, Conversion of Block Diagram into Signal Flow Graph, Conversion of algebraic equation into Block Diagram and Signal Flow Graph. Transfer function through Block Diagram Simplification using Masons Gain Formula.

UNIT – III

[8 Hrs.]

System Response & Time Domain Response Analysis: First and second order systems response to impulse, ramp and sinusoidal inputs, properties of unit step response of second order system, systems with velocity lag, Steady state errors and Error constants.

Signals: Step, Ramp, Impulse, Parabolic and Periodic signals with their mathematical representation and characteristics.

Mode of Controls: Basic control actions and Industrial controllers, Introduction to P, PI and PID controllers their characteristics, representation and applications. Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on system performance.

Controller Mechanisms: Pneumatic, hydraulic and electric controllers, general principles for generating various control actions.

UNIT – IV

[8 Hrs.]

Control system analysis: Concept and types of stability, Routh-Hurwitz Criterion and its application for determination of stability, limitations.

Root locus plot: Simple transfer functions transient response from root locus. Concept of stability, necessary condition for stability, Root locus concept, construction of Root loci.

.UNIT – V

[8 Hrs.]

Frequency Domain analysis - Correlation between time and frequency responses of a second order System. Bode & Polar plot: Determination of Gain Margin, Phase Margin and their Stability from Bode and Polar plots. Inverse Bode Plot, Transportation lag, System Identification from Bode plot.

UNIT – VI

[8 Hrs.]

State space representation of Continuous Time systems: State equations, Transfer function from State Variable Representation – Solutions of the state equations, Concepts of Controllability and Observability, State space representation for Discrete time systems.

Stability criterion: Introduction to control system design lag lead compensation, Feed Back Compensation and Pole -Zero placement.

LIST OF TUTORIALS:

- 1) Mathematical Modeling of Mechanical and Electrical System.
- 2) Numerical examples of Block Diagram Reduction Technique and Signal Flow Graph.
- 3) Numerical of Time response analysis.
- 4) Numerical of Frequency Domain analysis.
- 5) Numerical of Routh's Criteria.
- 6) Numerical of Polar Plot.
- 7) Numerical of Root Locus.
- 8) Numerical of Bode plot.
- 9) Numerical of State space representations.

10) Numerical of Root Locus using MATLAB.

At least **six** exercises are expected.

TEXT BOOKS:

1. Control System Engineering, J. Nagrath and M.Gopal, New Age International Publishers, 5th Edition, 2007
2. Control System – Principles and Design, M. Gopal, Tata McGraw Hill, 2nd Edition, 2002.
3. Control Systems Engineering, S. K. Bhattacharya, Pearson.
4. Control System Engineering, Baxi and Goyal, Technical Publication, Pune.
5. Control Systems, Dhanesh N. Manik, Cengage Learning.
6. Control Systems -Theory & Application, Smarajit Ghosh, Pearson.
7. Control Systems, Anand Kumar, PHI.

REFERENCE BOOKS:

1. Automatic Control Systems, Benjamin. C. Kuo, Prentice Hall of India, 7th Edition, 1995.
2. Digital Control and State Variable Methods, M. Gopal, 2nd Edition, TMH, 2007.
3. Feedback and Control Systems, Stubberud, Schaum's Outline Series, Tata McGraw- Hill, 2007.
4. Linear Control System Analysis and Design, John J. D'azzo & Constantine H. Houpis, Tata McGraw-Hill, Inc., 1995.
5. Modern Control Systems, Richard C. Dorf & Robert H. Bishop, Addison – Wesley, 1999.
6. Modern Control Engineering, K. Ogata, Prentice Hall of India.
7. Control System Engineering Using MATLAB, S.N. Sinanandam, S.N. Deepa, Vikas Publication.
8. Digital Control System, V.I. George, C.P. Kurian, Cengage Learning.
9. Control Systems - Problem and Solutions, K.R. Varmah, McGraw Hill Education.

BEPOE504T (BEME504T): HEAT TRANSFER (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to learn the various modes of heat transfer and laws associated with it. During this course, students can distinguish between steady state and unsteady state heat transfer; will be able to apply their knowledge of Dimensional Analysis to forced and free convection. Students will also be able to analyse radiation with and without radiation shield. Apart from this, students will also be able to analyse & design heat exchangers.

UNIT – I [8 Hrs.]

Introduction to basic modes of heat transfer, conduction, convection & radiation. Laws of heat transfer & conservation of energy requirement. General heat conduction equation in cartesian, cylindrical and spherical coordinates. One dimensional steady state heat conduction equation for the plane wall, cylinder and sphere, overall heat transfer coefficient. Thermal resistance of composite structure, contact resistance, variable thermal conductivity, critical thickness of insulation.

UNIT – II [8 Hrs.]

Conduction with internal heat generation for plane wall, cylinder and sphere. Extended surface, types of fins. Fins of uniform cross section area, temperature distribution and heat transfer rate, fin efficiency & effectiveness. Error in temperature measurement. Unsteady state heat transfer, lumped heat capacity analysis, Heisler's charts. Biot Number, Fourier's Number & its significance.

. UNIT – III [8 Hrs.]

Forced convection, physical significance of non-dimensional parameter. Flow of high, moderate & low Prandtl number, fluid flow over a flat plate. Concept of hydrodynamics & thermal boundary layer thickness, local and average heat transfer coefficient. Empirical co-relations for external, internal flows, laminar & turbulent flow through conduits. Dimensional analysis applied to forced convection.

UNIT – IV [8 Hrs.]

Free or natural convection. Grashoff's number, Rayleigh number, flow over horizontal and vertical plate, Empirical Co-relations for cylinders and spheres, heat transfer with phase change, pool boiling curve & regimes of pool boiling, Film & Drop wise condensation, laminar film condensation on vertical surface, on horizontal tubes, effect of super heated & non-condensable gases on condensation heat transfer, Dimensional analysis applied to free or Natural convection.

.UNIT – V [8 Hrs.]

Radiation, spectrum of radiation, black body radiation, radiation intensity, laws of radiation-Kirchoffs, Plancks, Weins displacement law, Stefan Boltzmann & Lamberts Co-sine law. Emissivity, Absorptivity, Transmissivity, Reflectivity, Radiosity, Emissive power, Irradiation. Radiation network, radiation exchange between parallel plate cylinder & sphere, shape factor & its laws, radiation between parallel plates, cylinder & spheres. Radiation shields.

UNIT – VI [8 Hrs.]

Heat exchanger : Classification, overall heat transfer coefficient, fouling factor, LMTD & effectiveness, NTU method of heat exchanger analysis for parallel, counter flow & cross flow arrangement, design aspect of heat exchangers, Introduction to compact heat exchanger, Heat Pipe, Introduction to mass transfer.

TEXT BOOKS:

1. Heat Transfer, J.P. Holman, McGraw Hill Book Company, New York.
2. Fundamentals of Heat and Mass Transfer, K. N. Seetharam & T.R. Seetharam, Wiley.
3. A Text Book of Heat Transfer, S.P. Sukhatme, University Press.

REFERENCE BOOKS:

1. Fundamentals of Heat and Mass Transfer, Venkanna B.K., PHI Publication.
2. Principles of Heat Transfer, Frank Kreith, Harper and Row Publishers, New York.
3. Heat Transfer - A Practical Approach, Yunus A. Cengel, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Heat & Mass Transfer, M.N. Ozisik, Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Heat & Mass Transfer, R.K. Rajput, Laxmi Publication.

DATA BOOK: Heat & Mass Transfer, Domkundwar, Dhanapat Rai & Sons Publication.

BEPOE504P (BEME504P): HEAT TRANSFER(PRACTICAL)

CREDITS: 01

Teaching Scheme

Practical : 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

List of practicals:

Minimum Eight out of the following shall be performed (Out of which Six must be experimental):

1. To determine the thermal conductivity of composite wall.
2. Determination of thermal conductivity of an insulating powder.
3. Determination of thermal conductivity of metal bar.
4. Determination of Stefan Boltzmann constant.
5. Determination of temperature distribution & heat transfer rate from fin under forced convection.
6. Determination of heat transfer coefficient in natural convection for vertical tube.
7. Determination of condensation heat transfer coefficient in film wise & drop wise condensation.
8. Determination of emissivity of non black body.
9. Study of various types of heat exchangers.
10. Computerized analysis of various parameters of heat exchanger using shell and tube heat exchanger.
11. Study of heat pipe.

BEPOE505T (BEME405T): MECHANICS OF MATERIAL (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the basic concepts of stress, strain and their variations under different types of loading. It includes the basic concepts involved in mechanics of materials, bending moment, shear force, stresses in beams, slope and deflection in beams under different loading and support conditions, understanding of torsional shear stress in shaft, crippling load in struts and columns. At the end of this course, students will be able to analyze different stresses, strains and deflections in a simple mechanical element under various loading and support conditions.

UNIT – I

[8 Hrs]

Concept of simple stresses and strains: Introduction, stress, strain, types of stresses, stress and strain diagram for brittle & ductile material, elastic limit, Hooks law, modulus of elasticity, modulus of rigidity, factor of safety, analysis of tapered rod, analysis of composite section, thermal stress and strain. Longitudinal strain & stress, lateral stresses and strains, Poisson's ratio, volumetric stresses and strain with uni-axial, bi-axial & tri-axial loading, bulk modulus, relation between Young's modulus and modulus of rigidity, Poisson's ratio and bulk modulus.

UNIT – II

[8 Hrs]

Shear force and bending moment: - Types of beam (cantilever beam, simply supported beam, overhung beam etc.), Types of loads (Concentrated and UDL), shear force and bending moment diagrams for different types of beams subjected to different types of loads, sign conventions for bending moment and shear force, shear force and bending moment diagrams for beams subjected to couple, Relation between load, shear force and bending moment.

Stresses in beams: - Pure bending, theory of simple bending with assumptions & expressions for bending stress, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections.

Shear stresses in beams: - Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress.

UNIT – III

[8 Hrs]

Deflection of beams:- Deflection & slope of cantilever, simply supported, overhung beams subjected to concentrated load, UDL, Relation between slope, deflection & radius curvature Macaulay's method to determine deflection of beam.

Principal stresses and strains:- Definition of principal planes & principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stresses in one plane in mutually perpendicular two planes, when member is subjected to shear stress and direct stresses in two mutually perpendicular planes, Mohr's circle for representation of principal stresses.

UNIT-IV

[8 Hrs]

Torsion of circular shafts: - Derivation of torsion equation with the assumptions made in it.

Torsion shear stress induced in the shaft, when it is subjected to torque. Strength and rigidity criterion for design of shaft. Torque transmitted by solid & hollow circular shaft. Equivalent twisting and bending moment in shaft when it is subjected to bending moment, torque & axial load.

Column & Struts: - Failure of long & short column, slenderness ratio, assumptions made in Euler's column theory, end conditions for column. Expression for crippling load for various end conditions of column and derivation on column with both ends hinged. Effective length of column, limitations of Euler's formula, Rankine formula.

UNIT-V

[8 Hrs]

Introduction to fracture mechanics: - Modes of fracture, stress intensity factors, crack propagation, creep phenomenon.

Strain energy & impact loading: - Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads & impact loads. Strain energy stored in bending & torsion.

UNIT-VI

[8 Hrs]

Factor of safety, Statistical methods in determining factor of safety. Theories of failure, modes of failure, compound stresses, eccentric axial loading, variable stresses in machine parts, Endurance, S-N Curve, stress concentration & stress raisers, notch sensitivity, stress concentration factor, methods for reducing stress concentration. Goodmans criteria, Soderberg criteria, Gerber's criteria, and fatigue design for finite and infinite life of the parts subjected to variable loads with uniform cross section.

LIST OF TUTORIALS:

1. Two problems on principle stresses
2. Two problems on Mohr's circle
3. Two problems on Thermal stresses with heat flow
4. Three problems on S.F. & B.M. diagrams
5. Two problems on Stresses in beam bending
6. Two problems on shear stresses
7. Two problems on Macaulay's methods
8. Two problems on area moment method
9. Two problems on shafts
10. Two problems on columns & struts
11. Two problems on compound loading
12. Two problems on fatigue & variable loads

TEXT BOOKS:

1. Elements of Strength of Materials, S. Timoshenko and O.H. Young, East West Press Private Ltd.
2. Strength of Materials, R K Bansal, Laxmi Publications
3. Strength of Materials, Ramamurtham, Dhanapat Rai Publication.
4. PSG Data Book.
5. Design Data for Machine Elements, B.D. Shiwalkar, Denett & Company
6. Strength of Material, R.K. Rajput, S. Chand Publication

REFERENCE BOOKS:

1. Strength of Material, Ferdinand L. Singer, Harper and Row, New York
2. Elements of Strength of Materials, V. Natarajan, Oxford & IBH Publishing Company
3. Strength of Materials, S S Rattan, Tata McGraw-Hill
4. Mechanics of Material, Beer & Johnson, Tata Mc-Graw Hill

BEPOE505P (BEME405P): MECHANICS OF MATERIAL (Practical)

CREDITS: 01

Teaching Scheme

Practical: 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight Practicals out of following areas shall be performed:

1. Study of Universal Testing Machine
2. Tension test on metals.
3. Compression test on materials.
4. Shear test on metals.
5. Impact test on metals.
6. Hardness test on metals.
7. Torsion test on metals.
8. Deflection of beams.
9. Modulus of rupture test.
10. Buckling of columns.
11. Deflection of springs

BEPOE506P (BEME306P): MACHINE DRAWING (Practical)

CREDITS: 04

Teaching Scheme

Examination Scheme

Practical: 2 Hours/Week

University Assessment: 50 Marks

Tutorial: 2 Hour/Week

College Assessment: 50Marks

Course Objectives and Expected Outcomes: The objective of this course is to make students understand the principles and requirements of machine & production drawings. This course will provide a way to learn how to assemble and disassemble important parts used in major mechanical engineering applications. After going through this course, students shall be able to draw & understand the drawings of mechanical components and their assemblies.

UNIT – I

Drawing Standards for following

Drawing Sheets, Name Blocks, Lines, Sections Dimensioning. Dimensioning of Tolerances, Standard Components, Standard Features, Machining Symbols, Welding Symbols, Surface Finish Symbols, Heat Treatment Manufacturing Instructions, Allowances, Materials

UNIT – II

Orthographic Projections of Elements, Orthographic Projections, Sectional Views, Multiple Views, Missing Views, Profiles, Cross sections, References, Alignments, Dimensioning

UNIT – III

Study, qualitative selection of type / size (excluding design calculations) and standard practices for following elements Threads, Bolts, Nuts, Washers, Rivets, Welds, Keys & Keyways, Splines, Couplings

UNIT – IV

Assembly and Dismantling: Principles, Fits and Tolerances (Standards, types, application and selection) Tolerance Charting, Surfaces finish requirement for assembly, Geometries suitable for assembly, Assembly / Dismantling Tools, Bearing Assemblies, Assemblies by fastening

UNIT – V

Study of Some standard Assemblies

Assembly Drawings, Principles, techniques and standards for preparing components drawings Subassembly, Drawings, Full assembly Drawing, Exploded Views

UNIT – VI

Production Drawing Name Plates, Part List, Revisions etc.

Essential Parts / Formats required for production drawing, Process Sheet

LIST OF PRACTICALS (Based on above Syllabus):

Minimum Eight Practicals shall be performed consisting of the following:

1. Conventional representation of Symbols.
2. Pencil Drawings of sectional views of machine components.

3. Pencil Drawings of some standard components. (e.g.Screw Fasteners)
4. Pencil Drawings of standard assemblies with components.(e.g. Couplings)
5. Pencil Drawing of a small assembly with components(e.g. Screw Jack)
6. Pencil Drawings of detailed drawings of Assembly
7. Pencil Drawings of a large assembly with component drawings, subassembly drawings and assembly drawing using all standard formats (e.g. Spring Loaded Safety Valve)
8. Sheet on Blue Print Reading.
9. Sheet on Preparation and explanation on Production Drawing.
10. Process Sheets for one component having maximum five operations.
11. Computer Print out on Three Dimension Modeling using CAD software.

Note:

1. Pencil drawings shall be in Full Imperial Sheet. Computer Printouts shall be on a Laser printer in A3 size. All drawings shall be submitted in one folder.
2. During University practical examination of 50 marks, students are expected to solve

TWO problems of 30 marks of two hours duration on,

- Sectional View / Missing View
- Assembly Drawing/ Sub assembly Drawing
- Prepare and explain production drawing

Oral of 20 marks shall be conducted during University practical examination.

TEXT BOOKS:

1. Machine Drawing, K. L. Narayana , New Age International Publishers
2. Machine Drawing, N. D. Bhatt & V M Panchal, Charoter Publications
3. Engineering Graphics with AutoCAD, D. M.Kulkarni, A.P.Rastogi, A.K.Sarkar, PHI Learning Pvt. Ltd
4. PSG Data book
5. CMTI Data Book
6. Jadaan Data Book, I.K. International
7. Relevant IS Codes.

REFERENCE BOOKS:

1. Machine Drawing - N.Sidheshwar, Shastry , Kanhaiah,Tata Mcgraw Hill
2. Fundamentals of Machine Drawing, Sadhu Singh, P. L.Shah, PHI Learning Pvt. Ltd

Rastrasant Tukdoji Maharaj Nagpur University, Nagpur

**Faculty of Engineering & Technology
B.E.(POWER ENGINEERING) : Sixth SEMESTER
Syllabus**

BEPOE601T (BEME601T): ENERGY CONVERSION - I (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination scheme

Duration of Paper: 03 hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to expose the students to the practical applications of thermodynamics. At the end of this course students will gain the knowledge of various components of the thermal power plant like boiler, nozzles, turbines and condensers and will be able to assess the performance of these components.

UNIT – I

[8 Hrs.]

Introduction to layout of thermal power plant, principle of steam generation, fuel for steam generators, necessity of water treatment, classification of steam generators, fire tube and water tube boilers, high pressure boilers, boiler mountings and accessories.

UNIT – II

[8 Hrs.]

Draught and its classification, calculations for chimney height, chimney diameter & efficiency. Condition for maximum discharge. Performance of steam generators: Evaporation capacity, equivalent evaporation, boiler efficiency.

UNIT – III

[8 Hrs.]

Fluidized bed boiler: Bubbling fluidized bed boilers, circulating fluidized bed boilers (Elementary treatment expected), coal handling, ash handling.

Cogeneration: Introduction to cogeneration, need, working principle and applications. Topping cycle and bottoming cycle.

UNIT – IV

[8 Hrs.]

Steam nozzles: Adiabatic expansion in nozzles, maximum discharge, critical pressure ratio and effects of friction, calculation of throat and exit areas, supersaturated flow, Wilson Line.

Steam turbines: Working principle of steam turbines, classification of steam turbines, comparison of impulse and reaction turbines, compounding of steam turbines, governing of turbines.

UNIT – V

[8 Hrs.]

Energy losses in steam turbines, flow of steam through turbine blades, reheat factors, velocity diagrams, graphical and analytical methods, work done, thrust and power, dimensions and proportioning of the blades, steam turbine efficiencies, condition for maximum efficiencies, reheat and regenerative cycles.

UNIT – VI

[8 Hrs.]

Steam condensers: Types of condensers, classification of condensers, quality and quantity of cooling water required, calculations for surface condenser, Dalton's law of partial pressure, sources of air leakages and air removal, air ejectors.

Cooling towers: wet cooling towers, dry cooling towers, cooling ponds.

LIST OF TUTORIALS:

- 1) Three problems on draught.
- 2) Two problems on performance of boiler.
- 3) Two problems on heat balance sheet of boiler.
- 4) Two problems on nozzle.
- 5) One problem on metastable flow.
- 6) Two problems on impulse turbine.
- 7) Two problems on reaction turbine.
- 8) One problem on reheat cycles.
- 9) One problem on regenerative cycle.
- 10) Two problems on condenser.

TEXT BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications.
2. A Course in Power Plant Engineering, Arora & V.M. Domkundwar, Dhanpat Rai & Sons
3. Thermal Engineering, R. K. Rajput, Laxmi publications.
4. Thermal Engineering, M.M. Rathode, TMH publication.
5. A Course in Thermal Engineering, Anand Domkundwar, C.P. Kothandaraman, S. Domkundwar, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Thermal Engineering, Mathur & Mehtra, Jain Brothers Publications, New Delhi.
2. Heat Engineering, V.P. Vasandani & D.S. Kumar, Metropolisian Book Publishers.
3. Power Plant Engineering, A.K. Raja, Shrivastava and Dwivedi, New age International Publishers.
4. Fluidized Bed Combustion, S. Oka and E. Anthony, Marcel Dekker Inc.
5. Power Plant Engineering, M. M. El- Wakil, McGraw Hill International.

BEPOE602T - THERMAL POWER PLANT CONTROL & INSTRUMENTATION

Credits: 05

Teaching Scheme

Lectures: 4 hours/week

Tutorial: 1Hour/week

Examination Scheme

Duration of paper: 3 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives: The course covers the basic aspects of measurement, signal conditioning and instrumentation and its application in power plant. The student should be able to understand the concepts of measurement of various important parameters and its significance in power plant.

UNIT I Qualities & Basic Principles of Measurements

- i) Characteristic (static/dynamic/performance),
- ii) Error (types/sources),
- iii) SI Standards of measurement of different quantities
- iv) Range, span, error in instruments & their calculations [8 hrs]

UNIT II Transducers & Measuring Instruments

- i) Use of capacitive, resistive, inductive, differential transformer devices for measurement
- ii) Different types of transducers, sensors & their use in measurement of different physical quantities like Pressure, force, Level, Temperature, Flow,
- iii) Measuring instruments like Flame scanners, Pyrometer [8 hrs]

UNIT III Measurement of Mechanical, Electrical, Physical and Chemical Quantities.

- i) Torque, Speed, Vibration, Acceleration
- ii) Conductivity, Humidity
- iii) Weight, Volume
- iv) Frequency, P.F. [8 hrs]

UNIT IV Signal Conditioning, transmission and presentation

- i) Amplifiers, Filters, A/D & D/A conversion, signal transmission methods
- ii) PMMC, CRO, CRT, TUM, LED, LCD, DVM, Recorders
- iii) Transmission protocols like RS232, 4-20 mA loop, HART, GPIB [8 hrs]

UNIT V Analyzers & turbovisory instrumentation

- i) CO₂, O₂, CO analyzers
- ii) Turbovisory equipments. [8 hrs]

UNIT VI Automatic control of Power Plant

- i) Introduction to auto control,
- ii) Auto control loops used in Thermal Power Plant
- iii) PID Controller, PLC
- iv) Hierarchy of Controls in TPP, Automation of TPP [8 hrs]

REF. BOOKS

1. A Course in Mechanical Measurement & Instruments - A. K. Sawhney, Dhanpat Rai & sons. - 12th Edition.
2. Mechanical Measurements - Backith, Managoni, Lienhard - Perason Education Asia1st Edition.
3. Applied Electronics & Instrumentation - S. M. Dhia - Tata Mcgrawhill - 1st Edition
4. Electronics & Instrumentation - B. R. Gupta - Wheeler Publishing - 2nd Edition.
5. A Course in Electronic Measurement & Instrumentation - A. K. Sawhney - Dhanpat Rai & sons -17th Edition
6. NPTI Publications

BEPOE602P - THERMAL POWER PLANT CONTROL & INSTRUMENTATION (PRACTICAL)

Credits: 01

Teaching Scheme

Practical: 2 hours/week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

8-10 Practicals based on above syllabus

BEPOE603T - STEAM GENERATOR & ITS AUXILIARIES

Credits: 05

Teaching Scheme

Lectures: 4 hours/week

Tutorial: 1Hour/week

Examination Scheme

Duration of paper: 3 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course objectives: The paper covers the principle of working of steam generator, its types & the constructional features and the various auxiliary systems associated with a typical utility boiler. The student would understand in detail the constructional aspects of subcritical boilers and various boiler auxiliary systems like fuel firing arrangement, fans, airheater, pulverisers, ESP etc., and salient features of Supercritical & FBC Boilers in generating stations.

Unit I

[8 hrs]

i) BOILER DEVELOPMENT, TYPES & PRESSURE PARTS.

Historical development of Boilers and types, General arrangement of Power Plant Boilers, Industrial Boilers, CFBC and heat recovery Boilers.

ii) BOILER PRESSURE PARTS

Circulation Theory Boiling phenomenon, Nucleate/Film boiling/DNB, Natural, Forced Circulation, circulation ratio, factors affecting circulation.

Economizer, Need, arrangement, material used for tubes, types, causes of Failure, support of tubes. Water Wall System, Arrangement of water walls, circulation types and once Through Boilers, Heat flux distribution, material, provision of free expansion and Supports of various tubes and headers, sealing arrangement, Bukstays, types of water walls merits and demerits.

Boiler drum and internals, mounting. Need of separation, types of separators used, drum Construction and arrangement, various drum internals and their function, blow down, chemical dosing, various drum connections, need and arrangement, boiler mountings

Super Heaters & Reheaters Requirement of superheating and re-heating, types of Superheaters and their temperature characteristics, other types of superheaters, tube material selection, various arrangement of superheaters and reheaters used in Boiler designs; factors affecting steam temperature, control, supports of tubes and headers.

Unit II

[8 hrs]

COMBUSTION OF FUELS WITH REFERENCE TO UTILITY BOILERS.

Combustion : Definition, requirements, factors influencing combustion efficiency. Fuel : Types, constituents.

Coal : formation, ranking, characteristics of Indian coal. Proximate & Ultimate analysis and their requirements in boiler design. Heating value, Gross and net. Fuel oils, Distillates and Residual oils properties of fuel oils such as pour Point, fire point, viscosity etc. -Stoichiometric air and excess air

Unit III

[8 hrs]

DRAUGHT SYSTEM INCLUDING AIR HEATERS

Theory of Natural and Mechanical (forced, Induced & Balanced) draft and their application in different conditions, draft loss, stack effect, units of draft measurement.

Fans : working principle, types, radial (Flat, Forward, Backward curved bladed), Axial (impulse, reaction), fans, comparison, construction details of different types, fan characteristics, system resistance.

Fan control, requirement, different methods, damper control, IGV, Blade pitch, variable speed, arrangements, comparisons.

Application of fans in Boilers, FD ID, PA, Seal Air, Scanner Air, Igniter Air, Gas recirculation, mill exhaust fans their function, consideration/selection of a fan type for a particular application. Layout of Fans in a typical Power Plant.

AIR HEATERS :- Requirement in Boilers, types, recuperative and regenerative (Ljungstrom, bi & tri sectors, Davidson) comparison, Construction details of different types, sealing system in rotary air heaters, cold end corrosion in air heaters, SCAPH, Need and arrangement.

Unit IV

[8 hrs]

PULVERISER PLANT Need for coal pulverization, requirements for pulverized fuel firing system.

Raw coal feeders, types (volumetric and Gravimetric) working principle and construction details of different raw coal feeders. Pulverizers, Classifications (slow, medium, high speed). Different types of pulverizers (Ball, Bowl, Ball & Race & Beater mill and their construction details, considerations for selection of a particular type. Classifier, requirement & management.

Factors affecting performance of a pulverizers, grindability index, fineness, moisture, etc.

Coal drying, considerations for choosing hot air or flue gas. Different PF systems such as direct/indirect, pressure/suction. FG/hot air drying etc. and common systems adopted in Indian Power Stations.

FUEL FIRING SYSTEM

Ideal requirements for a fuel firing system in Boiler. Effects of fuel characteristics on furnace and burner design. Ignition energy requirements in boiler, auxiliary & inherent ignition energy, concept of initiation and maintenance during boiler operation.

Ignitor, types, eddy plate including IFM and HEA ignitors, working principles, construction.

Oil atomization, need, mechanism of atomization, mechanical, twin fluid atomizers, oil guns, retractable.

Coal nozzles, construction, different types.

Wind box for corner firing/front wall firing, secondary air dampers/air registers.

Furnace, types furnace ratings, EPRS, Plan area, volumetric.

Unit V

[8 hrs]

SOOT BLOWERS

Slagging phenomena, effect of soot deposits, soot blower, types, working principle, construction, selection of blowing medium, water, steam, compressed air, operation of soot blowers, precautions.

ASH EXTRACTION SYSTEM

Electrostatic precipitators and mech. Precipitators, bag filters. Need, working principle, design features, construction affecting performance.

Unit VI

[8 hrs]

Supercritical Boilers & Fluidised based bed combustion

Introduction to Supercritical technology, salient features, advantages, arrangements of supercritical boilers & their types, spiral wall & vertical tubing, Introduction to FBC technology, advantages & limitations, scope, fuel flexibility, Classification of FBC boilers, Description of various components of CFBC Boiler,

REF. BOOKS

1. PPF Vol. 2 – NPTI Publication
2. boiler Manuals BHEL
3. Thermal Engineering – P. L. Ballanery
4. Thermal Engineering – Vol. I.M.L.Mathur & Vol. II – F. S. Mehta (Jain Bros.)
5. Power Plant Engineering – F. T. Morse

BEPOE603P - STEAM GENERATOR & ITS AUXILIARIES (PRACTICAL)

Credits: 01

Teaching Scheme

Practical: 2 hours/week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

Minimum eight study practicals based on above syllabus.

BEPOE604T - POWER GENERATION TECHNOLOGY & REGULATORY ISSUES

Credits: 04

Teaching Scheme

Lectures: 3 hours/week

Tutorial: 1 Hour/week

Examination Scheme

Duration of paper: 3 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives: The paper endeavors to impart the basic knowledge of various power generation technologies and the regulatory framework under which Indian Power sector operates. The student should be able to get an idea of the various players in the power sector, the legislative framework guiding the working of the utilities. The student should be able to understand the conventional & non-conventional sources of power generation and their technology.

Unit I [8 hrs]

Coal Based power Generation, operating principle, Different types of coal based power plants, Captive power Generation, advantages & constraints, captive power generation options, type of captive power plant

Unit II [8 hrs]

Gas Turbine and Combined Cycles Power Generation – Equipments like Compressors, Gas Turbine, Combustion Chambers, Open Cycle and Close Cycle Gas Turbine Plants, Waste Heat Recovery Boilers., Co – Generation Power Plants

Unit III [8 hrs]

Hydro Electric Power Generation, various types of Hydro Turbines, principles of operation and selection, Pump Storage Power Plants.

Unit IV [8 hrs]

Nuclear Power Generation, Various types of nuclear reactors, arrangements layout and auxiliaries used, Introduction to nuclear Engg. Radio activities, Binding Energy, Nuclear Energy released from Nuclear reactor, fission change reaction, various types of nuclear fuels used.

Unit V [8 hrs]

Diesel Generator Power Plant – arrangements and equipments, Renewable power Generation, types of renewable energy sources

Unit VI [8 hrs]

Power Secenario in India, Regulatory Issues in Indian power sector, Structure of Power sector, Reforms in Power Sector, Electricity Act 2003, Regulatory commissions & their role, National Electricity Policy, National Electricity plan, Concept of Open access, ABT, concept of power trading

BOOKS:

Gas Turbine Theory by Cohen & Rogers

Gas Turbine & Jet Propulsion by Khajuria & Dubey

Thermal Engineering by R. Yadav

Power Plant Engineering by P. K. Nag.

Hydraulic Machine Theory and Design by VP Vasandhni

Hydraulic machines by Jagdish Lall

Nuclear Reactor Theory by Glass Stone.

Power Plant Engineering by M Varma, Frederick & Morse

Thermal Engineering by P. A. Balaney

Elements of Power Station Design by M.V.Deshpande

Generation of Electrical energy by B.R.Gupta, S.Chand Publications

Energy conversion & Power Generation by L.D.Agrawal & G.K.Mittal

NPTI Publications.

BEPOE605T (BEME605T): DYNAMICS OF MACHINES (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the method of dynamic force analysis of machinery, the concept of vibratory systems and their analysis and also to study the effect of undesirable effects of unbalances in rotors and engines.

UNIT – I [8 Hrs.]

Concepts in machine element dynamics. D'Alembert principle. Application of these approaches for simple two degree of freedom systems. Simple precession and gyroscopic couple. Gyroscopic effect on airplane, ship, vehicles and grinding mills.

UNIT – II [8 Hrs.]

Dynamic force analysis of planar linkages such as four bar chain and reciprocating mechanism by graphical method, virtual work method. Cam dynamics and jump-off phenomenon.

UNIT – III [8 Hrs.]

Static & Dynamic balancing in rotating machines. Balancing machines and field balancing by vector diagram. Balancing in reciprocating mechanism.

UNIT – IV [8 Hrs.]

Turning moment Vs crank angle diagram for single- cylinder and multiple-cylinder engines, punching machines etc. Flywheel selection.

Speed governors, centrifugal and inertia type, Watt, Portal, Proel, Hartnell governors, operating characteristics of governors. .

UNIT – V [8 Hrs.]

Derivation of equation of motion for vibratory system. Free vibration of single-degree-of-freedom system with and without damping. Logarithmic decrement and damping estimation. Forced vibration of single-degree-of-freedom system and vibration isolation, whirling of shaft and critical speed of rotors.

UNIT – VI [8 Hrs.]

Equation of motion for two-degree-of-freedom system. Natural frequencies and mode shapes, vibration absorber. Torsional oscillation of two-disc and three disc rotors. Introduction to FFT analyzer for vibration measurements.

TEXT BOOKS:

1. Mechanical Vibrations, S. S. Rao, Addison Wesley Publishing.
2. Mechanical Vibrations, V. P. Singh, Dhanpat Rai & Sons.
3. Mechanical Vibrations, G. K. Grover, Nem Chand & Bros.

4. Fundamentals of Mechanical Vibration, Graham Kelly, Tata McGraw Hill.
5. Theory of Machines, Jagdish Lal, Metropolitan Publishers.
6. Theory of Machines, Rattan S. S, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
7. Vibration and Noise for Engineering, Pujara, K, Dhanpat Rai and Company.
8. Theory of Machine, Thomas Bevan, Pearson Publications.
9. Mechanics of Machines, V. Ramamurti, Narosa Publications.
10. Mechanism & Machine Theory, A.G. Ambekar, PHI Publication.

REFERENCE BOOKS:

1. Theory of Mechanisms and Machines, Ghosh A. and Mallick A.K., Affiliated East- West Press Pvt. Ltd., New Delhi, 1988.
2. Theory of Machines and Mechanisms, Shigley J.E. and Uicker J.J., McGraw-Hill, Inc., 1995.
3. Mechanism and Machine Theory, Rao J.S. and Duggipati R.V., Wiley-Eastern Limited, New Delhi, 1992.
4. Mechanics of Machines, John Hannah and Stephens R.C., Viva Books

BEPOE606T (BEME606T): Functional English

Total Credits: 03

Teaching Scheme

Theory: 2 hrs per week + 1 tutorial
Duration of University Exams :2 hrs

Examination Scheme

T (University): 40 marks
T (Internal): 10 marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTS/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.) to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure

Unit I. Functional Grammar: (4 periods) (3+3+2+2=10)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs.
[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type),
50 noun/prepositional phrases, 50 idioms/proverbs]

Unit II. English for Competitive Exams & Interview Techniques: (6 periods)
3+3+2+2=10 or (10X1=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III (A) Formal Correspondence (8 periods) (10X1=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: [Four fictional & four non-fictional unseen texts]

Unit IV. Technical & Scientific Writing: (4 periods) (10X1=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers.
Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering
Reference Books:

1. Oxford Learners' Dictionary of Current English
2. Business Communication - KK Sinha, Galgotia Publishers
3. Developing Communication skills- Krishna Mohan & Meera Banerjee
4. Effective technical Communication –Barun K Mitra
5. Effective Business Communication – Herta A Murphy, Habert Hidebrandt, Jane P Thomas

Evaluation Pattern:**Internal Examination: Weightage = 10 marks**

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks**Question Pattern for End Semester Examination.**

Q No.	Unit No	Que.type	No. of Questions	Weightage
1 or 2	I	objective	2 bunches of 4 questions each	(3+3+2+2)=10)
3 or 4	II	Objective	2 bunch of 4 questions each	(3+3+2+2)=10 or (10X1=10)
5 or 6	III	subjective	1 out of 2	(10X1=10)
7 or 8	IV	Subjective	1 out of 2	(10X1=10)

BEPOE607P - POWER PLANT SCHEME TRACING

Credits: 02

Teaching Scheme

Tutorial: 1 Hour/week

Practical: 2 hours/week

Examination Scheme

College Assessment: 50 Marks

Course objectives: The basic understanding of various schemes is a prerequisite for proper and effective operation of the thermal power plant. The course includes tracing of various thermal power plant schemes by visiting the power plant. The student should understand in detail the various power plant schemes of boiler, turbine, generator and balance of plant, layout of various systems and location of various equipments in various schemes.

Course work:

Scheme briefing

Briefing of various schemes on boiler, turbine, generator, balance of plant

Tracing of Schemes

It is expected that the students should trace the schemes by visiting the power plant and identify the various equipments in the schemes as per the scheme tracing booklet and the same is to be submitted for evaluation.

Reference Books:

NPTI Scheme Tracing Manual

Various NPTI Publications

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

B.E. (Power Engineering)SCHEME OF EXAMINATION (CBS)

FIFTH SEMESTER

S. N.	Power Engg	Sub Code of respective board	Subject	Board	Teaching Scheme				Credits	Examination Scheme		Total Marks	Min. Passing Marks	Paper Duration
					L	T	P	Total		College Assessment	Univ. Assessment			
1	BEPOE501T	BEPOE501T	TPS LAYOUT, COMMON AUXILIARIES & SAFETY	POE	3	1	0	4	4	20	80	100	40	3 Hours
2	BEPOE502T	BEME502T	DESIGN OF MACHINE ELEMENTS	ME	3	1	0	4	4	20	80	100	40	3 Hours
3	BEPOE503T	BEME602T	CONTROL SYSTEMS ENGINEERING	ME	3	1	0	4	4	20	80	100	40	3 Hours
4	BEPOE504T	BEME504T	HEAT TRANSFER	ME	3	1	0	4	4	20	80	100	40	3 Hours
5	BEPOE504P	BEME504P	HEAT TRANSFER	ME	0	0	2	2	1	25	25	50	25	
6	BEPOE505T	BEME405T	MECHANICS OF MATERIALS	ME	3	1	0	4	4	20	80	100	40	3 Hours
7	BEPOE505P	BEME405P	MECHANICS OF MATERIALS	ME	0	0	2	2	1	25	25	50	25	
8	BEPOE506P	BEME306P	MACHINE DRAWING	ME	0	2	2	4	4	50	50	100	50	
			Total		15	7	6	28	26	200	500	700		

SIXTH SEMESTER

S.N	Power Engg	Sub Code of respective board	Subject	Board	Scheme				Credits	Examination Scheme		Total Marks	Min. Passing Marks	Paper Duration
					L	T	P	Total		College Assessment	Univ. Assessment			
1	BEPOE601T	BEME601T	ENERGY CONVERSION I	ME	3	1	0	4	4	20	80	100	40	3 Hours
2	BEPOE602T	BEPOE602T	THERMAL POWER PLANT CONTROL & INSTRUMENTATION	POE	4	1	0	5	5	20	80	100	40	3 Hours
3	BEPOE602P	BEPOE602P	THERMAL POWER PLANT CONTROL & INSTRUMENTATION	POE	0	0	2	2	1	25	25	50	25	
4	BEPOE603T	BEPOE603T	STEAM GENERATOR & AUXILIARIES	POE	4	1	0	5	5	20	80	100	40	3 Hours
5	BEPOE603P	BEPOE603P	STEAM GENERATOR & AUXILIARIES	POE	0	0	2	2	1	25	25	50	25	
6	BEPOE604T	BEPOE604T	POWER GENERATION TECHNOLOGY & REGULATORY ISSUES	POE	3	1	0	4	4	20	80	100	40	3 Hours
7	BEPOE605T	BEME605T	DYNAMICS OF MACHINES	ME	3	1	0	4	4	20	80	100	40	3 Hours
8	BEPOE606T		FUNCTIONAL ENGLISH	ASH	2	1	0	3	3	10	40	50	20	2 Hours
9	BEPOE607P	BEPOE607P	POWER PLANT SCHEME TRACING	POE	0	1	2	3	2	50		50	25	
			Total		19	7	6	32	29	210	490	700		

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Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Semester: Fifth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	Assessment of Marks for Theory				Assessment of Marks for Practicals				
							College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE501T	Structural Analysis -II	3	1		4	4	20	80	100	40					3
BECVE501P	Structural Analysis -II			2	2	1					25	25	50	25	
BECVE502T	Reinforced Cement Concrete (RCC) Structures	3	1		4	4	20	80	100	40					4
BECVE502P	Reinforced Cement Concrete (RCC) Structures			2	2	1					25	25	50	25	
BECVE503T	Fluid Mechanics -I	3	1		4	4	20	80	100	40					3
BECVE503P	Fluid Mechanics -I			2	2	1					25	25	50	25	
BECVE504T	Geotechnical Engineering -II	3	1		4	4	20	80	100	40					3
BECVE505T	Hydrology & Water Resources (HWR)	4			4	4	20	80	100	40					3
BECVE506P	Communicative English & Technical Writing			3	3	2					25	25	50	25	
Total		16	4	9	29	25	100	400	500		100	100	200		

Note: 1."Technical Writing" shall consist of detailed report on Summer Training- 1 (ST-1) underwent after 4th Semester.

2. Equal weightage shall be given to the components of "Communicative English" and "Technical Writing"

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Semester: Sixth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	Assessment of Marks for Theory				Assessment of Marks for Practicals				
							College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE601T	Steel Structures	3	1		4	4	20	80	100	40					4
BECVE601P	Steel Structures			2	2	1					25	25	50	25	
BECVE602T	Surveying-II	3	1		4	4	20	80	100	40					3
BECVE602P	Surveying-II			4	4	2					25	25	50	25	
BECVE603T	Fluid Mechanics -II	3	1		4	4	20	80	100	40					3
BECVE603P	Fluid Mechanics -II			2	2	1					25	25	50	25	
BECVE604P	Building Design and Drawing			4	4	4					50	50	100	50	
BECVE605T	Environmental Engineering-II	3	1		4	4	20	80	100	40					3
BECVE606P	Site Visit & Mini Project			3	3	3					25	25	50		
Total		12	4	15	31	27	80	320	400		150	150	300		

Summer Training - 2 (ST-2) of 2-4 Weeks duration during Summer Vacation is mandatory and will be evaluated in Seventh Semester.

Note:

1. External Practical Evaluation of Building Design and Drawing shall be performance based by drawing assigned problem given jointly by the Internal & External Examiners on AutoCAD
2. "Site Visit" shall cover minimum Five Site Visits.
3. "Mini Project" shall include report on Site Visits and Assigned Mini Project/Software Training, etc.
4. Equal weightage shall be given for components of "Site Visits" and "Mini Project".

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

V Semester				
Code No.	Name of Subject in Semester Pattern		Code No.	Name of Equivalent Subject in Credit Based Semester Pattern
5CE01	Steel Structures (T)		BECVE601T	Steel Structures
5CE01	Steel Structures (P)			BECVE601P
5CE02	Environmental Engineering - II		BECVE605	Environmental Engineering - II
5CE03	Surveying - II (T)		BECVE602T	Surveying – II
5CE03	Surveying - II (P)			BECVE602P
5CE04	Transportation Engineering - I (T)		BECVE403T	Transportation Engineering - I
5CE04	Transportation Engineering - I (P)			BECVE403P
5CE05	Building Design and Drawing (T)			BECVE604P
5CE05	Building Design and Drawing (P)			BECVE604P
5CE06	Project Management		BECVE704	Construction Management and Law
5CE07	Site Visit			BECVE606P
				Site Visit and Mini Project
VI Semester				
Code No.	Name of Subject in Semester Pattern		Code No.	Name of Equivalent Subject in Credit Based Semester Pattern
6CE01	Structural Analysis - II (T)		BECVE501T	Structural Analysis - II
6CE01	Structural Analysis - II (P)			BECVE501P
6CE02	RCC Structures (T)		BECVE502T	Reinforced Cement Concrete (RCC) Structures
6CE02	RCC Structures (P)			BECVE502P
6CE03	Geotechnical Engineering - II		BECVE504T	Geotechnical Engineering - II
6CE04	Fluid Mechanics - II (T)		BECVE603T	Fluid Mechanics - II
6CE04	Fluid Mechanics - (P)			BECVE603P
6CE05	Computer Applications in Civil Engineering			Semester - I, Serial No. 8
6CE06	Technical Writing		BECVE506	Communicative English and Technical Writing

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU's relevant ordinance.

STRUCTURAL ANALYSIS –II

BECVE501T

(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4

Evaluation Scheme: (80/20)

Exam Duration: 3 hrs

COURSE OUTCOMES: The students shall be able to

1. Apply the different methods of analysis of frames in practical problems
2. Formulation of stiffness matrix, transformation matrix, load matrix for various structural components for analysis purposes.
3. Understand the basics of finite element method in the analysis of structural components.
4. Understand the concepts related to structural dynamics.

Unit – I

Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

Unit - II

Analysis of Continuous Beams & Simple Portal frames (sway and Non Sway) Using Moment Distribution.

Unit - III

Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8). Member load matrix including lack of fit, temperature, Assembly of Global/ Structure load matrix, Solution to problems with maximum degree of freedom three.

Unit - IV

Formulation of element/local stiffness matrix and global stiffness matrix for beam members (without axial deformations) for continuous beams, Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three.

Unit – V

Formulation of element/ local stiffness matrix and global stiffness matrix for Plane frame members (without axial deformations), Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, temperature Moments Assembly of global/ structural load matrix.

Solution to Plane frame problems with maximum degree of freedom six inclined member problems.

Unit - VI

Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, (MDOF (up to 3 DOF), mode shape and nodal frequency).

Introduction to finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/Non-prismatic) Displacement based bar elements (Prismatic/Non-prismatic)

REFERENCE BOOKS:

- 1. C K Wang, 'Intermediate Structural Analysis'**
- 2. S P Timoshenko, 'Theory of Structure'**
- 3. Jain, Jain Krishna, 'Plain & Reinforced Concrete Structures', Vol-II**
- 4. Rally and Dally, 'Experimental Stress Analysis'**

STRUCTURAL ANALYSIS –II

BECVE501P

Evaluation Scheme: (25-Internal/25-External)

(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

Minimum Eight Problems, on complete syllabus with hand calculations using scientific calculators and also solution to same problems by using available application software.

(Solution is restricted to four degree of freedom problems and assembly restricted to eight degree of freedom problems)

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502T

(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4

Evaluation Scheme: (80/20)

Exam Duration: 4 hrs

COURSE OUTCOMES: The students shall be able to

1. Understand the basic concepts of structural design Methods of RCC to the practical problem
2. Understand the composite action of reinforced steel and concrete in reinforced concrete structural members
3. Use the knowledge of the structural properties of materials i.e. steel and concrete in assessing the strength.
4. Use the knowledge in structural planning and design of various components of buildings.
5. Apply the concepts and applications of prestressed concrete in real problems

Unit – I

Introduction to the Working Stress Method of RCC design. Basic concepts in design for flexure, assumptions, design constants. Analysis of the rectangular section, Balanced, under-reinforced and over-reinforced sections; Drawbacks and limitations of Working stress methods.

Unit – II

Prestressed Concrete: Properties of high grade/strength materials, concepts of prestressed concrete, methods of prestressing, losses in prestressing. Various systems of prestressing with particular reference to Freyssinet, Magnel Blaton and Gifford Udall systems Analysis of rectangular, T and I section. Design of prestressed slab/ rectangular beam

Unit - III

Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, other limit states. Review of IS – 456-2000.

Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode

Analysis & Design of Doubly reinforced sections

Unit - IV

Limit state of collapse in flexure: Analysis and design of Tee and L-beam section.

Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.

Design of rectangular pad/ slopped footing for axial load

Unit - V

Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and force. Check for bond.

Limit state of Serviceability:

Causes and control cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, Cracks due to loading. Needs for crack width control

Moment- curvature relationship, deflection control of beams; Deflection calculation for beam.

Limit state of collapse in torsion: Concepts of interaction to torsion, shear and flexure
Analysis & design of rectangular section for torsion, shear and flexure

Unit – VI (with LSM)

Design of one-way, simply supported, single span and cantilever slabs, and continuous slab/ beam with IS coefficients.

Design of RCC Two way slab with various end conditions using IS code coefficient.

Deflection calculation for one-way slabs

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502P

Evaluation Scheme: (25-Internal/25-External)

(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

1. Design of beams, columns, slab and foundation as per relevant IS Code
2. Understanding the professional RCC drawing.
3. Minimum One Site visit pertaining to above design

FLUID MECHANICS-I

BECVE503T

(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4

Evaluation Scheme: (80/20)

Exam Duration: 3 hrs

COURSE OUTCOMES: The students shall be able to

1. Measure and determine fluid pressures and forces on plates/surfaces, pipe bends, etc.
2. Apply the Bernoulli's equation to solve the problems in fluid.
3. Understand the concepts of dimensional analysis use the dimensionless number suitably.
4. Understand the basic concepts related to laminar and turbulent flow.
5. Apply the principles of hydrostatics and determine the forces.

Unit-I :

Fluids and their Properties: Definition of fluid, fluid properties, mass density, specific weight and specific gravity, viscosity; Newton's equation, coefficients of dynamic and kinematic viscosity. Rheological Diagram. Ideal and real fluids. Compressibility and bulk modulus, Surface tension capillarity, pressure inside a bulb and cylindrical jet, vapor pressure and cavitations. Effects of pressure and temperature on fluid properties.

Fluids Pressure and its Measurement: Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure, Gauge pressures. Pressure measurements using manometer, differential manometer and gauges

Unit-II

Hydrostatics: Hydrostatic pressure on plane and curved surface. Centre of pressure, fluids in relative equilibrium; fluid masses subjected to horizontal, vertical and inclined acceleration.

Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium

Unit-III

Fundamentals of Fluid Flow-I: Kinematics of Flow: Velocity, its variation with space and time; Steady, unsteady, uniform & non-uniform; One, two and three dimensional; rotational, irrotational flow. Acceleration of fluid particles, Normal and Tangential acceleration. Stream line, path line & streak line; Lagrangian and Eulerian approaches in fluid flow description. Equation of continuity in Cartesian co-ordinates, stream functions, velocity potential and potential flow. Relationship between stream function and velocity potential, flow nets, circulation, vortices, source and sink. Free and forced vortices.

Unit-IV

Fundamentals of Fluid Flow-II: Kinetics of Flow: Factors influencing motion, Euler's equations of motion. Bernoulli's equation, Assumptions, derivation, limitations and application, Kinetic energy correction factor. Momentum equation, Impact of Jets, forces on plates, pipe bends and closed conduits.

Fluid Measurement-I: Velocity measurement; pitot tube, pitot-static tube and Prandtl tube. Discharge measurement: Venturimeter, Orificemeter and flow nozzles.

Unit-V

Fluid Measurement-II: Orifices and Mouth pieces- Orifice: definition, types, Hydraulic coefficients, factors affecting them and their experiments. Large/small orifices and submerged orifices. Time for emptying tanks by orifices Mouthpieces: Definition, types and utility, pressure at Vena contracta, Coefficients of discharge.

Flow Measurement and Control: Notches & Weirs – Definitions, Types; Rectangular, triangular and trapezoidal, End contraction. Co-efficient of discharge and its determination; Error in measurement of head. Velocity of approach and its effects Cipolletti, broad-crested and submerged weirs

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Unit-VI

Dimensional Analysis And Theory of Models: Dimensional Analysis: Fundamentals, methods, (Raleigh's and Buckingham); Similitude, Geometric, Kinematic and Dynamic similarities. Predominant forces, Dimension-less numbers and their significances.

Behavior of Real Fluids: Viscous flow - Laminar and Turbulent flows, Reynolds apparatus critical velocity. Reynolds Number, simple problems on determination of Laminar and Turbulent flows in pipes.

FLUID MECHANICS-I

BECVE503P

Evaluation Scheme: (25-Internal/25-External)

(P – 2 Hrs/Week); Total Credit - 1

Minimum eight practicals from the given below list should be performed

1. To verify Bernoulli's theorem
2. To determine the coefficient of discharge of Venturimeter
3. To determine the coefficient of discharge of Orifice meter
4. To determine the coefficient of discharge of Rectangular Notch
5. To determine the coefficient of discharge of Triangular Notch
6. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.
7. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
8. To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number

GEOTECHNICAL ENGINEERING-II

BECVE504T

(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4

Evaluation Scheme: (80/20)

Exam Duration: 3hrs

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of different soil exploration techniques to ascertain the properties of soil
2. To analyze the stability of natural slopes, safety & sustainability of the slopes, design of retaining structures, reinforced earth walls, etc.
3. Practice Ground Improvement Techniques.
4. Design the shallow & deep foundation.

Unit- I: GEOTECHNICAL EXPLORATION

Importance and objective of field exploration , geophysical methods and its limitations, methods of subsurface exploration, methods of boring, number, location and depth of boring, types of soil samples and samplers, principles of design of samplers, collection & shipments of samples, boring and sampling record.

Unit- II: STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes, Taylor's stability numbers & stability charts, stability analysis of finite slope for purely C- soils and C - ϕ soils, center of critical slip circle, (Swedish circle method), slices method for homogeneous C - ϕ soil slopes with pore pressure consideration, Friction circle method, method of improving stability of slopes; types, selection and design of graded filters.

Unit- III: LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure; general & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories of earth pressure. Effects of surcharge & submergence. Determination of Active earth pressure through graphical construction; Rebhann's and Culman's method

Unit- IV: GROUND IMPROVEMENT

Need of ground improvement, ground improvement techniques, stabilization using lime, cement & flyash; preloading concept, vibrocompaction/flotation, concept of sand drains, stone columns, encased stone column, concept of NPVD (natural prefabricated vertical drain) and PPVD (polymer prefabricated vertical drain). Basic concept of reinforced soil, different types of Geo-synthetics, Geo-synthetic application and functions in civil engineering

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory, its validity and limitation, types of shear failure in foundation soil, effect of water table on bearing capacity, (introduction to IS method, factor affecting bearing capacity, field determination of bearing capacity through plate load test and standard penetration test,)

Settlement of shallow foundation: Causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. (Standard penetration test, corrections for N - values to obtain design soil parameters.)

Unit- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Pile capacity by static formula & dynamic formulae, pile load test, group action of piles, spacing of piles in group, settlement of group of pile (pile group,) negative skin friction and its effect on pile capacity, general features of under reamed piles.

REFERENCE BOOKS:

1. Gopal Ranjan &Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
2. Arora K.R. : Soil Mechanics & Foundation Engineering
3. Punmia B. C. : Soil Mechanics & Foundation
4. P Raj : Geotechnical Engineer,Mc Graw Hill Education,2000

HYDROLOGY AND WATER RESOURCES

BECVE505T

(L-4 Hrs/Week); Total Credits- 4

Evaluation Scheme: (80/20)

Exam Duration: 3hrs

COURSE OUTCOMES: The students shall be able to

1. Use of knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.
2. Use the techniques of the Hydrographs to forecast flood discharge at various durations.
3. Apply the Statistical techniques to analyze the flood occurrence & frequency.
4. Use the knowledge pertaining to the flood to plan flood routine & emergency plans.
5. Apply the knowledge of geo-hydrology terms in planning, assessing & computation of ground water potential and its assessment using various techniques.
6. Take-up planning of water resources mini project.

Unit – I

Introduction: Hydrology, definition, engineering hydrology, and its importance, development of hydrology and allied science, hydrological cycle, hydrological evolution and brief description of its components, the earth and its atmosphere, importance of temperature, humidity, and wind in hydrological study.

Precipitation: Definition anticipation, artificial rains, types of precipitation, orthographic, conventional and cyclonic, factors affecting precipitation with reference to physiographic divisions of India

Measurement of precipitation: non automatic and automatic rain gauges, selection of site, density and adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, supplementary rainfall data missing records, intensity duration frequency and depth area duration analysis

Unit - II

Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement, application, problems.

Evaporation and transportation: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and imperial formula, control of evaporation. Evapo-transpiration and its measurement. Interception and its measurement.

Unit - III

Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.

Hydro-graphics: flood hydrology, definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, theory, S-curve and its use, instantaneous UHG.

Unit - IV

Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis.

Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routine and flood forecasting, economic planning for flood control (Emergency action plan)

Unit - V

Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test.

Unit - VI

Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting

Project planning for water resources: multipurpose projects inter basin water transfer and inter-state river dispute. Water resource planning through watershed management, (Instrument used for measurement of climatic parameter, wind vane, anemometer, Sunshine Recorder, Stevenson's Screen, Different types of thermometers, Thermo hydro graph).

COMMUNICATIVE ENGLISH & TECHNICAL WRITING

BECVE506P

Evaluation Scheme: (25-Internal/25-External)

(P-3 Hrs/Week); Total Credits-2

Outcomes:

Students will be:

1. Adept in using functional grammar
2. Able to write at work
3. Able to draft reports and letters
4. To understand the planning and procedure of carrying out research work
5. Dexterous in presentation skills and participate in GD

Practical 1- Language and style

Grammar, Mechanics, Punctuations, Spellings, Vocabulary & Word Watch (List of Technical and Business terms with usage)

Assignments: 4 Nos. (3 worksheets on Grammar, 1 on Mechanics and Punctuation)

Grammar- *Subject and verb agreement, prepositional phrases, pronouns, pronoun references, avoiding shifts, avoiding sexism (avoiding gender bias), modifiers, the clause and simple sentence, compound sentences, transition words, parallelisms.*

Mechanics- *Fragments, run-ons, and comma splices abbreviations & acronyms.*

Punctuations - *colons and semicolons, end punctuations, parentheses, dashes, brackets, ellipses, slashes, and hyphens, apostrophes.*

Method / plan – *Concept clearance using Worksheets with MCQ / activities*

Practical 2- Writing at Work & Other Business Writing

Assignments: 4 Nos. (2 topics from A & B each)

A. Writing at Work

Types of Letters (inquiry, order, sales, complaint etc), Memos, E- mail, The Job Search (Resume & Cover letter), Fliers & Brochures.

Method / plan: *analyzing errors in mails, resumes, letters and brochures with respect to practical- 1, practice writing with samples given*

B. Other Business writing

Itinerary Writing, Inter –office Memorandum (memo), Circulars (Informative, Public, Official), Notice, Agenda and Minutes

Method / plan: *analyzing errors in circulars, memos with respect to practical 1, practice writing with samples given as assignment*

Practical 3- Report Strategies

Assignment: 2 Nos. (Any two reports from the given topics)

Reports (Trip / study tour / site visit),
reports, Incident reports, Investigative
Maintenance manual for buildings

Lab reports, Feasibility reports / Recommendation
reports, Technical Proposals, The Summary,

Method / plan: Analyze reports and proposals in the area of your study. Attempt following all the rules in Practical -1 & Practical-5 and give a presentation to your class.

After attending a lecture / meeting / conference, summarize its contents. Provide the speakers name, location of the presentation, date of presentation for the source citation.

Sample for summary

Many textbooks begin or end chapters with summaries. Find such a summary in one of your textbooks. Then read the accompanying chapter. Is the summary effective? If so, why? If not, Why not? If the summary is ineffective, how would you rewrite it?

Practical 4- Orientation to Research

Planning and process, Structure, documentation, composing a bibliography for a research paper /report

Assignments: 3 Nos. (Preparation of a technical paper, Review of 10 technical papers on a particular subject, Study of Detailed Project Report & Preparing a summary)

Method / Plan: Assignments

1. Planning and process,

Structure- Title, authors details, abstract, introduction, discussion, conclusion, footnotes / list of references, Bibliography

Documentation- relevance and purpose, methods and systems available

composing a Bibliography for a research paper /report- placement and arrangement, author, inclusive page numbers, citing an introduction, preface, foreword, or afterword, articles, online journals or website, Check list for a research paper

2. Choosing a Detailed Project Report / Carrying out feasibility study (prepare a summary based on the research)

Sample

Many people are opening their own businesses. What does it take to open your own business? Before you can write an effective business plan and seek financing from a bank, you must research the project.

Choose a new venture, selling or a product or service of your choice. What would it cost to open this business? What would be your best location, or should your business

be online? What certification or licensing is needed? How many personnel would you need? What equipment is necessary? Who would be your clientele?

Based on research, write a proposal appropriate for presentation to a bank. In this proposal present your business plan for a new entrepreneurial opportunity

Practical 5- Dynamics of Professional Presentations

1. Introduction, planning, occasion, audience, purpose, thesis statement
2. Outlining and structuring, introduction, main body, conclusion
3. Nuances of delivery, modes of delivery, guidelines to effective delivery
4. Visual aids in presentation
5. Organizational GD

Activities : 2 Nos. (A PPT presentation on any one of the Research Project and GD)

Practical 6: Report Writing on Summer Training-1 (ST-1)

Note: Based on the 5 practicals prescribed, many assignments can be prepared and given to the students. Any innovative project and assignment will be highly appreciated.

Proper evidence of the execution of the projects/ Reports / assignments / worksheets should be maintained.

REFERENCE BOOKS:

1. **Technical Writing: Process and Product: S.J. Gerson and S. M. Gerson, Pearson Education Inc., Singapore (Printed in India by Anand Sons)**
2. **Basic Communication Skills for Technology: A.J. Rutherford, Darling Kindersley(India) Pvt. Ltd, India (Printed in India by Saurabh Printers Pvt. Ltd)**
3. **Effective Technical Communication: Rizvi. M Ashraf, Tata Mc Graw Hills, India**
4. **Communication Skills: Sanjay Kumar and Pushp Lata, Oxford University Press**

VI Semester

STEEL STRUCTURES

BECVE601T
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)
Exam Duration: 4 hrs

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of structural properties in assessing its strength for the construction purpose.
2. Apply the knowledge of various techniques in analyzing the steel structural components.
3. Make use of knowledge of analysis in structural planning and design of various components of buildings.

NOTE: Use I.S Code. - 800-2007

Unit – I

Steel as a structural material, various grades of structural steel properties; various rolled steel sections (including cold formed section, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875 etc.

Introduction to Plastic Analysis, Shape Factor, Plastic hinge formation Collapse mechanism for beams

Design of axially loaded members: (a) Tension members. (b) Compression members. Design of roof truss: Load assessment for DL, LL and WL.

Unit - II

Structural Fasteners:

Behavior of bolted and welded connections (types, Designation, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolt and welded connections. Moment resistant bolted and welded connection (bending and torsion)

Design of connection: Beam to beam, beam to column

Unit – III

Design of simple and built up beams: Laterally restrained and un-restrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. (Design of welded plate girder.)

Unit - IV

Design of single rolled steel section column subjected to axial load and biaxial moment including base design.

Design of axially loaded built up columns. Laced and battened (Column bases, slab base, gusseted base, and moment resistant bases).

STEEL STRUCTURES

BECVE601P
(P-2 Hrs/Week); Total Credits-1

Evaluation Scheme: (25-Internal/25-External)

Term Work –

Minimum three design assignment based on above topics along with the detailed structural drawings on A2 size sheets.

Practical Examination shall be based on the above Practical work.

SURVEYING-II

BECVE602T

(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)

Exam Duration: 3hrs

COURSE OUTCOMES: The students shall be able to

1. Carry forward the concepts of basic surveying techniques
2. Operate various survey instruments effectively with precision
3. Use different types of techniques in various surveying problems
4. Apply the concepts of modern surveying techniques & instrumentation.
5. Take – up mini project using different surveying techniques.

UNIT-I

Tacheometric Surveying: Classification, principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.

UNIT II

Simple, Compound, Reverse Curves and Vertical Curves:

- a) Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves.
- b) Compound Curves: Elements of compound Curves, setting out the curve.
- c) Reverse Curves: Elements of reverse Curves, setting out the curve.
- d) Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point.

UNIT III

Transition Curves: Elements of transition curves, super elevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.

UNIT IV

Geodetic Surveying and Triangulation Adjustment

Geodetic Surveying: Classification of triangulation survey, inter-visibility of stations, field work, reduction to centre, base line measurement, corrections.

Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment (Triangle only)

UNIT V

Photographic Surveying: Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, Tilt and height displacements, heights from relief displacement and parallax measurements, flight planning, study of photo theodolite and stereoscope.

UNIT VI

Advanced Techniques in Surveying:

Total station, Electromagnetic Distance Measurement (EDM)

Remote Sensing: Introduction, definitions, Remote sensing systems, advantages, Basic Principles, energy interaction in the atmosphere, Indian remote sensing Satellite series and their characteristics

GIS & GPS: Components of geographical information system (GIS), advantages, function of GIS, Raster and vector data, advantages and disadvantages, global positioning system.(GPS),Introduction, definitions, GPS receivers, antenna, advantages of GPS.

REFERENCE BOOKS:

1. Surveying & Levelling by B.C. Punmia (Vol 2 & Vol 3)
2. Surveying & Levelling by Kanetkar & Kulkarni (Vol 2)
3. Remote sensing & G.I.S. by Dr. M. Anji Rddy

SURVEYING-II

BECVE602P

Evaluation Scheme: (25-Internal/25-External)

(P-4 Hrs/Week); Total Credits - 2

A) PRACTICALS: Minimum Eight Practicals out of following

1. Determination of constants of Tacheometer
2. Determination of elevation of points by Tacheometric surveying
3. Determination of elevation of points and horizontal distance between them by Tacheometric survey.
4. Determination of gradient of given length of road by Tacheometric survey
5. Setting out of simple circular curve by offsets from chord produced method
6. Setting out of simple circular curve by Rankine method of tangential angle
7. Setting out of simple transition curve by tangential angle method
8. Use of Advanced techniques of surveying.
9. Toposheet: Understanding and identification of different features of drawing

B) SURVEY PROJECT:

Survey project should be carried out for minimum 2 days in the following areas (Any One)

1. Road Project,
2. Irrigation Project (canal alignment, watershed demarking, contouring)
3. Water Supply Project

FLUID MECHANICS –II

BECVE603T
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)
Exam Duration: 3 hrs.

COURSE OUTCOMES: The students shall be able to

1. Understand the concepts related to boundary layer theory and determination of drag and lift forces.
2. Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer pressures.
3. Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
4. Understand the different techniques of dimensional analysis and its use in model testing.
5. Understand and apply basics related to Turbines & Pumps in Water Resources planning.
6. Make use of specific energy concepts in the analysis of open channel flow.
7. Undertake Gradually Varied Flow analysis and its computation.

UNIT-I

LAMINAR FLOW: Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen Poiseuille equation.

BOUNDARY LAYER THEORY: Nominal thickness, displacement thickness, momentum thickness of the boundary layer: Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub-layer: Separation of boundary layer on plane and curved surfaces.

REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: General definition of drag and lift; Flow past plates, cylinders and spheres; drag on sphere, cylinder and flat plate.

UNIT-II

FLOW THROUGH PIPES:

Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade's experiment; Moody's chart; Darcy-Weisbach & Hazen-William's equation for frictional head loss; Hydraulic gradient and energy gradient; Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross method of pipe networks; Water-hammer, pressure head due to sudden closure of valve.

UNIT-III

FLOW THROUGH OPEN CHANNEL:

(A) **GENERAL:** Types of channel and their geometrical properties; Types of flow in open channel.

(B) **UNIFORM FLOW:** Chezy's and Manning's equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

(C) **CRITICAL FLOW:** Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope; normal, critical slope; Specific force and its diagram; Conditions of critical flow.

UNIT-IV

(A) **APPLICATIONS OF SPECIFIC ENERGY,** gradual transitions of channels.

(B) **GRADUALLY VARIED FLOW:** Dynamic equation for GVF; Classification and characteristics of surface profiles; Direct Step method of computing profile length.

(C) **RAPIDLY VARIED FLOW:** Definition of hydraulic jump; Equation of hydraulic jump in horizontal, rectangular channel; Length & height of jump; Energy loss in jump; Classifications of jump.

UNIT-V

HYDRAULIC MODELS: Difference between model and prototype; Similitude- type of similarities; Model Laws- Reynolds model law and Froude model law; Types of model-distorted, undistorted; Froude's method of determining resistance to partially submerged objects like ship.

UNIT-VI

FLUID MACHINERY:

(A) **TURBINES:** Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

(B) **RECIPROCATING PUMPS:** Components parts, working principle, Work done of single & double acting pumps; Negative slip, Air vessels – Working principle and necessity.

(C) **CENTRIFUGAL PUMP:** Component parts; Working principle; Static and manometric heads; different efficiencies; Priming & priming devices, Specific speed; Theoretical aspects of multistage pumps; Trouble & remedies; operating characteristics curves. Selection of pumps, system head curves and pump head curves. Model testing of pumps

REFERENCE BOOKS:

1. Hydraulics & Fluid Mechanics- Dr.Modi & Dr. Seth
2. Fluid Mechanics-Streeter & Wylie
3. Fluid Mechanics- Dr. A.K.Jain
4. Fluid Mechanics through problems- Garde
5. Theory and applications of Fluid Mechanics- K. Subramanya
6. Foundation of Fluid Mechanics-Yuan
7. Flow through open channel – K.G.Rangaraju

FLUID MECHANICS –II**BECVE603P****Evaluation Scheme: (25-Internal/25-External)****(P-2 Hrs/Week); Total Credits - 1****PRACTICALS:**

Minimum TEN practicals, from the list given below shall be performed:

1. Study of flow around immersed bodies.
2. Determination of Darcy-Weisbach friction factor for given pipes.
3. Determination of Manning's or Chezy's constant for an open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Study of hydraulic jump in a horizontal rectangular channel.
7. Study and performance of Francis turbine.
8. Study and performance of Pelton Wheel turbine.
9. Study and performance of Centrifugal pump.
10. Study and performance of Reciprocating pump.
11. Problem on pipe network analysis manually and using application software.

BUILDING DESIGN & DRAWING

BECVE604P

Evaluation Scheme: (50-Internal/50-External)

(P- 4 Hrs/Week); Total Credits-4

COURSE OUTCOMES: The students shall be able to

1. Understand building bye laws & building code
2. Apply the principles of building planning and design.
3. To draw submission/working drawing using suitable software.
4. Make use of knowledge to give layout on the field as per the plan.
5. To draw simple perspective drawings.
6. Understand Drawings and Detailing of Building services

UNIT-I

Introduction: Site requirements, requirements of owner and Building byelaws, Importance of Building drawing to Engineer. Use of building byelaws and National building code

UNIT-II

Method of Drawing: Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962. a) Developing working drawings to scale as per IS. 1962 from the given sketch design and general specifications for terraced and pitched roofs. b) Developing submission drawings to scale with location site and block plan complete

UNIT-III

Designing of Buildings:

Introduction: Climate and design consideration, orientation, recommendations of CBR1, Roorki and general principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

UNIT-IV

(A) Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.

(B) Drawings and Detailing of Building services; electrical, plumbing, sanitary, etc.

TERM WORK:

1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment one manual and one with Computer Aided Drafting)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One manual and one with Computer Aided Drafting)

3. Working drawing of multistoried Public/Educational/Health/Community/Industrial building including structural details and layout of services. (One assignment)
4. Two point perspective of the single storied Residential building neglecting small building elements. (one assignment - pitched or terraced roof)
5. Minimum 10 CAD based self explanatory dimensioned sketches of various building elements.
6. Line plans of various types of buildings e.g. public/educational/industrial/hospital/community on graph sheets (04 assignments = 2 manual+2 CAD)
7. Submission drawing of two storied residential building framed structure including all details and statements as per the local byelaws.
8. One compulsory field exercise on layout of building etc.
9. Understanding professional architectural drawing.

NOTE:-

1. The internal practical exam includes drawing exam using AutoCAD of 20 marks and 30 Marks for continuous assessment.
2. The external practical exam shall consist of performance based on above syllabus on software of 30 marks and viva voce 20 marks

ENVIRONMENTAL ENGINEERING-II

BECVE605T
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4

Evaluation Scheme: (80/20)
Exam Duration: 3 hrs.

COURSE OUTCOMES: The students shall be able to

1. Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
2. Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of water treatment plant components.
5. Take-up functional planning, layout and design of sewage treatment plant components.
6. Plan for rural sanitation provisions, perform functional design of septic tank,
7. Analyze the industrial waste water for its treatment units.
8. Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter

Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

REFERENCE BOOKS

1. B.C.Punmia, "Waste Water Engineering" - Laxmi Publication
2. S.K.Garg, "Environmental Engineering" -Vol II Standard Publication
3. G.S.Birdie, "Water Supply & Sanitary Engineering"
4. M.J.Macghee, "Water Supply & Sewage" – McGraw Hill Publication
5. M.N.Rao & H.V.N.Rao, "Air 'Pollution" McGraw Hill Publication
6. C.S.Rao, "Environmental Pollution Control Engineering".

SITE VISITS & MINI PROJECT

BECVE606P

Evaluation Scheme: (25-Internal/25-External)

(P-3 Hrs/Week); Total Credits-3

COURSE OUTCOMES: The students shall be able to

1. Get an idea of various project details such as contracts, layout, planning, drawing, estimates, Arbitration provision, licensee & licensor, architects, structural designer, etc
2. Get an idea of various construction equipment, manpower & techniques used at site, techniques of batching, mixing, transportation, and placement of different construction materials.
3. Get an overview on safety measures, basic amenities to provide, inventory control.
4. Write a legible, correct and technically sound report after the visit.
5. Ascertain the provisions and execution as per the working drawing.

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

- Minimum Five visits are expected.
- Students should submit a detailed report on the visit duly approved by the concerned teacher. **The Detailed Report should mainly consist of the following: -**
 - Name of Construction Site with address
 - Nature of construction work and various structural components

- Nature of ownership, executing and supervising authority
- Architect and Structural Engineer
- Architectural concept and Design features
- Commencement of the work and tentative completion
- Present Status of work
- Estimated cost of the work (Money spent till date)
- Mode of availability of finance
- Various types of manpower for the work
- Various safety measures and amenities provided to manpower
- Various construction equipments for the work
- Various materials used for the work
- CPM / PERT of the project
- Type of inventory control
- Resource planning implemented
- Social benefits and implication
- Safety measures during and posts construction
- Post Construction Maintenance provisions
- Effect on environmental aspect and sustainable development
- Various of scaffolding, Formwork, lifting devices
- Site of precast units for the work and its mode of transportation
- Use of local available material like fly-ash, slag, silica-fumes, etc.
- Causes for delay / faulty construction

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: FIFTH (C.B.S.)

BRANCH: COMPUTER SCIENCE & ENGINEERING

Sr. No.	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni	
1 BECSE301T	Data Communication	3	-	1	4	3	-	1	4	20	80	-	-	100
2 BECSE302T	Object Oriented Programming	4	-	1	5	4	-	1	5	20	80	-	-	100
3 BECSE302P	Object Oriented Programming Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
4 BECSE303T	Database Management System	4	-	1	5	4	-	1	5	20	80	-	-	100
5 BECSE303P	Database Management System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
6 BECSE304T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
7 BECSE305T	Design & Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
8 BECSE305P	Design & Analysis of Algorithms lab	-	2	-	2	-	1	-	1	-	-	25	25	50
	Total	19	6	5	30	19	3	5	27	100	400	75	75	650

FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE

SEMESTER: SIXTH (C.B.S.)

BRANCH: COMPUTER SCIENCE & ENGINEERING

Sr. No.	Subject	Workload				Credit				Marks				
		L	P	T	Total	L	P	T	Total	Theory		Practical		Total Marks
										Sess.	Univ.	Sess.	Uni	
1 BECSE306T	Artificial Intelligence	4	-	1	5	4	-	1	5	20	80	-	-	100
2 BECSE307T	Design Patterns	4	-	1	5	4	-	1	5	20	80	-	-	100
3 BECSE307P	Design Patterns lab	-	2	-	2	-	1	-	1	-	-	25	25	50
4 BECSE308T	Software Engineering & Project Management	4	-	1	5	4	-	1	5	20	80	-	-	100
5 BECSE309T	Computer Networks	4	-	1	5	4	-	1	5	20	80	-	-	100
6 BECSE309P	Computer Networks Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7 BECSE310T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
8 BECSE311P	Mini Project	-	2	-	2	-	2	-	2	-	-	25	25	50
	Total	18	6	5	29	18	4	5	27	90	360	75	75	600

SYLLABUS: V SEMESTER (Computer Science and Engineering) (C.B.S.)

BECSE301T: Data Communication

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

UNIT - 1

Analog and digital signals; periodic and non periodic signals analog signals time and frequency domains; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

UNIT - 2

Signal conversions: digital-to-digital conversion, digital-to-analog conversion, analog to digital conversion, analog-to-analog conversion in detail, Basics of Image and Video Compression.

UNIT - 3

COMMUNICATION MEDIA: guided media and unguided media, Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony

UNIT - 4

Multiplexing and Spread Spectrum, frequency division multiplexing (FDM). Time division multiplexing (TDM): inverse multiplexing, wave-division multiplexing, FHSS AND DSSS multiplexing applications: the telephone system: Common carrier services and hierarchies, Analog services, Digital Services; DIGITAL SUBSCRIBER LINE (DSL): ADSL, RADSL, HSDL, SDSL, VDSL

UNIT - 5

Introduction to Image and Video Compression

Image Compression, JPEG, MPEG compression techniques

Digitizing Audio and Video data representation formats, Compression of Audio and Video files. Comparison of various methods of compression.

UNIT – 6

Image and Video Compression Techniques

Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Real Time Interactive Audio/Video, RTP, HTTP and WWW.

Text / Reference Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 4th Edition, Tata McGraw Hill
2. Packet guide to core network protocol by Bruce Hartpence, Oreilly
3. Understanding Data Communications and Networks by William A. Shay, 2nd Edition, Vikas Publishing House.
4. Electronic Communication Systems by Kennedy

BECSE302T: Object Oriented Programming

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Unit I: Introduction: OOP concept, Procedural vs OOP programming, OOP terminology and features(data encapsulation, inheritance, polymorphism and late binding), Tokens, Character set, Keywords, Data-types, Data Types declarations, Constants and variables, expressions, Standard Library and header files. Objects & Classes in C++: Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects, C++ String class.

Unit II: Operator overloading: Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers & arrays. Pointers & functions. New& delete operators. Pointers for objects.

Unit III: Inheritance in C++: Derived class & base class, Derived class constructors, Function overloading, class hierarchies, Public and private inheritance, Multiple inheritance. containership: classes within classes.

Unit IV: Virtual functions concepts, Abstracts classes & pure virtual functions. Virtual base classes, Friend functions, Static functions, Assignment and copy initialization, the this pointer. Dynamic type information.

Unit V: Streams & Files in C++: Stream classes, stream errors, disk file I/O with streams, File pointers, Error handling in file I/O. File I/O with members functions, overloading the extractions & insertion operators, Memory as a stream object, command-line arguments, Persistent Objects

Unit VI: Function Template, Class templates, Exception syntax, Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers, Iterates, Specialized iterates, Associative containers. Function objects.

1. C++: The Complete Reference, by Herbert Schildt 4th edition Mc-Graw-Hill
2. Object-Oriented Programming in C++ by Robert Lafore 4th edition Pearson Education
3. The C++ Programming Language by Bjarne Stroustrup 3rd edition Pearson Education

Reference books:

1. Object Oriented Programming in C++ by Subhash K U Pearson Education
2. Mastering C++ by K R Venugopal Tata Mc-Graw-Hill Education

BECSE302P: Object Oriented Programming: Practical based on above syllabus using C++

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	25

Some practicals can be conducted on core JAVA

BECSE303T: Database Management System

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

Syllabus**UNIT-I**

General introduction to database systems, Database-DBMS distinction, Approaches to building a database, Data models, Three-schema architecture of a database, Challenges in building a DBMS, Various components of a DBMS, E/R Data model. SQL, PL/SQL Concept

UNIT-II

Relational Data Model, Concept of relations, Schema-instance distinction, Keys, referential integrity and foreign keys, Relational algebra operators, Tuple relation calculus, Domain relational calculus.

UNIT-III

Physical and logical hierarchy. Concept of index, B-trees, hash index, function index, bitmap index. Concepts of Functional dependency, Normalization, Business data analysis, tools & techniques for business data analysis.

UNIT-IV

Overview: Query Processing and Optimization, measures of query cost estimation in query optimization, pipelining and Materialization, Structure of query evaluation plans.

UNIT-V

Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking

UNIT-VI

Recovery System: failure classification, recovery and atomicity, log based recovery, checkpoints, buffer management, advanced recovery techniques. Introduction to Web databases, distributed databases, data warehousing and data mining, Data Security.

TextBooks:

1. Database System Concepts by AviSilberschatz , Henry F. Korth , S. Sudarshan, Tata McGraw Hill, Fifth Edition
2. Fundamentals of Database Systems – Elmasiri and Navathe, Addison Wesley, 2000.
3. An introduction to Database Systems,C J Date,A.Kannan,S.Swamynathan –Eight Edition

Reference Books:

1. Database Management Systems - by Raghu Ramakrishnan and Johannes Gehrke, Tata McGraw Hill Publication, Third Edition
2. Introduction to Database Management Systems by Kahate

BECSE303P: Database Management System: Practical based on above syllabus.

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	25

Some Practicals can be based on following OPEN SOURCES:

1. Informatica
2. Micro Strategy
3. ETL
4. HADOOP Technology

BECSE304T: Computer Graphics

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I**Introduction to Computer Graphics**

Overview of Computer Graphics, Computer Graphics Application and Software, Graphics Areas, Graphics Pipeline, Graphics API's, Numerical issues, Efficiency Display and Hardcopy Technologies, Display Technologies – Raster scan Display System, Video Controller – Vector scan display system, Random Scan Display Processor, Input Devices for Operator Interaction, Image Scanners

UNIT II

Basic Raster Graphics Algorithms for Drawing 2D primitives, aliasing and ant aliasing, Polygon filling methods: Scan Conversion Algorithms: Simple Ordered edge list, Edge Fill, Fence fill and Edge Flag Algorithm. ,Seed fill Algorithms: Simple and Scan Line Seed Fill Algorithm, Halftoning techniques

UNIT III

Graphics Programming using OPENGL: Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing matrix specifications, a few examples and demos of OpenGL programs, Animations in OpenGL

UNIT IV

2D Clipping algorithms for regular and irregular windows: Sutherland Cohen Outcode, Sutherland Cohen Subdivision, Mid-Point subdivision, Cyrus Beck and Sutherland Hodgman, Cohen-Sutherland Polygon clipping Algorithm. Clipping about Concave regions.

2D Transformations, Translation, Rotation, Reflection, Scaling, Shearing Combined Transformation, Rotation and Reflection about an Arbitrary Line

UNIT V

Normalized Device Coordinates and Viewing Transformations, 3D System Basics and 3D Transformations, 3D graphics projections, parallel, perspective, viewing transformations. 3D graphics hidden surfaces and line removal, painter's algorithm, Z -buffers, Warnock's algorithm.

UNIT VI

Basic Ray tracing Algorithm, Perspective, Computing Viewing Rays, Ray-Object Intersection Shading, A Ray tracing Program, Shadows, Ideal Specular Reflection.

Curves and Surfaces: Polygon Mesh, Parametric Cubic Curves, Parametric Bicubic Surfaces, Quadratic Surface, Bezier Curves and B-spline curves.

Text Books:

1. Fundamentals of Computer Graphics, Peter Shirley and Steve Marschner, Third Edition.(A.K.Peters Publication house)
2. Procedural Elements of Computer Graphics III Edition, Rogers, McGraw Hill.
3. Computer Graphics - Principles and Practice, J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Second Edition in C, Pearson Education.
4. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Fourth Edition, Pearson Education.
5. Computer Graphics, Hearn and Baker, PHI, India

BECSE305T: Design & Analysis of Algorithms

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT-I

Mathematical foundations, summation of arithmetic and geometric series, n , n^2 , bounding summations using integration, Recursion and Induction: recurrence relations, solutions of recurrence relations using techniques of characteristic equation, generating functions, master method and substitution method. Complexity calculation of various standard functions, principles of designing algorithms.

UNIT-II

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, application of amortized analysis, Sorting networks, comparison networks, bio-tonic sorting network, advanced data structures like Fibonacci heap, disjoint set representation

UNIT-III

Divide and conquer basic strategy, binary search, quick sort, merge sort, matrix operations, Multiplication Algorithm Greedy method – basic strategy, Knapsack Problem, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path, Optimal Search Patterns.

UNIT-IV

Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem, Longest Common Subsequence problem, 0/1 Knapsack Problem, Chained Matrix Multiplication

UNIT-V

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen's problem, graph coloring, Hamiltonian cycles etc, Introduction to Approximation algorithm.

UNIT-VI

NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, decision and optimization problems, graph based problems on NP Principle.

Text Books:

1. Introduction to Algorithms, Thomas H. Cormen et.al. Prentice Hall of India.
2. Design & Analysis of Algorithms, Horowitz Sahani, University Press.
3. The Design and Analysis of Algorithms Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman, Pearson Publication.

BECSE305P: Design & Analysis of Algorithms lab: Practical will be based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

Practicals based on C, C++ or Java

4.

SYLLABUS: VI SEMESTER (Computer Science and Engineering) (C.B.S.)

BECSE306T: Artificial Intelligence

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT - I:

Introduction: What is AI? History & Applications, Artificial intelligence as representation & Search, Production system, Basics of problem solving: problem representation paradigms, defining problem as a state space representation, Characteristics.

UNIT - II:

Search Techniques: Uninformed Search techniques, Informed Heuristic Based Search, Generate and test, Hill-climbing, Best-First Search, Problem Reduction, and Constraint Satisfaction.

UNIT - III:

Knowledge representation: Knowledge representation Issues: First order logic, Predicate Logic, Structured Knowledge Representation: Backward Chaining , Backward Chaining , Resolution , Semantic Nets, Frames, and Scripts, Ontology.

UNIT - IV:

Uncertainty: Handling uncertain knowledge, rational decisions, basics of probability, axioms of probability, Baye's Rule and conditional independence , Bayesian networks , Exact and Approximate inference in Bayesian Networks, Fuzzy Logic .

UNIT - V:

Learning: What is learning?, Knowledge and learning, Learning in Problem Solving, Learning from example, learning probabilistic models, Formal Learning Theory

UNIT - VI:

Expert Systems: Fundamental blocks, Knowledge Engineering, Knowledge Acquisition, Knowledge Based Systems, Automated Reasoning, Understanding Natural language

Text Books:

1. E.Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill, 2008.
2. Artificial intelligence and soft computing for beginners by Anandita Das Bhattachargee, Shroff Publishers
3. Artificial Intelligence – A Practical Approach : Patterson , Tata McGraw Hill, 3rd Edition

Reference Books:

1. Introduction to Artificial Intelligence – Charniak (Pearson Education)

BECSE307T: Design Patterns

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Practical) 1 hr (Tutorial)	5	100	20	80	100

UNIT – 1

Introduction to Design Patterns and Observer Pattern: Basics of Design patterns, Description of design patterns, Catalog and organization of catalog, design patterns to solve design problems, selection of design pattern, Use of design patterns.

UNIT - 2

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Creational Patterns

UNIT - 3

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion of Structural Patterns

UNIT - 4

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns

UNIT – 5

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation, Summary

UNIT – 6

Complexity Analysis of Design Patterns, Methods to analyze the complexity of design patterns, Implementation techniques and applications of design pattern in game design, product design,

TextBooks:

1. Head First Design Patterns, by Eric Freeman and Elisabeth Freeman
2. Design Patterns Explained, by Shalloway and Trott

Reference Books

3. Introduction to design Patterns in C++ with Qt by Alan Ezust, Paul Ezust

BECSE307P: Design PatternsLab : Practical based on above syllabus using JAVA or .net

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

Some Practicals based can be based Open Source Technology

BECSE309T:Software Engineering & Project Management

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT - I

Introduction: Software Characteristics, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

UNIT - II

Software engineering Principles and Practice :Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

UNIT - III

System Analysis: Structured Analysis, Data modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model, Design Concepts : Abstraction , Pattern modularity, Information hiding, Design classes, Refactoring.

UNIT - IV

Software Testing:Testing Fundamentals, Black-Box Testing, White-Box Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging.

UNIT - V

Quality Management: Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance. Quality concepts, Evolution of Quality Management, Quality assurance, Software reviews, Statistical quality assurance.

UNIT - VI

Project management : Introduction to Software Project Management, Project Planning, Project scheduling, Risk management , Change Management, Software reengineering, Restructuring Reverse engineering, Forward Engineering

Text Books:

1. Software Engineering-A Practitioner's Approach (Sixth Edition)-Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Sommerville (Pearson Education)
3. Software Engineering: Theory and Practice (Fourth Edition – Pfleeger)
4. Software Engineering- Mishra /Mohanty (Pearson Education)

Reference Books:

1. Software Engineering-Schaum's Series (TMH)
2. Software Project Management - Sanjay Mohapatra (Cengage Learning)
3. Quantitative techniques in project management by Rettyvellayudam

BECSE310T: Computer Networks

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT-I

Introduction to computer Networks, direction of data flow (simplex, Half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN); Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT-II

Physical Layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

UNIT-III

Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fastEthernet;

UNIT-IV

Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing, Mobile routing basic algorithms.

UNIT-V

Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols. Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets. Congestion control protocols.

UNIT-VI

Process to process delivery; UDP; TCP; Quality of service: techniques to improve Qos. ISDN services & ATM; DSL technology, Cable modem, Sonet. Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “ – TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
3. W. Stallings – “Data and Computer Communications (8th Ed.)” – PHI/ Pearson Education

Reference Books:

1. Kurose and Rose – “Computer Networking -A top down approach featuring the internet” – Pearson Education
2. Introduction to Data Communications and Networking by Wayne Tomasi-Pearson Edition
3. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI

**BECSE310P: Computer Networks: Practical
based on above syllabus.**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	25

Practicals based on tools

1. Omnet

2. Castella

And JAVA, J2EE

R.T.M.N.U Nagpur
Syllabus of B.E 6th Semester,
Computer Science Engineering

BECSE310T

Functional English

Sr. No.	Subject Code	Subject	Workload				Credit				Marks				
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Theory		Practical		Total Marks
											Sessional	University	Sessional	University	
1	BECSE310T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50

Syllabus:

Unit 1. Functional Grammar: (4 Hours) (3+3+4=10)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

Unit II. English for Competitive Exams & Interview Techniques: (6 Hours) (3+3+4=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III

(A) Formal Correspondence (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: (4 Hours)

[Four fictional & four non-fictional unseen texts]

Unit IV. Technical & Scientific Writing: (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal, Cambridge University Press

4. *Contemporary Business Communication* by Scot Ober , Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

THIRD SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College Assessment	Univ. Assessment	Total Marks		
1	BEELE301T	APPLIED MATHEMATICS-III	ASH	4	1	0	5	5	20	80	100	40	3 Hours
2	BEELE302T	NON CONVENTIONAL ENERGY SOURCES	EE	4	0	0	4	4	20	80	100	40	3 Hours
3	BEELE303T	ELECTRICAL MEASUREMENT AND INSTRUMENTATION	EE	4	1	0	5	5	20	80	100	40	3 Hours
4	BEELE303P	ELECTRICAL MEASUREMENT AND INSTRUMENTATION	EE	0	0	2	2	1	25	25	50	25	
5	BEELE304T	NETWORK ANALYSIS	EE	4	1	0	5	5	20	80	100	40	3 Hours
6	BEELE304P	NETWORK ANALYSIS	EE	0	0	2	2	1	25	25	50	25	
7	BEELE305T	ELECTRONIC DEVICES & CIRCUITS	EN	4	1	0	5	5	20	80	100	40	3 Hours
8	BEELE305P	ELECTRONIC DEVICES & CIRCUITS	EN	0	0	2	2	1	25	25	50	25	
		Total		20	4	6	30	27			650		

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

FOURTH SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College Assessment	Univ. Assessment	Total Marks		
1	BEELE401T	APPLIED MATHEMATICS - IV	ASH	4	1	0	5	5	20	80	100	40	3 Hours
2	BEELE402T	ELEMENTS OF ELECTROMAGNETICS	EE	4	1	0	5	5	20	80	100	40	3 Hours
3	BEELE403T	DIGITAL AND LINEAR ELECTRONIC CIRCUITS	EN	3	1	0	4	4	20	80	100	40	3 Hours
4	BEELE403P	DIGITAL AND LINEAR ELECTRONIC CIRCUITS	EN	0	0	2	2	1	25	25	50	25	
5	BEELE404T	ELECTRICAL MACHINES-I	EE	4	1	0	5	5	20	80	100	40	3 Hours
6	BEELE404P	ELECTRICAL MACHINES-I	EE	0	0	2	2	1	25	25	50	25	
7	BEELE405T	COMPUTER PROGRAMMING	EE	4	1	0	5	5	20	80	100	40	3 Hours
8	BEELE405P	COMPUTER PROGRAMMING	EE	0	0	2	2	1	25	25	50	25	
9	BEELE406T	ENVIRONMENTAL STUDIES	ASH	3	0	0	3	0	75 + 25		Grades		
		Total		22	5	6	33	27			650		

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

FIFTH SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College Assessment	Univ. Assessment	Total Marks		
1	BEELE501T	ELECTRICAL POWER SYST - I	EE	4	1	0	5	5	20	80	100	40	3 Hours
2	BEELE502T	UTILIZATION OF ELECTRIC ENERGY	EE	3	1	0	4	4	20	80	100	40	3 Hours
3	BEELE503T	ELECTRICAL MACHINE DESIGN	EE	4	1	0	5	5	20	80	100	40	3 Hours
4	BEELE504T	MICROPROCESSOR & INTERFACING	EN	3	1	0	4	4	20	80	100	40	3 Hours
5	BEELE504P	MICROPROCESSOR & INTERFACING	EN	0	0	2	2	1	25	25	50	25	
6	BEELE505T	ELECTRICAL MACHINES-II	EE	4	1	0	5	5	20	80	100	40	3 Hours
7	BEELE505P	ELECTRICAL MACHINES-II	EE	0	0	2	2	1	25	25	50	25	
8	BEELE506P	ELECTRICAL DRAWING & SIMULATION	EE	0	0	2	2	2	25	25	50	25	
9	BEELE507P	ELECTRICAL ENGINEERING WORKSHOP	EE	0	0	2	2	2	25	25	50	25	
		Total		18	5	8	31	29			700		

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

SIXTH SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College Assessment	Univ. Assessment	Total Marks		
1	BEELE601T	POWER STATION PRACTICE	EE	3	1	0	4	4	20	80	100	40	3 Hours
2	BEELE602T	ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT	ASH	3	1	0	4	4	20	80	100	40	3 Hours
3	BEELE603T	ELECTRICAL DRIVES & THEIR CONTROL	EE	4	1	0	5	5	20	80	100	40	3 Hours
4	BEELE604T	POWER ELECTRONICS	EE	4	1	0	5	5	20	80	100	40	3 Hours
5	BEELE604P	POWER ELECTRONICS	EE	0	0	2	2	1	25	25	50	25	
6	BEELE605T	CONTROL SYSTEM-I	EE	4	1	0	5	5	20	80	100	40	3 Hours
7	BEELE605P	CONTROL SYSTEM-I	EE	0	0	2	2	1	25	25	50	25	
8	BEELE606P	INDUSTRIAL VISITS & REPORT WRITING	EE	0	0	2	2	2	50	0	50	25	
9	BEELE607T	FUNCTIONAL ENGLISH	ASH	2	0	0	2	2	10	40	50	20	2 Hours
		Total		20	5	6	31	29			700		

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

SEVENTH SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College Assessment	Univ. Assessment	Total Marks		
1	BEELE701T	CONTROL SYSTEM-II	EE	4	1	0	5	5	20	80	100	40	3 Hours
2	BEELE702T	ELECTRICAL POWER SYSTEM –II	EE	4	1	0	5	5	20	80	100	40	3 Hours
3	BEELE703T	ELECTIVE –I	EE	3	1	0	4	4	20	80	100	40	3 Hours
4	BEELE704T	HIGH VOLTAGE ENGINEERING	EE	4	1	0	5	5	20	80	100	40	3 Hours
5	BEELE704P	HIGH VOLTAGE ENGINEERING	EE	0	0	2	2	1	25	25	50	25	
6	BEELE705T	ELECTRICAL INSTALLATION DESIGN	EE	4	1	0	5	5	20	80	100	40	3 Hours
7	BEELE705P	ELECTRICAL INSTALLATION DESIGN	EE	0	0	2	2	2	25	25	50	25	
8	BEELE706P	PROJECT SEMINAR	EE	0	0	3	3	3	50	0	50	25	
		Total		19	5	7	31	30			650		

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering)
SCHEME OF EXAMINATION

EIGHTH SEMESTER

S.N.	Sub Code	Subject	Board	Teaching Scheme				Credits	Examination Scheme			Min. Passing Marks	Paper Duration
				L	T	P	Total		College	Univ.	Total		
1	BEELE801T	ELECTIVE- II	EE	3	1	0	4	4	20	80	100	40	3 Hours
2	BEELE802T	ELECTIVE- III	EE	3	1	0	4	4	20	80	100	40	3 Hours
3	BEELE803T	SWITCHGEAR & PROTECTION	EE	4	1	0	5	5	20	80	100	40	3 Hours
	BEELE803P	SWITCHGEAR & PROTECTION	EE	0	0	2	2	1	25	25	50	25	
4	BEELE804T	COMPUTER APPLICATIONS IN POWER SYSTEM	EE	4	1	0	5	5	20	80	100	40	3 Hours
	BEELE804P	COMPUTER APPLICATIONS IN POWER SYSTEM	EE	0	0	2	2	1	25	25	50	25	
5	BEELE805P	PROJECT	EE	0	0	6	6	6	75	75	150	75	
		Total		14	4	10	28	26			650		

S. No.	ELECTIVE-I	ELECTIVE-II	ELECTIVE - III
1	IT and Its Applications in Power System Control	Entrepreneurship Development	Bio-medical Engineering
2	Fuzzy Logic and Neural Networks	Digital Signal Processing	Advanced Microprocessor Peripherals
3	Flexible AC Transmission Systems	Power Quality	Power Semiconductor Based Electric
4	Energy Management and Audit	EHV AC and HVDC Transmission	Electrical Distribution System

[illegible]

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Absorption Scheme for the students of B. E. Electrical Engg. (Electronics & Power)
from OLD semester pattern to NEW semester pattern

V Semester B. E. Electrical Engineering

Subject Code	Name of subject in Old semester pattern	Subject Code	Name of subject in New semester pattern
5S-EE-01	ELECTRICAL POWER SYSTEM-I (Th.)	BEELE501T	ELECTRICAL POWER SYSTEM - I
5S-EE-02	INSTRUMENTATION (Th.)		----
5S-EE-03	ELECTRICAL MACHINES DESIGN (Th.)	BEELE503T	ELECTRICAL MACHINE DESIGN
5S-EE-04	MICROPROCESSOR & INTERFACING (Th.)	BEELE504T	MICROPROCESSOR & INTERFACING
	MICROPROCESSOR & INTERFACING (Pract.)	BEELE504P	MICROPROCESSOR & INTERFACING
5S-EE-05	ELECTRICAL MACHINES-II (Th.)	BEELE505T	ELECTRICAL MACHINES-II
5S-EE-05	ELECTRICAL MACHINES-II (Pract.)	BEELE505P	ELECTRICAL MACHINES-II
5S-EE-06	ELECTRICAL ENGG. WORKSHOP	BEELE507P	ELECTRICAL ENGINEERING WORKSHOP
	-----	BEELE506P	ELECTRICAL DRAWING & SIMULATION*
	-----	BEELE502T	UTILIZATION OF ELECTRIC ENERGY *

* The students who fail to clear any subject(s) of the V semester (old pattern) by the last chance prescribed, shall be required to clear the respective equivalent subject of V semester (new pattern) along with an additional subject marked with (*).

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Absorption Scheme for the students of B. E. Electrical Engg. (Electronics & Power)
from OLD semester pattern to NEW semester pattern

VI Semester B. E. Electrical Engineering

Subject Code	Name of subject in Old semester pattern	Subject Code	Name of subject in New semester pattern
6S-EE-01	POWER STATION PRACTICE (Th.)	BEELE601T	POWER STATION PRACTICE
6S-EE-02	ENGG.ECO. & IND. MGT. (Th.)	BEELE602T	ENGG.ECO. & IND. MGT
6S-EE-03	ELECT. DRIVES & THEIR CONTROL (Th.)	BEELE603T	ELECT. DRIVES & THEIR CONTROL
6S-EE-04	LINEAR ELECTRONIC CIRCUITS (Th.)		----
	LINEAR ELECTRONIC CIRCUITS (Pract.)		----
6S-EE-05	CONTROL SYSTEM-I (Th.)	BEELE605T	CONTROL SYSTEM-I
	CONTROL SYSTEM-I (Pract.)	BEELE605P	CONTROL SYSTEM-I
6S-EE-06	COMP. AIDED ELECT.ENGG. DRAWING (Pract.)	---	-----
		BEELE604T	POWER ELECTRONICS*
		BEELE604P	POWER ELECTRONICS*
		BEELE606P	INDUSTRIAL VISITS &REPORT WRITING*
		BEELE607T	FUNCTIONAL ENGLISH*

* The students who fail to clear any subject(s) of the VI semester (old pattern) by the last chance prescribed, shall be required to clear the respective equivalent subject of VI semester (new pattern) along with an additional subject marked with (*).

V SEM. ELECTRICAL ENGG.

BEELE501T	ELECTRICAL POWER SYST - I	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
Students will develop the ability <ul style="list-style-type: none"> ■ To model and represent the system components used in power system. ■ To represent and understand the transmission line parameters. ● To understand the load flow analysis of power system. 	students should be able to <ul style="list-style-type: none"> ■ Modeling and representation of the system components used in power system. ■ Concept of designing transmission line parameters ● The basic concept of load flow analysis.

UNIT- 1:

Structure of electrical power system, brief exposure to generation, transmission and distribution aspects, elementary consideration of economic bulk power supply system, use of high voltage general system consideration, idea about substation, concept of real, reactive and complex power. Load and their characteristics, voltage and frequency dependence of loads. (10hrs)

UNIT- 2:

Representation of power system elements, models and parameters of generator, transformer and transmission lines, Transmission line parameters calculation (R,L,C), per unit system representation. 8hrs

UNIT-3:

Elementary distribution scheme: Feeders and distributors. LT and HT cables, Introduction to distribution automation.

Concept of insulator, types of insulator, string efficiency. 10 hrs

UNIT-4:

Voltage regulation and efficiency of power transmission lines using equivalent pi and T representation. Representation using circle diagram with generalized constants. 10 hrs

UNIT-5:

Interconnection of system elements to form two bus systems. Illustration of active and reactive power transmission, types of buses. Introduction to load flow studies in multibus system (Methods of solution not expected). Introduction of frequency and voltage as system state indicators. 10 hrs

UNIT-6:

Elementary concepts of real and reactive power control. Steady state performance of turbine governors, load sharing between generators, preliminary concepts of automatic voltage regulator, 8 hrs

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Elements of power system analysis	W. D. Stevenson	PHI
Modern Power system analysis	Nagrath I.J. & Kothari D.P.	Mc-Graw Hill
Power system analysis	Wadhwa C.L.	New-Age international
Power System Analysis	Asfaq Hussain	CBS
Reference Books		
A Text book of Electric Power Distribution Automation	Dr. M. K. Khedkar & Dr. G. M. Dhole	Laxmi Publications
Electric Energy System Theory	O. E. Elgerd	
Westinghouse transmission and distribution handbooks		

BEELE502T	UTILIZATION OF ELECTRIC ENERGY	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
Students will <ul style="list-style-type: none"> understand application of electrical supply for different applications to calculate electrical equivalent rating for mechanical application 	students should be able to <ul style="list-style-type: none"> understand applications for heating, welding, illumination using electric power understand applications for fan, lowers, compressor, pumps and refrigeration using electric power

Unit I: Electric Heating:

(8 Hrs)

- Electric Heating : Types and methods of electrical heating, advantages of electrically produced heat, types & application of electric heating equipments, transfer of heat.
- Resistance Ovens : General constructions, design of heating elements, efficiency & losses, radiant heating.
- Induction heating: Core type & core less induction furnace, indirect induction oven, medium and high frequency eddy - current heating.
- Dielectric heating: Principle and application.
- Arc furnace : Direct & indirect arc furnace, power supply, characteristics & control.

Unit II: Electric Welding:

(8 Hrs)

- Importance, Advantages & Disadvantages of welding, classification of welding processes.
- Resistance welding, Butt welding, Spot welding, Projection welding, Seam welding.
- Electric arc welding: Carbon arc welding, metal arc welding, submerged arc welding, Stainless Steel welding
- Ultrasonic welding, electron beam welding, laser beam welding.

Unit III : Illumination :

(8 Hrs)

Nature of light, terms used in illumination, solid angle, laws of illumination, polar curves, Colour Rendering Index (CRI), Design of illumination systems, indoor lighting systems, factory lighting, outdoor lighting design, flood lighting, street lighting, energy saving in lighting systems.

Unit IV: Refrigeration & Air conditioning:

(8 Hrs)

Terminology, refrigeration cycle, refrigeration systems (Vapor compression, vapor absorption), domestic refrigerator, drinking water cooler, desert air cooler.

Air conditioning: Factors involved in air conditioning, comfort air conditioning, industrial air conditioning, effective temperature, summer / winter air conditioning systems, types of air conditioning systems, room air conditioning, and central air conditioning.

Unit V: Fans & Pumps:

(10 Hrs)

Fans and Blowers: Fan types, fan performance evaluation & efficient system operation, fan design & selection criteria, flow control strategies, fan performance assessment, energy saving opportunities.

Pumps: Pump types, system characteristics. Pump curves, factors affecting pump performance, efficient pumping system operation, flow control strategies, energy conservation opportunities in pumping system.

Unit VI: Compressors and DG Sets:

(8 Hrs)

Compressors: Compressor types, Compressor efficiency, Compressed air system components.

Diesel Generating Systems: Introduction, selection and installation factors, operational factors, energy performance assessment in DG sets, energy saving measures for DG sets.

Books :

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Utilization of Electric Power & Electric Traction	J.B. Gupta	Kataria & Sons
Art and Science of Utilization of Electrical Energy	H Partap	Dhanpat Rai & Sons, Delhi
Utilization of Electrical Power	Dr N. V. Suryanarayana	Wiley Eastern Ltd, New Age International
Electronics in Industry	Chute & Chute	McGraw Hill
Utilization of Electric Energy	E. Openshaw Taylor	Orient Longman
Guide book for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency		

BEELE503T	ELECTRICAL MACHINE DESIGN	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
Students will develop the ability <ul style="list-style-type: none"> To analyze different materials and their properties used in design of machine. To calculate and understand the core design and main dimension of transformer. To understand the performance characteristics and cooling of transformers. 	students should be able to <ul style="list-style-type: none"> Select proper material for design of a machine. Design a overall transformer and estimates its performance characteristics as per requirement and constraints specified. Design rotor core of Induction motor Design overall dimensions of synchronous machines

Unit. 1:

REVIEW OF MATERIAL USED IN CONSTRUCTION OF ELECTRICAL MACHINES: - Classification of insulating materials depending upon permissible temperature rise, properties of transformer oil. Standard specification, C.M.R. and short time rating of machines. Heating and cooling characteristics. (10 Hrs)

Unit. 2:

TRANSFORMER DESIGN: - Specific loading, equation for voltage per turn for power and distribution transformer output equation. (10Hrs)

Unit. 3:

Principal of electric and magnetic circuit design, method of cooling and cooling circuit design. Estimation of performance characteristics from the design data. (10 hrs)

Unit. 4:

INDUCTION MOTOR: - Main dimensions, output equation, loading constant estimation of axial lengths, air gap diameter, winding design. (9 hrs)

Unit. 5:

Air gap length, slot combination for stator and rotor of I.M., cage rotor and wound rotor design. Calculation of on load current and other performance on characteristics for design data. (8hrs)

Unit. 6:

SYNCHRONOUS MACHINE: Air gap length, methods of obtaining sinusoidal O/P voltage, field coil design for salient pole machine and for turbo generator rotor, ventilation of synchronous generator, cooling air circuits, closed ventilation / quantity of cooling medium hydrogen and water as cooling media. (8hrs)

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Electrical machine Design	A.K. Sawhney	Dhanpatrai and Sons, Delhi
Electrical Machine Design	Balbair Singh	Brite students Publication, Pune
Electrical Machine Design	M.V. Deshpande	
Reference Books		
Performance and Design of A.C. Machines	M.G. Say	
Power Transformer	S.B. Vasntinsky	P.S.G. College of Technology Coimbtore-4
Principle of Electrical Machine Design	R. K. Agrawal	S. Chand Publication

BEELE504T	MICROPROCESSOR & INTERFACING	L = 3	T = 1	P = 0	Credits = 4
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
This subject helps student to learn the <ul style="list-style-type: none"> • Microprocessor applications in electrical engineering. • The principle of microprocessor chip working, programming with microprocessor is also explained in this subject. 	students should be able to use and apply <ul style="list-style-type: none"> • VLSI circuit concept • Introduction to Intel 8085A architecture • Programming instructions • Interrupts • Methods of data transfer • Hardware and Interface

UNIT-1:

VLSI circuit concept. Approach to integrated system design using Microprocessors. Bus concepts. Address, Data and control. Organization of computer with MPU, Bits/ Bytes / Words/ Long words - their ranges accuracy and precision. Memory organization. Linear / Absolute decoding.

UNIT-2:

Introduction to Intel's 8085A Architecture description software instructions. Address mode- advantages, Timing diagrams, Assemblers and Disassemblers (By Hand Coding).

UNIT-3:

Flag structure, concept of PSW stacks and subroutines simple and Nested. PUSH, POP instructions and CALL/RETURN instruction. Stack manipulations, simple programs.

UNIT-4:

Interrupts - Concept and structure in 8085. Interrupt services routines. Advanced instructions and programming of 8085A.

UNIT-5:

Method of data transfer - serial, parallel, synchronous asynchronous, IN/OUT instructions. Timing diagrams, simple hardware interface to 8085 of standard Latches/Buffers/Keys/display devices as I/O ports. Handshaking concept. Architecture and interface of 8255 and 8253 to 8085.

UNIT-6:

Hardware considerations - bus contention. Slow memory interfacing complete signal description of 8085. Multiplexed Key board/Display interface and assembler directives. General awareness about micro computer system related products.

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Programming and interfacing 8085A	Gaonkar	Wiley Eastern
Programming of 8085	D.V. Hall	McGraw Hill
Microprocessor principals and Applications	Pal	Tata Mc Graw Hill
Reference Books		
Intel Microprocessors	Goody	Tata McGraw Hill
Microprocessors principals and Applications	Gomorra	Tata Mc Graw Hill

BEELE504P	MICROPROCESSOR & INTERFACING	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration

	25	25		50	Practical
BEELE505T	ELECTRICAL MACHINES-II	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
<p>This subject helps student to learn the</p> <ul style="list-style-type: none"> • Understand the basic principle, construction, operation, performance characteristics and steady state and transient analysis of synchronous machines. • Understand the principle, construction, operation, control and applications of special electric motors. 	<ul style="list-style-type: none"> • The student has understood principle, construction, laying of armature and field windings, types, generation of emf, steady state and transient behavior, synchronization and parallel operation of synchronous generators • The student has understood principle, construction, methods of starting of synchronous motor, its operation with variable load, operation with variable excitation, performance evaluation. • The student has understood special motors, like Repulsion, Hysteresis, Reluctance, Universal and Schrage motors.

UNIT-1: THREE PHASE SYNCHRONOUS MACHINES

Introduction, constructional features of cylindrical and salient pole rotor machines, introduction to armature winding and field windings MMF of armature and field windings induced EMF. (9 Hrs)

UNIT-2: STEADY STATE OPERATION OF THREE PHASE SYNCHRONOUS MACHINES:

Phasor diagram, voltage regulation using synchronous impedance and Potier triangle method, steady state performance of three phase synchronous machines, circle diagrams. (9 Hrs)

UNIT-3: SYNCHRONIZATION:

Parallel operation, experimental determination of parameters (positive sequence reactance, negative sequence reactance, Zero sequence reactance, short circuit ratio, losses and efficiency. (9 Hrs)

UNIT-4: SYNCHRONOUS MACHINES ON INFINITE BUS

Phasor diagram, expression for torque, load / torque angle, synchronous machine operation, effects of variable excitation and power input on generator operation and effect of variable excitation and load on motor operation. (10 Hrs)

UNIT-5: TRANSIENT BEHAVIOR

Sudden 3-phase short circuit. Transient and sub-transient reactance's and their measurement. Time constant and equivalent circuit diagram, hunting & damper windings. (10Hrs)

UNIT-6: INTRODUCTION TO SPECIAL MACHINES:

Repulsion motors, AC series motors, universal motors, reluctance motor, hysteresis motor, brushless dc motor, power selsyns, position selsyns (only elementary aspects are expected). (8Hrs)

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Electrical Machine	Dr.P.K.Mukherjeeand S. Chakravarti	Dhanpat Rai
Electrical Machinery	Nagrath and Kothari	3 rd , Tata Mcgraw Hill
Generalised Theory of Electrical Machinery	P.S. Bhimbra	Tata Mcgraw Hill
Reference Books		
Electrical Machinery	Fitzgerald and Kingsley and Kusco	McGraw Hill
Electrical Machinery	P. S. Bhimbra	

BEELE505P	ELECTRICAL MACHINES-II	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	College Assessment	University Examination	Total		Univ. Exam. Duration
	25	25	50		Practical

BEELE506P	ELECTRICAL DRAWING & SIMULATION	L = 0	T = 0	P = 2	Credits = 2
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	25	25		50	Practical

Objective: -

Drawings are the powerful tools used by Engineers to represent the concepts on paper. Conventional drawing methods are time consuming & difficult to edit. With the availability of powerful package for drawing and analysis of Electrical Systems, need is being felt to introduce this practical to converse the Electrical Engineering students with the latest trends in drawing, designing & analysis*.

Efforts should made to make this as practically oriented as possible so that the students are not only able prepare the drawing, but also have fair insight into the different aspects of the components of the electrical systems.

The packages suggested are only as guidelines. Similar other packages may also be used to achieve **objectives & scope.**

* Detailed analysis is not expected.

SCOPE:

Line diagram single phase, three phases of a factory layout and a substation.

1. Drawing & layouts of DP structures and its components, insulators & bushings, substation assemblies, indoor/outdoor, plinth/pole mounted transformers/switchgears, cable layouts, transmission towers & transmission systems, winding diagrams for motors.
2. General arrangement diagram of power & motor control centers, schematic/single line diagrams of electrical/electronic/illumination layout in industry/office/house, flow charts.
3. Circuit's simulation(Voltage, Current, Power etc.).

Softwares Proposed: - MATLAB, PSCAD, ETAP, PSIM, Power World Simulator, VISIO, AUTOCAD

BEELE507P	ELECTRICAL ENGINEERING WORKSHOP	L = 0	T = 0	P = 2	Credits = 2
Examination Scheme	College Assessment	University Examination	Total	Univ. Exam. Duration	
	25	25	50	Practical	

VI – SEM. ELECTRICAL ENGG.

BEELE601T	POWER STATION PRACTICE	L = 3	T = 1	P = 0	Credits = 4
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
<ul style="list-style-type: none"> To understand different sources of energy, methods of energy conversion, economics of generation, load survey, fixation of tariffs for all types of power generating stations and to study voltage control for AC generator. 	On completion of this course student will be able to <ul style="list-style-type: none"> Work in Power Generation plant. To calculate the tariff for different customers.

UNIT-1:

SOURCES OF ELECTRICAL ENERGY: - Coal, oil and natural gas water power, nuclear fission and fusion, their scope and potentialities for energy conversion.

Generation: - different factors connected with a generating station, connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity and utilization factor, load curve, load duration curve, load survey, base load and peak load station, advantages of interconnection. 10 Hrs

UNIT-2:

THERMAL STATIONS: - Choice of site, location, size and number of units, general layout, major equipment, essential and non-essential auxiliaries, electric supply to auxiliaries, cost of generation, factors affecting costs of generation. 10 Hrs

UNIT- 3:

HYDRO STATION: - Hydrology, stream flow, flow duration curve, power duration curve, mass curve, reservoir capacity, type of hydro plants and their field of use, pumped storages plants and their utility, surge tanks, governing characteristics of turbine and hydro generators. 10 Hrs

UNIT-4:

NUCLEAR STATION : - Principle of Nuclear energy, materials, types of nuclear reactors, breeder reactors, location, material for moderator and control rods, cost economics. 8 Hrs

UNIT-5:

VOLTAGE CONTROL OF A.C. GENERATOR : - Exciter instability, methods of stabilizing exciter voltage, Automatic voltage regulator action.

Tariff – different consideration of flat rate and two part economical choice. 8 hrs

UNIT-6: COGENERATION, CAPTIVE POWER GENERATION & SUSTAINABLE DEVELOPMENT

Definition and scope, cogeneration technologies, industries suitable for cogeneration, captive generation advantages and constraints, captive generation options, type of captive power plants, financing of captive power plants, Energy problems, prospects of changes in energy supply, agenda for sustainable development. 8Hrs

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Elements of Power Station design	M.V. Deshpande	PHI
Energy Conversion and power generation	L.D. Agrawal and G.K. Mittal	Khanna
Generation of Electrical Energy	B. R. Gupta	S. Chand
Reference Books		
Electric power stations	Car	
Electric power system control	H.P. Young	Chapman and Hall
Generating Stations	Lowels	

BEELE602T	ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT	L = 3	T = 1	P = 0	Credits = 4
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
<ul style="list-style-type: none"> Every engineer has to manage the things during his working. This subject helps student to understand material, production, personnel, finance and marketing management. 	<ul style="list-style-type: none"> After the completion of course the students will be able to manage the thing economically.

UNIT-1:

Demand utility and indifference curves, Approaches to analysis of demand, Elasticity of demand, Measures of demand elasticity, factors of production. Advertising elasticity, Marginalism.

UNIT-2:

Laws of returns and costs, Price and output determination under perfect competition, monopoly, Monopolistic competition, oligopoly, Depreciation and methods for its determination.

UNIT-3:

Function of central and commercial banks inflation, deflation, stagflation, Direct and Indirect taxes monetary and cycles, New Economic Policy, Liberalization, Globalization, Privatization, Market friendly state.

Fiscal policy of the government, Meaning and phases of business.

UNIT-4:

Definition, nature and scope of management function of management – planning, organizing, Directing, Controlling, Communicating.

UNIT-5:

Meaning of Marketing managements, concepts of Marketing. Marketing Mix, Administrative and cost plus pricing, Channels of distribution, Advertising and sales promotion.

UNIT-6:

Meaning, nature and scope of financial management, Brief outline of profit and loss account, balance sheet, Budgets and their importance, Ratio analysis, Principles of costing.

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Modern Economics	H.L. Ahuja	
Monetary Economics	M.L. Seth	
Industrial Management	I.K. Chopde, A.M. Sheikh	
Business Organization and Management	S.A. Sherlekar	
Reference Books		
Modern Economic Theory	K.K. Dewett	
Managerial Economics	Joel Dean	
Economics	Samuelson	

BEELE603T	ELECTRICAL DRIVES & THEIR CONTROL	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objective	Learning Outcomes
<ul style="list-style-type: none"> To understand the starting, speed control/braking, heating and cooling characteristics of electric motors and to learn the necessity of flywheel. To learn the basics of Programmable Logic Controllers and become familiar with Ladder Programming. To Study the motors used in Electric Traction. 	<p>The student will develop an ability</p> <ul style="list-style-type: none"> To solve numericals on starting, speed control and braking. To solve numericals on heating and cooling of motors. It will lay the foundation for studying the advanced subject Power Semiconductor based drives to be studied in 8th semester. to work on the drives used in the Industry. to work with PLC's in the Industry will gain an insight in the working of drives used in traction.

UNIT-1;

Definition classification and speed torque characteristics of common drive motors and their characteristics under starting, running, braking and speed control. 8 Hrs.

UNIT-2:

SELECTION OF MOTOR: Power capacity for continuous and intermittent periodic duties flywheel effect. 10 Hrs

UNIT-3:

PLC, its Programming and its application in electrical drives. 8 Hrs.

UNIT-4:

AC AND DC CONTACTORS AND RELAYS: Lock out contactors, magnetic structure, operation arc interruption contactor rating, H.V. contactors, control circuits for automatic starting and braking of DC motor and three phase induction motor. Control panel design for MCC. 10 Hrs

UNIT-5:

TRACTION MOTORS: Motors used in AC/DC traction, their performance and desirable characteristics, requirements and suitability of motor for traction duty. Traction motor control – control of DC traction motor. Series parallel control with numerical starting and braking of traction motor. 10Hrs

UNIT-6:

Brief idea about drives commonly used in industries. Digital control of electric motor. Block diagram arrangement, comparison with other methods of control. 8 Hrs

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
A course in Electrical Power	Soni, Gupta and Bhatnagar	
Modern Electrical Traction	H. Pratap	
Art and Science of Utilization of Electrical Energy	H. Pratap	
Magnetic Control of Industrial motors	Heumann	
Industrial Electronics	Petru Zula	McGraw Hill
Industrial Electronics	Bhattacharya	
Basic course in Electrical Drives	S. K. Pillai	

BEELE604T	POWER ELECTRONICS	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objectives	Learning Outcomes
<p>To introduce students the basic theory of power semiconductor devices and their practical application in power electronics.</p> <p>To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.</p> <p>To provide the basis for further study of power electronics circuits and systems.</p>	<p>A student who successfully fulfills the course requirements will be able to</p> <ul style="list-style-type: none"> • understand basic operation of various power semiconductor devices. • understand the basic principle of switching circuits. • analyze and design an AC/DC rectifier circuit. • analyze and design DC/DC converter circuits. • analyze DC/AC inverter circuit. • understand the role power electronics play in the improvement of energy usage efficiency and the development of renewable energy technologies.

Unit 1: SCR and Its characteristics: Gate characteristics, SCR turn off, ratings, series and parallel connections of SCRs, Protection of SCR gate circuit protection, over voltage and over current protection, snubber circuit design, commutation methods. 10 Hrs

Unit 2: Static controllable switches: Characteristic and working of MOSFET Gate turn off thyristor and insulated gate bipolar transistor, Triac, AC regulator, Uni-junction transistors, Triggering circuits and optocouplers. 8 Hrs

Unit 3: Line commutated converters: Working of single pulse converter, two pulse midpoint converter, three pulse midpoint converter and 3 phase six pulse bridge converter, effect of source inductance in converters, effect of freewheeling diode. 8 Hrs

Unit 4: Single phase and three phase half controlled converters: Speed control of d.c. motors using line commutated converters. Power factor improvement methods, Cyclo-converters (single phase), dual converter. 8 Hrs

Unit 5: D.C. Choppers: Principles of step down chopper, step up chopper classification, impulse commutated and resonant pulse choppers. Multi phase choppers. Application of choppers, Inverters: Basic series resonant inverter, half bridge and full bridge series resonant inverters. 10 Hrs

Unit 6: Single phase and three phase bridge inverters, commutation and trigger-circuits for forced commutated thyristor inverters. Output voltage control, Harmonics in output voltage waveform, Harmonic attenuation by filters. Harmonic reduction by pulse width modulation techniques. Analysis for pulse width, modulation. Working of current source inverters few applications of inverters. 10 Hrs

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Power Electronics circuits Devices and Applications	M. H. Rashid	Prentice Hall India
Power Electronics	Ned Mohan, T.M. Undeland and W.P. Robbins	John Wiley and Sons, Inc
Thyristors and their Applications	G.K. Dubey and Doralda, Joshi and Sinha	New Age
Power Electronics	Khanchandani	Tata McGraw Hill
Power Electronics	P. C. Sen	
Reference Books		
Power Electronics	C.W. Lander	

BEELE604P	POWER ELECTRONICS	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	25	25		50	Practical

EELE605T	CONTROL SYSTEM - I	L = 4	T = 1	P = 0	Credits = 5
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	20	80		100	3 Hrs

Learning Objectives	Learning Outcome
<ul style="list-style-type: none"> To impart knowledge of modeling and stability analysis of linear time-invariant system. To understand the stability, time domain specifications and tools To study frequency domain analysis of linear system An introduction to state space approach.	<ul style="list-style-type: none"> Model the linear systems and study the control system components specifications through classical and state variable approach. Understand the time response and time response specifications. Analyze the absolute stability Analyse the relative stability through root locus method Frequency response tools like bode plot and nyquist plot Understand the introductory concepts of state variable approach

UNIT-1

Introduction to need for automation and automatic control. Use of feedback, broad spectrum of system application. Mathematical modeling (Electrical & Electromechanical) differential Equation, Transfer functions, block diagram, signal flow graph. 10Hrs

UNIT-2

Effect of feedback on parameter variations, disturbance signal, Control system components electrical, electromechanical, their functional analysis and input output representation. Servomechanism. 8Hrs

UNIT-3:

Time response of system, standard inputs, first order and second order system, concept of gain and time constant. Steady state error, type of control system, approximate methods for higher order system, PD, PI, PID controllers. 8Hrs

UNIT-4:

Stability of control systems, condition of stability, characteristics equation, Routh Hurwitz criterion, special cases for determining relative stability.

Root location and its effect on time response, elementary idea of root locus, effect of addition of pole and zero on proximity of imaginary axis. 10 Hrs

UNIT-5:

Frequency response method of analyzing linear system, Polar, Nyquist and Bode plot, stability and accuracy analysis from frequency response, open loop and close loop frequency response, effect of variation of gain and addition of pole and zero on response plot, stability margin in frequency response. 10 Hrs

UNIT-6:

State variable methods of analysis, characteristics of system state. Choice of state variables, representation of vector matrix differential equation, standard form, relation between transfer function and state variables. 8 Hrs

BOOKS:-

Text Books		
Title of Book	Name of Author/s	Edition & Publisher
Modern control system Engineerring	K.Ogatta	Prentice Hall,India
Control System Analysis	Nagrath/Gopal	New age International
Automatic Control Systems	B.C. Kuo	Prentice Hall,India
Control System Engineering	S. K. Bhattacharya	Pearson
Reference Books		
Linear System Design	D' azzo and Houpis	McGraw Hill
Control Systems, Principles & Design	M. Gopal	TMH (Tata McGraw Hill)
Control Systems Engineering	Samarajit Ghosh	Pearson

Practical:

Based on above syllabus. At least two practical should be set using related software.

BEELE606P	INDUSTRIAL VISITS & REPORT WRITING	L = 0	T = 0	P = 2	Credits = 2
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	50	0		50	

Expected work from each student in this practical :-

1) Power point presentation on visited industry

2) Report must contain:-

Single line diagram of the establishment

Electrical Installations available in the establishment

List of Loads available with ratings of equipments

Types of load (continuous, intermittent etc.)

Analysis of Energy Bill

Any problems identified / discussed

BEELE607T FUNCTIONAL ENGLISH

BEELE607T	FUNCTIONAL ENGLISH	L = 2	T = 0	P = 0	Credits = 2
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	10	40		50	2 Hrs

Syllabus

Total Credits: 02

Teaching Scheme

Theory: 2 hrs per week

Duration of University Examination :2 hrs

Examination Scheme

T (University): 40 marks

T (Internal): 10 marks

Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure

Unit 1. Functional Grammar:

(4 hours)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs.

[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

Unit II. English for Competitive Exams & Interview Techniques:

(6 hours)

IPA (vowel & consonant phonemes), Word building (**English** words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment : [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III. Formal Correspondence

(4 hours)

Business Letters, e-mail etiquettes [Orders, Complaints , Enquiries, Job applications and Resume Writing ,Writing Memorandum, Circulars, notices]

Unit IV. Analytical comprehension:

(4 hours)

[Four fictional & four non-fictional unseen texts]

Unit V. Technical & Scientific Writing:

(6 hours)

Features of Technical Writing, Writing Scientific Projects, Technical Report writing, Writing Manuals, Writing Project Proposals, Writing Research papers.

Assignment: (Any one project/review as assignment)

RECOMMENDED BOOKS

- **Reference Books:**

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal , Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober , Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5



Rashtrasant Tukadoji Maharaj Nagpur University

Formerly Known as Nagpur University



PROPOSED SCHEME OF EXAMINATION FOR FIFTH SEMESTER BACHELOR OF ENGINEERING

(ELECTRONICS & COMMUNICATION/ELECTRONICS & TELECOMMUNICATION ENGINEERING)

Sub Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Internal	University	Internal	University	
BEECE501T/ BEETE501T	Electronics	Antenna & Wave Propagation	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE502T/ BEETE502T	Electronics	Microprocessor & Microcontroller	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE502P/ BEETE502P	Electronics	Microprocessor & Microcontroller	0	2	0	2	0	1	0	1	0	0	25	25	50
BEECE503T/ BEETE503T	Electronics	Analog Circuits & Design	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE503P/ BEETE503P	Electronics	Analog Circuits & Design	0	2	0	2	0	1	0	1	0	0	25	25	50
BEECE504T/ BEETE504T	Electronics	Communication Electronics	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE504P/ BEETE504P	Electronics	Communication Electronics	0	2	0	2	0	1	0	1	0	0	25	25	50
BEECE505T/ BEETE505T	Applied Science & Humanities	Industrial Economics & Entrepreneurship Development	4	0	0	4	4	0	0	4	20	80	0	0	100
Total			20	6	4	30	20	3	4	27	100	400	75	75	650



Rashtrasant Tukadoji Maharaj Nagpur University

Formerly Known as Nagpur University



PROPOSED SCHEME OF EXAMINATION FOR SIXTH SEMESTER BACHELOR OF ENGINEERING

(ELECTRONICS & COMMUNICATION/ELECTRONICS & TELECOMMUNICATION ENGINEERING)

Sub Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Inter nal	Unive rsity	Inter nal	Univer sity	
BEECE601T/ BEETE601T	Electronics	Telecommunication Switching Systems	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE602T/ BEETE602T	Electronics	Digital Signal processing	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE602P/ BEETE602P	Electronics	Digital Signal processing	0	2	0	2	0	1	0	1	0	0	25	25	50
BEECE603T/ BEETE603T	Electrical	Control System Engg.	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE604T/ BEETE604T	Electronics	Digital Communication	4	0	1	5	4	0	1	5	20	80	0	0	100
BEECE604P/ BEETE604P	Electronics	Digital Communication	0	2	0	2	0	2	0	2	0	0	25	25	50
BEECE605T/ BEETE605T	Applied Science & Humanities	Functional English	2	0	1	3	2	0	1	3	10	40	0	0	50
BEECE606P/ BEETE606P	Electronics	Electronics Workshop Practice	0	2	0	2	0	2	0	2	0	0	25	25	50
BEECE607P/ BEETE607P	Electronics	Industrial Visit	0	2	0	2	Audit Course			0	0	0	G	0	0
Total			18	8	5	31	18	5	5	28	90	360	75	75	600

B. E. Fifth Semester
(Electronics & Communication/ Electronics & Telecommunication Engg.)
Antenna & Wave Propagation

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEECE501T/BEETE501T

[4 – 0 – 1 – 5]

Objectives:

1. To study transmission line characteristics.
2. To study the basics of radiating elements and effect of propagation of radio waves in actual environment.
3. To study the antennas, their principle of operation, analysis and their applications.
4. To study the features of Antenna array, Microstrip antenna and reflector antenna.
5. To study designing aspects of Antenna.

Outcome:

At the end of the course the students shall be able to:

1. Describe transmission line characteristics.
2. calculate antenna parameters (radiation pattern, beam width, lobes, directivity, gain, impedance, efficiency, polarization)
3. Analyze wire antennas (monopoles, dipoles, and loops).
4. Analyze and design antenna arrays.
5. Describe the operation of broadband and traveling wave antennas.
6. Describe the operation of aperture and reflector antennas.
7. Analyze and design Microstrip antennas.

Unit I: Transmission Lines

(12)

Transmission line equations and their solution , transmission line parameters, characteristics impedance, propagation constant, attenuation constant and phase constant, waveform distortion , distortionless transmission lines, loading of transmission lines, reflection coefficient and VSWR, Equivalent circuits of transmission lines, transmission lines at radio frequency, open and short circuited lines, smith chart, stub matching.

Unit II: Linear wire antennas

(12)

Infinitesimal dipole, its radiation field, radiation resistance, radiation sphere, near field, far field directivity, small dipole, finite length dipole, half wave length dipole, linear elements near or on infinite perfect conductors, ground effects and their application, folded dipole

Loop Antenna:

Small loop, comparisons of small loop with magnetic dipole, radiation pattern its parameters and their application

Unit III: Arrays**(10)**

Linear arrays, planer arrays and circular arrays. Array of two isotropic point sources, non – isotropic sources, principle of pattern multiplication, linear arrays of n elements, broadside, End fire, radiation

Pattern, directivity, Beam width and null directions, array factor, Antenna analysis using Dolph-Tschebyscheff, the Log-periodic antenna, the composite Yagi-Uda-Corner-Log-Periodic array

Unit IV: Microstrip antennas**(08)**

Radiation Mechanism of Microstrip antenna, feeding methods, methods of analysis, Multiband Microstrip antenna for Mobile Communication, Circularly Polarized Patch antenna, Rectangular & circular patch, Circular polarization and feed network.

Unit V: Reflector antennas**(06)**

Simple reflectors, the design of a shaped Cylindrical reflector, Radiation patterns of Reflector Antennas, Dual shaped Reflector Systems Plane reflector, Corner reflector, horn antenna, aperture antenna.

Unit VI: Antenna Measurements**(12)**

Reciprocity in antenna Measurements, Near-Field & Far-Field, Co-ordinate System, Sources of Error in antenna measurements, measurement ranges, measurement of different antenna Parameters, antenna ranges, radiation pattern, Gain and directivity, Polarization

Radio Wave Propagation: Atmosphere of Earth, Terrestrial Propagation of Electromagnetic waves, Fading, Noise and interference, Ground wave propagation, Ionospheric propagation

Books:**Text Books:**

1. Antenna Theory analysis and design – Costantine A. Balanis, John Wiley publication
2. Antenna and Wave propagation, - K.D. Prasad, Satya Prakashan
3. Electromagnetic – Jordan Balmann, Prentice Hall of India publication
4. Antenna Theory and Design , Robert S. Elliott , Wiley Student Edition
5. Electromagnetic Waves- R. K. Shevgaonkar

Reference Books:

1. Antenna & Wave Propagation , Sisir K Das, Mc Graw Hill
2. Harish A. R., Antenna and wave Propagation, Oxford University Press
3. Antennas and Radio Propagation, R.E. Collins, Mc Graw -Hill

B. E. Fifth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE502T/ BEECE502T/ BEETE502T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study fundamentals of microprocessor and microcontroller systems.
2. To study architecture of microprocessor & to understand the concept of memory organization, stack memory, Assembly language programming.
3. To study different interrupt techniques.
4. To study interfacing of microprocessor & microcontroller with different peripheral devices.

Outcome:

After completing this course students shall be able to:

1. Describe internal organization of 8086/8088 microprocessors & 8051 microcontrollers.
2. Describe the concept of addressing modes and timing diagram of Microprocessor.
3. Interface 8086 & 8051 with Keyboard/ Display, ADC/DAC, Stepper motor etc.
4. Demonstrate the concept of interrupts and its use.
5. Demonstrate the concept of Serial & parallel data communication
6. Describe Handshaking concept and interfacing with peripheral devices.
7. Describe the concept of DMA & Pentium.
8. Describe 8087 Numeric coprocessor & its use in practical application.
9. Interface various hardware with microprocessor.

Unit I: Intel 8086/8088 microprocessor & Programming:

(09)

8086/8088 microprocessor, Pin diagram, Architecture, features and operating modes, Clock generator 8284, memory organization & interfacing, Addressing modes, complete instruction set.

Unit II: 8086 & Peripheral Interfacing I:

(11)

Assembly language programming of 8086, Interrupt structure, I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Organization, Working modes, command words & interfacing.

Unit III: 8086 & Peripheral Interfacing II:

(10)

Programmable interval timer/counter 8254; Architecture, working modes, interfacing 8259 PIC,

Organization, control words, interfacing, cascading of 8259's. Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.

Unit – IV: Numeric Co-processor & DMA Controller:**(10)**

8086 maximum mode pin diagram, Closely coupled & loosely coupled multiprocessor system, 8087 Numeric coprocessor, architecture, interfacing with 8086, instruction set. DMAC 8237, Architecture, interfacing & programming, Introduction to Pentium.

Unit – V: 8051 microcontroller & programming:**(10)**

Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051. 8051 Interrupt structure, Interrupt vector table with priorities, enabling & disabling of interrupts

Unit – VI: 8051 microcontroller interfacing:**(10)**

Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes, Assembly language programming examples, counter/timer programming in various modes. Serial communication, Operating modes, serial port control register, Baud rates. I/O expansion using 8255, Interfacing keyboard, LED display, ADC & DAC interface, stepper motor interface

Books:**Text Books:**

1. Programming & Interfacing of 8086/8088, D.V. Hall, TMH.
2. Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson
3. M.A. Mazidi & J.G. Mazidi, the 8051 Microcontroller and Embedded system, 3rd Indian reprint, Pearson Education
4. The Intel Microprocessor 8086 & 80486 Pentium and Pentium Pro. Architecture Programming and Interfacing – Brey.

Reference Books:

1. Intel Reference Manuals, Microprocessors & Microcontrollers: Intel
2. Microcontrollers – Peatman, Mc Graw Hill.
3. Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.
4. 8086/8088 Microprocessors, Walter Triebel & Avtar Singh
5. Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh, P. R. Sridhar, PHI Publication.
6. The 8051 Microcontroller & Embedded Systems, Kenneth J. Ayala, Dhanvijay V. Gadre, CENGAGE Learning.

B. E. Fifth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE502P/ BEECE502P/ BEETE502P

[0 – 2 – 0 – 2]

Objectives:

1. To perform a practical based on microprocessor and microcontroller based system.
2. To study assembly language programming skills.
3. Interface different peripherals with microprocessor and microcontroller with its use.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate the concept of Assembly languages structure and programming.
2. Interface various peripherals with 8086 and 8051.
3. Simulate the programs on different software platforms.

Any TEN practicals are to be conducted.

List of Experiments:

1. Study of 8086 microprocessor.
2. Write and execute 8086 assembly Language Programs to multiply two 16 bit numbers.
3. Write and execute 8086 assembly Language Programs to divide 16 bit number by 8 bit number.
4. Write and execute 8086 assembly Language Programs to search a look-up table for a byte (make use of XLAT)
5. Write and execute 8086 assembly Language Programs to compare two strings (use String instructions)
6. Write and execute 8086 assembly Language Programs to arrange the data bytes in ascending/descending order.
7. Write and execute 8086 assembly Language Programs to generate Fibonacci series and store it from memory location 0050H.
8. Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
9. Write and execute 8051 assembly language program to exchange two data strings.
10. Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port.
11. Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED's.
12. Interface 8255 with 8086 microprocessor and write a program to rotate the stepper motor.

13. Interface 8253 with 8086 microprocessor and write a program to generate square waveform.
14. Interface 8279 with 8086 microprocessor and write a 8086 instructions to initialize 8279 (for a task as per the user's requirement).
15. Interface of ADC using 8255 with 8086 and write a program to convert analog signal input into its equivalent digital value and store it in memory locations.

Note: Few programs should be based on MASM / Simulator. Minimum 4 interfacing experiments should be conducted.

B. E. Fifth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE503T/ BEECE503T/BEETE503T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic characteristic, construction, open loop & close loop operations of Op-Amp.
2. To study linear and non linear applications of Op-Amp.
3. To study the design of Electronic Circuits for Oscillator, Multivibrator and Active Filters
4. To enable students to design regulated power supply using regulated ICs

Outcome:

After completing this course students shall be able to:

1. Describe the basic differential Amplifier using transistor and its operation & characteristic.
2. Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
3. Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
4. Analyze and design amplifier circuits, oscillators, Filter, regulated power supply

Unit I: OP-Amp Fundamentals:

(8)

Block diagram of OP-Amp (Basic Building Blocks), Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting and Non-inverting configurations and design, concepts of virtual short and ground.

Unit II: OP-Amp Linear Applications:

(10)

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), Peak detector, Log and antilog amplifiers using OP-Amp & Transistor and analog multipliers.

Unit III: OP-Amp Non-Linear Applications:

(12)

Comparators, Schmitt trigger, Comparator IC such as LM 339, Clipper and Clamper, Precision Rectifier, PLL Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, Sample/Hold circuits, D/A (R/R) & A/D conversion circuits (Successive Approximation Method), design of ADC using 0804 ICs.

Unit IV: Design of Power supply system: (09)

Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78xx and 79xx, protection circuits for regulators, Design of SMPS (Buck & Boost)

Unit V: Design of sinusoidal oscillators & Function generator: (09)

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley, Colpitts oscillator, and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of function generators.

Unit VI: Design of Filters & Drivers: (12)

Advantages of active filters, Design of Butterworth Active Filter, Design of Active filter of LPF, HPF, BPF of 1st order, 2nd and higher order (up to 6th order) Butterworth filter.

Design of Relay driver circuit, Design of stepper motor control circuit, Design of Dc servo motor control circuit

Books:

Text Books:

1. Operational Amplifier and Applications: R. Gayakwad.
2. Monograph on Electronic circuit Design: Goyal & Khetan.
3. Franco: Designing with Op-Amps (McGraw Hill).

Reference Books:

1. Linear Integrated Circuits Marnall I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Dailey: Operational Amplifier (Tata McGraw Hill).
4. Regulated Power supply Handbook. Texas Instruments.
5. Electronics: BJT's, FETS and Microcircuits – Anielo.
6. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

B. E. Fifth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25Marks

Subject Code: BEENE503P/ BEECE503P/BEETE503P

[0 – 2 – 0– 2]

Objectives:

1. To learn about various types of analog systems.
 2. To study the practical aspects of linear and non-linear applications of OP-AMP.
 3. To design the oscillators using OP-AMP and Transistors.
 4. To study frequency response of different circuits based on operational amplifier.
-

Outcome:

At the end of the course the students shall be able to:

1. Gain a sound understanding of the operation, analysis and design of analog electronic circuits and systems
 2. Design linear and nonlinear applications of operational amplifier.
 3. Design the oscillators and other complex circuits using op amp ICs.
 4. Demonstrate the gain-bandwidth concept and frequency response of basic amplifiers.
-

Any TEN practicals are to be conducted

LIST OF EXPERIMENTS

1. (A)Design Non-Inverting OP-AMP and measure the gain and plot the input/output waveforms.
(B)Design Inverting OP-AMP and measure the gain and plot the input/output waveforms.
2. Plot the Frequency response of Inverting and Non-inverting amplifiers.
3. Implementation of Op-Amp as adder & subtractor.
4. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
5. To design OP-AMP as Schmitt trigger for generating a waveform of specific pulse width.
6. To design OP-AMP as peak detector.
7. To design OP-AMP as Precision rectifier and plot the waveforms.
8. To Verify Op-amp parameters (1) CMRR (2) Slew Rate.
9. To Verify and simulate Clipper circuit using IC 741.
10. Design and verify Multivibrator circuits using IC 555.

11. To study Phase Lock Loop using IC 565.
12. To study OP-AMP as Clippers & Clampers.
13. Design RC oscillator using OP-AMP and calculate its frequency.
14. Design transistorized LC oscillator and calculate its frequency.
15. Design first & second order low pass Butterworth filter.
16. Design first & second order high pass Butterworth filter.
17. Design of series voltage regulators.
18. Design of Driver Circuit for DC servomotor/Relays.
19. Design of control circuit for stepper motor.

Note: Simulate results using simulation software for at least four experiments.

B. E. Fifth Semester

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE504T/ BEECE504T/BEETE504T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic concept of communication and different modulation system based on basic parameters.
 2. To study the concept of noise, properties & its effects.
 3. To study the AM, FM, PM process & compute modulation Index.
 4. To study the fundamentals of AM and FM Receivers.
 5. To develop knowledge about fundamentals of Broadband Communication Systems.
-

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate a basic understanding of the term bandwidth and its application in communications.
 2. Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and angle modulation and demodulation of analog signals etc.
 3. Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
 4. Compare different modulation techniques of Generation of FM (Direct & Indirect Method)
 5. Identify, formulate & solve communication engineering problems.
-

Unit I: Amplitude (Linear) Modulation

(08)

Base band & Carrier communication, Introduction of amplitude modulation, Equation of AM, Generation of AM (DSBFC) and its spectrum, Modulation Index , Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Non linear generation, switching modulator, Ring modulator & its spectrum, SSBSC, ISB & VSB, their generation methods & Comparison, AM Broadcast technical standards.

Unit II: Angle Modulation

(12)

Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), Comparison of FM and PM.

Unit III: Pulse Modulation

(10)

Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Analog modulation: PAM PWM & PPM.

PCM – Generation & reconstruction, Bandwidth requirement of PCM. Differential PCM, Delta Modulation & Adaptive DM. (Only Block diagram treatment).

Unit IV: Noise**(10)**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem Connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

Unit V: AM and FM Receivers**(10)****Communication Receiver, Block Diagram & special Features**

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Pre-emphasis, De-emphasis

AM Detection: Rectifier detection, Envelope detection, Demodulation of DSBSC: Synchronous detection, Demodulation of SSBSC.

FM Detection: Foster Seelay FM Detector & FM detection using PLL

Unit VI: Broadband Communication Links & Multiplexing:**(10)**

Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

Short and Medium Haul Systems: Coaxial Cables, Fiber optic links, Microwave Links, Tropospheric scatter Links.

Long Haul Systems: Submarine cables.

Books:**Text Books:**

1. Kennedy & Devis : Electronic Communication Systems , Tata McGraw Hills Publication(Fourth Edition)
2. Dennis Roddy & Coolen - Electronic Communication, PHI (Fourth Edition)
3. B. P. Lathi: Modern Digital and Analog. Communication Systems: Oxford Press Publication (Third Edition)

Reference Books:

1. Simon Haykin: Communication Systems, John Wiley & Sons (Fourth Edition)
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
3. Leon W.Couch, II: Digital and Analog Communication Systems, Pearson Education (Seventh Edition)
4. Electronic Communication Systems, Roy Blake, CENGAGE Learning.

B. E. Fifth Semester

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE504P/ BEECE504P/BEETE504P

[0 – 2 – 0 – 2]

Objectives:

1. To perform practical based on analog and digital modulation techniques.
 2. To study the analysis of AM and FM receivers.
 3. To study ASK, FSK and PSK techniques.
 4. To perform Matlab based practical for different modulation techniques.
-

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate different modulation techniques used in electronic communication system.
 2. Use the modulation techniques and modern communication tools necessary for various engineering applications.
 3. Evaluate fundamental communication system parameters, such as bandwidth power, signal to quantization noise ratio, data rate etc.
-

Any TEN practicals are to be conducted

List of Experiments:

1. To generate Amplitude Modulated wave using different techniques and plot its waveform.
2. To study different AM detection techniques.
3. To measure Noise Figure.
4. To generate Frequency Modulated wave using different techniques and plot its waveform.
5. To study different FM Detection Techniques.
6. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms. Observe the demodulated output.
7. To generate Pulse Width modulated signal and study PWM demodulation.
8. To generate Pulse Position modulated signal and study Pulse Position Demodulation.
9. To study Single side band (SSB) Transmission & Reception
10. To study Double Side Band (DSB) Transmission & Reception
11. To study generation of SSB-SC using balanced modulator
12. To study generation of DSB-SC signal.
13. To study DTMF Encoder Decoder

14. To perform Spectrum Analysis of AM & FM signals
15. To perform Time Division Multiplexing (TDM).
16. To study Pre-Emphasis and De-Emphasis
17. To study Super heterodyne Receiver
18. To study FM radio receiver circuit.
19. Simulation of Analog modulation techniques using MATLAB.
20. Simulation of Frequency modulation techniques using MATLAB.
21. To perform Pulse Code Modulation (PCM) using Simulation in MATLAB.

B. E. Sixth Semester
(Electronics & Communication/ Electronics & Telecommunication Engg)
TELECOMMUNICATION SWITCHING SYSTEMS

Duration: 3 Hrs.
College Assessment: 20 Marks
University Assessment: 80 Marks

Subject Code: BEECE601T/ BEETE601T

[4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the latest development of Telecommunication systems.
 2. To study the architecture and major design issues related to switching systems.
-

Outcome:

After completing this course students shall able to:

1. Describe the need for switching systems and their evolution from analogue to digital.
 2. Describe the Public Switched Telephone Network.
 3. Describe private networks.
 4. Describe integrated networks.
-

Unit 1: Telecommunication Switching Systems

(10)

Principles of manual switching system, electronic telephone, local and central battery system, trunk exchange, junction working. Automatic telephony: strowger exchange, line switches and selectors, ringing and tone circuit, subscriber unselector circuit, trunking diagram, cross bar switching system

Message switching, Circuit switching, manual switching and Electronic Switching. Digital switching: Switching functions, space division switching, time division switching, two dimensional switching, digital cross connect systems, digital switching in an analog environment.

Unit 2: Telecommunication Traffic

(10)

Unit of Traffic, Traffic measurement, a mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, systems with a single server, Queues in tandem, delay tables and application of Delay formulae. Analysis: Traffic Characteristics: Arrival Distributions, Holding time Distribution. Loss Systems: Lost calls cleared, lost calls returning, lost calls Held, lost calls cleared.

Unit 3: Switching Networks

(12)

Single Stage Networks, Gradings: Principle, Design of progressive grading, other gradings, Traffic capacity of gradings, Applications of gradings. Link Systems: General, Two stage networks, three stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, Call packing, Rearrangeable networks, Strict sense non blocking networks, Sectionalized switching networks Control of Switching Systems: Call processing Functions: Sequence of operations, Signal exchanges, State transition diagrams. Common Control, Reliability, Availability and Security.

Unit 4: Network Synchronization and Management

(08)

Timing: Timing Recovery, Clock Instability, Elastic Stores, Jitter measurements, systematic jitter. Timing Inaccuracy: Slips, Asynchronous Multiplexing, Waiting time jitter. Network Synchronization: Plesiochronous, pulse stuffing, mutual synchronization, Network master, Master – Slave synchronization, Hierarchical synchronization Processes. Network management: Routing control, Flow control.

Unit 5: Networks

(10)

Data Networks: Data Transmission in PSTN, Data Communication Architecture, Link to link layers, End to End layers, Satellite based Data networks, LANs, MANs, Fiber optic networks, Data network Standards, Protocol stacks, Interworking. Integrated Services Digital Networks: ISDN, Network and protocol Architecture, Transmission Channels, User network interfaces, signaling, Numbering and Addressing, ISDN Standards, Broadband ISDN, Voice Data Integration

Unit 6: Cellular Telephone Concepts

(10)

Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular System topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone calls processing. Cellular Telephone systems: Digital cellular telephone

Books:

Textbooks:

1. J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education
2. John C. Bellamy, "Digital Telephony", Third Edition; Wiley Publications
3. Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications
4. Wayne Tomasi, "Electronic Communications Systems"; 5th Edition; Pearson Education

Reference Books:

1. P.Gnanasivam, "Telecommunication Switching and Networks.
2. Rappaport, "Wireless communication"
3. Tannenbaum "Data communication and networks" 4th Edition, TMH

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL SIGNAL PROCESSING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE602T/ BEECE602T/ BEETE602T

[4 – 0 – 1 – 5]

Objectives:

1. To study the basic concepts of digital signal processing.
2. To study analysis and processing of signals for different kind of applications and retrieval of information from signals.
3. To understand the physical significance of circular convolution and its relation with linear convolution.
4. To study designing of digital filters and its realization.
5. To study analysis of signals using the discrete Fourier transform (DFT) and Z-Transform.
6. To study behavior of discrete time systems using Z-Transform.

Outcome:

By the end of the course the students shall be able to:

1. Represent discrete-time signals analytically and visualize them in the time domain.
2. Meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
3. Design and implement digital filter for various applications.
4. Describe the various transforms for analysis of signals and systems.
5. Describe the concept of multi rate signal processing and how to apply it for the wavelet transform.

Unit I: Introduction

(08)

Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data.

Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

Unit II: Z- Transforms

(08)

The Z-transform: Definition, properties of the region of convergence for the Z-transform, Z-transform properties, Inverse Z-transform, Parseval's theorem, unilateral Z-transform.

Unit III: Discrete and Fast Fourier Transforms

(12)

Definition and properties of DFT, IDFT, Relation between DFT and Z-Transform, Radix-2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

Unit IV: IIR Filter Design & Realization

(12)

Filter design methods – Approximation of derivatives, Impulse invariance, bilinear transformation, characteristics & designing of Butterworth, Chebyshev filters, frequency transformations, IIR filter structures- Direct form I-II, transpose form, parallel form, cascade, Lattice and Lattice-ladder structures.

Unit V: FIR Filter Design & Realization

(12)

Symmetric and antisymmetric FIR filters, Linear phase FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hanning, Hamming & Blackman), frequency sampling method, FIR differentiators, FIR filter structures.

Unit VI: Multirate DSP

(08)

Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by rational factor I/D, Sub band coding of speech signals and its applications, introduction to wavelet & wavelet transform, Introduction to DSP architecture TMS 320.

Books:

Text Books:

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.
2. A.V. Oppenheim, R.W. Schaffer, "Discrete Time Signal Processing", Pearson Education.
3. Rabiner Gold "Theory and Application of DSP", PHI
4. Texas Instruments and Analog Devices DSP Chip Manuals.

Reference books:

1. Digital signal processing- A practical approach Second Edition, 2002. E. C. Ifeachor, B. W. Jarvis Pearson Education
2. Sanjit K. Mitra, 'Digital Signal Processing – A Computer based approach'
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', 2nd Edition McGraw Hill.
4. A. Nagoor Kani, 'Digital Signal Processing', 2nd Edition McGraw Hill.
5. P. Ramesh Babu, 'Digital Signal Processing' Scitech

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL SIGNAL PROCESSING

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEENE602P/ BEECE602P/ BEETE602P

[0 – 2 – 0 – 2]

Objectives:

1. To understand principle & working of digital signal processing for various applications.
 2. To understand Z transforms and discrete time Fourier transforms for the analysis of digital signals and systems.
 3. To design and implement FIR & IIR filter and analysis of their frequency response.
-

Outcome:

At the end of the course the students shall be able to:

1. Analyze and process the signals in the discrete domain.
 2. Design the filters to suit requirements of specific applications.
 3. Apply the techniques, skills, and modern engineering tools like MATLAB and digital processors.
-

Any TEN practicals are to be conducted

LIST OF EXPERIMENTS

1. To plot and represent following basic discrete time signals using MATLAB functions. :
Unit impulse, unit step, ramp, real and complex exponential and its representations
2. To plot linear convolution of discrete signals using MATLAB functions.
3. Write a program to compute cross-correlation and auto-correlation of the given sequences with corresponding plot.
4. Write a program to test stability of given discrete- time system.
5. To find Z transform of discrete time signal and its ROC with corresponding plot.
6. To find inverse Z transform of given discrete time signal.
7. Write a program to find frequency response of given system.
8. To compute DFT and IDFT of discrete time signals.

9. Write a program to find FFT and IFFT of given sequences.
10. Compute linear and circular convolution using DFT / IDFT method
11. Designing of Digital IIR filter using MATLAB functions.
12. Designing of Digital FIR filter using window.
13. Designing of Digital FIR filter using GUI tool box.
14. To Study DSP Processor using TMS 5416 and TMS 6713 starter kits.
15. To perform linear convolution and circular convolution on Processor kit.
16. To designing and implementation of High pass filter on DSP processor.

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

CONTROL SYSTEM ENGINEERING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE603T/ BEECE603T/ BEETE603T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study the fundamental concepts of Control systems and mathematical modeling of the system.
2. To study the concept of time response and frequency response of the system.
3. To study controllers & compensators.
4. To study the basics of stability analysis of the system.

Outcome:

At the end of the course the students shall be able to:

1. Analyze various control systems.
 2. Represent the mathematical model of a system.
 3. Determine the response of different order systems for various step inputs.
 4. Analyze the stability of the system using Root locus. Bode plot, Nyquist plot.
 5. Obtain transfer function of systems using signal flow graph.
 6. Apply the state variable approach in design.
-

Unit I: Introduction and Modeling of control system

(11)

Introduction to need for automation and automatic control, use of feedback, Broad spectrum of system application. Mathematical modeling, Differential equations, transfer functions, block diagram, signal flow graphs, Effect of feedback on parameter variation, disturbance signal, servomechanisms. Control system components, Electrical, Electromechanical. Their functional analysis and input, output representation.

UNIT-II: Time Domain analysis

(09)

Time response of the system, first order & second order system, (standard inputs) concept of gain & time constant, steady state error, type of control system, approximate method for higher order system. Principles of P,PI,PD,PID controllers.

UNIT-III: Stability & Root Locus method

(11)

Stability: Stability of control systems, conditions of stability, characteristic equation, Routh Hurwitz criterion, special cases for determining relative stability.

Root Locus method: Root location and its effect on time response, elementary idea of Root Locus, effect of adding pole and zero and proximity of imaginary axis.

UNIT-IV: Frequency response analysis**(11)**

Frequency response method of analysing linear system, Nyquist & Bode Plot, stability & accuracy analysis from frequency response, open loop & closed loop frequency response.

Nyquist criteria, effect of variation of gain & addition of poles & zeros on response plot, stability margin in frequency response.

UNIT-V: Compensators**(08)**

Needs of compensations, lead compensations, Lag compensations, Lead-Lag compensations (theoretical concepts)

Overview of various transducers with their signal conditioning systems.

UNIT-VI: State variable approach**(10)**

State variable method of analysis, state choice of state representation of vector matrix differential equation, standard form, relation between transfer function and state variable.

Books:**Text Books:**

1. Control Systems Engineering, I.J. Nagrath, M. Gopal
2. Modern Control system (II Edition) – Katsuhiko Ogata
3. Control systems by Smarajit Ghosh (second Edition, Pearson Education)

Reference Book:

1. Automatic Control system (II Edition) – Benjamin C, Kuo, PHI
2. Modern Control System, Drof, Bishop, Wesly Publication
3. Control system Engineering, S.K. Bhattacharya, Pearson Education.

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL COMMUNICATION

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEENE604T/ BEECE604T/ BEETE604T

[4 – 0 – 1 – 5]

Objectives:

The Course Objectives are:

1. To study basic components of digital communication systems.
2. To understand the designing aspects of optimum receivers for digital modulation techniques.
3. To study the analysis of error performance of digital modulation techniques.
4. To study the designing of digital communication systems under given power, spectral and error performance constraint

Outcome:

After completing this course students shall be able to:

1. Explain the working principles of basic building blocks of a digital communication system.
2. Describe a random process in terms of its mean and correlation functions and characterize special Gaussian and Rayleigh distributions.
3. Explain receiver techniques for detection of a signal in AWGN channel
4. Describe digital modulation techniques.
5. Demonstrate the concept of coding and decoding techniques.
6. Model digital communication systems using appropriate mathematical techniques.
7. Describe spread spectrum analysis.

UNIT-I:-Digital Communication Concept

(10)

Review of Random variables, PDFs & CDFs, Central limit Theorem. Model of digital communication system, Gram Schmitt Orthogonalization procedure, signal space concept, Geometric interpretation of signals, probability of error, correlation receiver, matched filter receiver.

UNIT-II: - Source & Waveform Coding Methods

(10)

Source coding Theorem, Huffman coding-Z encoding algorithm, rate distortion theory for optimum quantization, scalar & vector quantization.

Waveform coding methods: ADPCM, Adaptive Sub-Band & Transform coding, LP & CELP coding.

UNIT-III:-Digital Modulation Techniques**(10)**

Coherent Binary: QPSK, MSK, Gaussian MSK, DPSK, Memory less modulation methods, linear modulation with memory, nonlinear modulation methods with memory: CPFSK, CPM.

UNIT-IV:-Channel Coding (PART-1)**(10)**

Introduction to Galois field, Construction of Galois field $GF(2^m)$ & its basic properties. Types of error control: Forward error correction (FEC), Automatic repeat request system (ARQ). Convolution encoding and decoding distance properties, Viterbi algorithm and Fano algorithm.

UNIT-V: - Channel Coding (PART-II)**(10)**

Trellis coded modulation, Introduction to Turbo coding, & Reed Solomon Codes: encoding & decoding, Low density parity check coding (LDPC)

UNIT-VI:**(10)**

Spread - Spectrum methods: - Study of PN sequences, direct sequence methods, Frequency hop methods, slow and fast frequency hop, performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA, Introduction to OFDM

Books:**Text Books:**

1. Digital communication: John G Prokis (TMG)
2. Digital communication: Simon Haykin (WEP)

Reference Books:

1. Lathi B.P. - Modern Digital and Analog communications systems - PRISM Indian Ed.
2. Digital Communication: J.S.Chitode
3. Digital Communication (Fundamentals & applications): Bernard Scalr
4. Introduction to Error Control Codes: Salvatore Gravano
5. OFDM For wireless communication systems: Ramjee Prasad
6. Modern Communication systems (Principles and application): Leon W. Couch II (PHI)
7. Error Control Coding: Shu Lin & Daniel J.Costello

B. E. Sixth Semester

(Electronics & Communication/ Electronics & Telecommunication Engg)

DIGITAL COMMUNICATION

Duration: 2 Hrs.

College Assessment: 25 Marks

University Assessment: 25 Marks

Subject Code: BEECE604P/ BEETE604P

[0 – 2 – 0 – 2]

Objectives:

1. To study the concept of communication based on RF-AF in digital domain.
 2. To study the role of sampling factor for analyzes the digital communication systems.
 3. To study & Design the digital communication systems.
 4. To study line coding and its application.
-

Outcome:

At the end of the course the students shall be able to:

1. Describe the concept of the digital communication based design for testing and analyze the circuits.
 2. Design and conduct experiments for testing digital communication circuits and systems.
 3. Analyze the different coding technique for design and modeling of digital communication
Identify, formulate and solve digital communication circuits and systems problems.
-

Any TEN practicals are to be conducted

LIST OF EXPERIMENTS

1. To Study and perform Error Detection and Correction codes.
2. To study the performance of adaptive Delta modulator/De-modulator circuits.
3. To Study and observe the effect of signal Distortion using EYE-Diagram.
4. To study generation & reception of BPSK & perform its spectral analysis.
5. To study generation & reception of FSK & perform its spectral analysis.
6. To study generation & reception of QPSK & perform its spectral analysis.
7. To study generation & reception of MSK & perform its spectral analysis.
8. To study generation & reception of DPSK & perform its spectral analysis.
9. To study Detection of digital baseband signal using matched filter in the presence of noise.

10. To study Frequency Hop spread spectrum Transmission & Reception.
11. To write and execute Matlab code for Convolutional Encoder and Decoder.
12. Write and execute Matlab code for generation of BPSK / Prepare Simulink Model for BPSK.
13. Write and execute Matlab code for generation of FSK / Prepare Simulink Model for FSK.
14. Write and execute Matlab code for generation of QPSK / Prepare Simulink Model for QPSK.

Note: Use DSO, Spectrum Analyzer, Logic Analyzer wherever necessary.

R.T.M.N.U Nagpur
(Electronics & Communication/ Electronics & Telecommunication Engineering)

**BEECE605T/
BEETE605T**

Functional English											Marks				
Sr. No.	Subject Code	Subject	Workload				Credit				Theory		Practical		Total Marks
			Lecture	Practical	Tutorial	Total Hrs/Week	Lecture	Practical	Tutorial	Total	Sessional	University	Sessional	University	
1	BEECE605T/ BEETE605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50

Syllabus:

Unit 1. Functional Grammar: (4 Hours) (3+3+4=10)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs)

Unit II. English for Competitive Exams & Interview Techniques: (6 Hours) (3+3+4=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III

(A) Formal Correspondence (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
 [Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: (4 Hours)

[Four fictional & four non-fictional unseen texts]

Unit IV. Technical & Scientific Writing: (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal, Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober, Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

Electronics Workshop Practice

Duration: 2 Hrs.

College Assessment: 25Marks

University Assessment: 25 Marks

Subject Code: BEECE606P/ BEETE606P/ BEENE606P

[0 – 2 – 0 – 2]

Objectives:

1. To make students familiar with measuring instruments like CRO, DSO, signal Generator.
2. To make students familiar with Interfacing Peripheral with computer.
3. To understand PCB Designing process
4. To enable students to design & fabricate their own Hardware.

Outcome:

At the end of the course the students shall be able

- to:
1. Use DSO and Spectrum Analyzer.
 2. Interface peripherals with computer.
 3. Design PCB using PCB designing software.
 4. Design & fabricate mini project.

Practical 1: Study of Functioning of Spectrum Analyzer and Digital Storage oscilloscope. (2 Hrs.)

Practical 2: Study of different Electronic components. (2 Hrs.)

Practical 3: Printed Circuit Boards (PCB): (4 Hrs.)

Types, Layout procedure, artwork, Fabrication (In this, fabrications of small circuit Using discrete component on single side PCB is expected).

Practical 4: Interfacing of displays (LCD, LED, 7 Segment) with PCs (2 Hrs.)

Practical 5: Hardware Mini Project (14 Hrs.)

- Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog **application circuit**.
- Mini Project work should be carried out by a group of maximum **three** students.
- Student should use standard software available for drawing circuit schematic, simulating the design and PCB (**single/double sided**) layout of circuit.
- Project report should consist of details of work carried out including **layouts, circuits, datasheets, list of components, cost** .

Reference Books:

- 1 Electronic Instruments and Instrumentation Technology
2. A course in Electrical and Electronics Measurements and Instrumentation - A.K. Sawhney - Dhanpat Rai & Co.
3. Electronic Components and Materials - Dr. Madhuri A. Joshi - Shroff Publications Third Edition
4. Electrical and Electronic Measurements –Banerjee,PHI
5. Introduction to Measurements and Instrumentation, 4th edition- Ghosh PHI 6.
- Electronic Instrumentation and Measurement Techniques, W.D. Copper,PHI

Web Resources: Refer online datasheets

B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

Industrial Visit

Duration: 2 Hrs.

College Assessment: G(Grade)

Subject Code: BEENE607P /BEECE607P/ BEETE607P

[0 – 2 – 0 – 2]

Objectives:

To provide industry exposure to students.

Outcome:

The students shall be able to apply this knowledge during their project and may be useful in future.

In industrial visit it is expected that

1. Student should visit the industry
2. Based on their interaction, experience during this Industrial visit they should prepare technical report with photograph and certificate from industry.

PROPOSED SYLLABUS OF INFORMATION TECHNOLOGY
FIFTH AND SIXTH SEMESTER
RTM NAGPUR UNIVERSITY, NAGPUR
ACADEMIC SESSION: 2014-2015

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: FIFTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT501T	System Programming	3	-	1	4	3	-	1	4	20	80	-	-	100
2	BEIT502T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BEIT503T	Software Engineering	3	-	1	4	3	-	1	4	20	80	-	-	100
4	BEIT503P	Software Engineering	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT504T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT504P	Computer Graphics	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BEIT505T	Java Programming	3	-	1	4	3	-	1	4	20	80	-	-	100
8	BEIT505P	Java Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
9	BEIT506T	Industrial Economics and Entrepreneurship Development	4	-	-	4	4	-	-	4	20	80	-	-	100
		Total	21	6	5	32	21	3	5	29	120	480	75	75	750

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: SIXTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT601T	Computer Networks	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT602T	Operating Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BEIT603T	Database Management Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT603P	Database Management Systems	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT604T	Internet Programming	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT604P	Internet Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BEIT605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
8	BEIT606P	Mini Project and Industrial Visit	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	18	6	5	29	18	4	5	27	90	360	75	75	600

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Scheme of Absorbtion of New course(C.B.S.) to Old course of Fifth Semester
B. E. (Information Technology)

As per Old course scheme of RTM,
Nagpur University

Sr. No	Sem	Subjects	Th/Pr
1	V	System Software	Th
2	V	Computer Graphics	Th
3	V	Computer Graphics	Pr
4	V	Principles of Management	Th
5	V	Information Theory and Data Communication	Th
6	V	Information Theory and Data Communication	Pr
7	V	Discrete and Integrated Circuits	Th
8	V	Discrete and Integrated Circuits	Pr
9	V	Object Oriented Methodologies	Th
10	V	Object Oriented Methodologies	Pr

As per New course(C.B.S.) scheme of RTM,
Nagpur University

Subject Code	Subjects	Th/Pr
BEIT501T	System Programming	Th
BEIT504T	Computer Graphics	Th
BEIT504P	Computer Graphics	Pr
BEIT506T	Industrial Economics and Entrepreneurship Development	Th
BEIT502T	Design and Analysis of Algorithms	Th
BEIT503T	Software Engineering	Th
BEIT503P	Software Engineering	Pr
BEIT505T	Java Programming	Th
BEIT505P	Java Programming	Pr

Note: If any student has cleared any subject as mentioned in absorption scheme of relevent semester in previous semester of old course will be exempted for appearing in the examination for that subject

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Proposed Scheme of Absorbtion of New course(C. B. S.) to Old course of Sixth Semester
B. E. (Information Technology)

As per Old course scheme of RTM,
Nagpur University

Sr. No	Sem	Subjects	Th/Pr
1	VI	Software Engineering	Th
2	VI	Software Engineering	Pr
3	VI	JAVA Programming	Th
4	VI	JAVA Programming	Pr
5	VI	Database Management Systems	Th
6	VI	Database Management Systems	Pr
7	VI	Operating Systems	Th
8	VI	Microprocessors	Th
9	VI	Microprocessors	Pr
10	VI	Visual Techniques	Th
11	VI	Visual Techniques	Pr

As per New course (C. B. S.)scheme of RTM,
Nagpur University

Subject Code	Subjects	Th/Pr
BEIT603T	Database Management Systems	Th
BEIT603P	Database Management Systems	Pr
BEIT602T	Operating Systems	Th
BEIT601T	Computer Networks	Th
BEIT604T	Internet Programming	Th
BEIT604P	Internet Programming	Pr
BEIT605T	Functional English	Th
BEIT606P	Mini Project and Industrial Visit	Pr

Note: If any student has cleared any subject as mentioned in absorption scheme of relevent semester in previous semester of old course will be exempted for appearing in the examination for that subject

Teaching Scheme:

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

UNIT I:

Introduction to System Software and IBM 360 Machine:

Evolution of components of programming system, Operating System, Overview, Functions and Facilities of, Goals of System software, Views of System Software, Virtual machine. General machine structure IBM 360/370, Machine Language Assembly language.

UNIT II:

Assembler:

Design of Pass-I and Pass-II Assemblers, Table Processing, Searching and Sorting, Problems based on symbol table, Base table and Literal table generation, Machine code generation and Searching and sorting.

UNIT III:

Macro Language and Macro Processor:

Macro instruction, Features of Macro facility, Implementation of 1-Pass, 2-Pass Macro processor, Macro calls within macro, macro definition within macros.

UNIT IV:

Loaders and Linkers:

Different Loading Schemes, Binders, Overlays, Linking loaders, Design of absolute loaders, Design of Direct Linking loaders.

UNIT V:

Compiler:

Phases of Compiler, Cross Compiler, Bootstrapping, Errors in each phases, Compiler writing tools, Lex and YACC, Databases used in Compilation process.

UNIT VI:

UNIX Device Drivers:

Introduction to Device drivers, Types of Device Drivers, Design issues in Device Drivers, Driver installation with example, character driver-A/D Converter, Block Driver-RAM Disk driver, Terminal Driver-The COM1 port driver

Text Books:

1. J. J. Donovan; System Programming; TMH, 2012
2. D.M. Dhamdhare; System Programming; THM; 2011
3. George Pajari; Eriting Unix Device Drivers; Pearson Education; 2011
4. O.G. Kakade; Principles of Compiler Design; Laxmi Pub. 2008

Reference Books:

1. Leland Beck, D. Manjula; System Software; An Introduction to System Programming; Pearson Education; 2013
2. Alfred Aho, J. Ullman; Principles of Compiler Design; Narosa Pub. 2010

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

UNIT I:

Mathematical foundation, summation of arithmetic and geometric series, Σn , Σn^2 , bounding summation using integrations, recurrence relations, solutions of recurrence relations using technique of characteristic equation, recursion tree method and master theorem, generating functions, Complexity calculation of various standard functions, principles of designing algorithms

UNIT II:

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case, average case and best case analysis of insertion sort, selection sort and bubble sort, lower bound proof, amortized analysis, application of amortized analysis, Sorting networks, comparison networks, biotonic sorting network.

UNIT III:

Divide and conquer strategies: Binary search, quick sort, merge sort, heap sort, Strassen's matrix multiplication algorithm, min-max algorithm. Greedy Approach: Basic strategy, activity selection problem, application to job sequencing with deadlines problem, knapsack problem, optimal merge pattern, Huffman code, minimum cost spanning tree using Prim's and Kruskal's algorithm,

UNIT IV:

Dynamic Programming: Basic Strategy, Multistage graph (forward and backward approach), Longest Common Subsequence, matrix chain multiplication, Optimal Binary Search Tree, 0/1 Knapsack problems, Travelling Salesman problem, single source shortest path using Bellman-Ford algorithm, all pair shortest path using Floyd-Warshall algorithm.

UNIT V:

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking: basic strategy, 4-Queen's problem, 8-Queen's problem, graph coloring, Hamiltonian cycles etc, Approximation algorithm and concepts based on approximation algorithms

UNIT VI:

NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, Cook's theorem, decision and optimization problems, polynomial reductions, graph based problems on NP Principle, Computational Geometry, Approximation algorithm.

Text Books:

1. "Introduction to Algorithms", Third Edition, Prentice Hall of India by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
2. "The Design and Analysis of Computer Algorithms", Pearson education by Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman.

3. "Fundamentals of Computer Algorithms", Second Edition, University Press By Horowitz, Sahani, Rajsekharan.
4. "Fundamentals of Algorithms", Prentice Hall by Brassard, Bratley
5. "Design and Analysis of Algorithms", Pearson Education, IIInd Edition, Parag Dave, Himanshu Dave

Reference Books:

1. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase and A. V. Gelder Pearson Education.

Teaching Scheme:

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

UNIT I:

Basics: Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Agile Process Models

UNIT II:

Measures Metrics and Indicator, Metrics for process & projects: Software measurement, metrics for software quality, metrics for small organization, Estimation: Software scope and Feasibility, Resources, Software project estimation, Decomposition Techniques, Empirical Estimation Models, Make-buy Decision, Project scheduling

UNIT III:

System Engineering: Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering: Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model, Metrics for Analysis Models

UNIT IV:

Design Engineering Concepts, Design Model, Pattern-Based Software Design, Architectural Design, Mapping data flow into software architecture, Cohesion, Coupling, User interface analysis and Design, Metrics for Design Models

UNIT V:

Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging, Software Testing Fundamentals, Black-Box Testing, White-Box Testing, Metrics for Source Code, Metrics for Testing & Maintenance

UNIT VI:

Risk Management: Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Software Reliability, Change Management: Software Configuration Management, SCM Repository, SCM Process, Reengineering: Software reengineering, Reverse Engineering, Restructuring, Forward Engineering

Text Books:

1. Software Engineering-A Practitioner's Approach (Sixth Edition) by Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Sommerville (Pearson)
3. Software Engineering for students (4th Edition)- Douglas Bell(Pearson)

Reference Books:

1. Schaum's Outline of Theory and Problems of Software Engineering by David Gustafson (TMH)
2. Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers)
3. Software Engineering, Theory and Practice(4th Edition)- Pfleeger, Atlee(Pearson)

BEIT503P

SOFTWARE ENGINEERING
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on SOFTWARE ENGINEERING syllabus (subject code: BEIT503T)
2. Practicals are based on:
 - a) DFD
 - b) UML diagrams for software
 - c) Testing Tools
 - d) CASE Tools
3. Minimum ten practicals have to be performed
4. Do not include study experiments

BEIT504T

COMPUTER GRAPHICS

(Theory Credit: 05)

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

UNIT I:

Geometry and line generation: points, lines, planes, pixels and frames buffers, types of display devices and its architecture DDA and Bresenham's algorithms for line generation, Bresenham's algorithm for circle generation, aliasing, anti-aliasing and its techniques.

UNIT II:

Graphics primitives: Display files, algorithms for polygon generation, polygon filling algorithms, NDC (normalized device co-ordinates), 2D transformations: scaling, rotation, translation, rotation about arbitrary point, reflections, shearing.

UNIT III:

Segment tables: operations on segments, data structures for segments and display files, Windowing and clipping: window, viewport, viewing transformations, clipping, line and Polygon clipping.

UNIT IV:

3D Graphics: 3D Transformation, parallel, perspective and isometric projections, 3D Transformations. Hidden surfaces and line removal: Painter's, Z-buffer, Warnock's, Back-face Removal algorithm

UNIT V:

Curves and surfaces: Methods of interpolation, Bezier and B-splines, surface rendering methods: Gouraud Shading, Phong Shading, Constant Intensity Shading, Fast Shading.

UNIT VI:

Color Models and Color Application: Properties of light, standard primaries, chromaticity Diagram, Intuitive colour concept RGB, YIQ CMY, HSK, colour models and their conversion, colour selection and applications. Animation: Design of Animation sequences, animation Function, Raster animation, animation Language, Key-Frame System, motion Specification.

Text Books:

1. Procedural elements for computer graphics by David F. Rogers, Mc-Graw Hill.
2. Computer Graphics 'C' Version, Second Edition By Donald Hearn and M.Pauline Baker, Pearson publication
3. Mathematical elements for computer graphics by David Rogers and J. Alan Adams, Tata Mcgraw Hill Education Private Limited
4. Computer graphics principles and practice in C by Foley, Vandam, Feiner and Huges (Pearson)
5. Computer Graphics, Vikas publications, Neeta Jain
6. Principles of interactive computer graphics by Newman and Sproul.

BEIT504P

COMPUTER GRAPHICS
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on COMPUTER GRAPHICS syllabus (subject code: BEIT504T)
2. There should be at the most two practicals per unit
3. Minimum ten practicals have to be performed
4. Do not include study experiments

BEIT505T

JAVA PROGRAMMING

(Theory Credit: 04)

Teaching Scheme:

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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UNIT I:

Introduction to Java, Data types, Literals: Types of Literals, Operators, Control Statements: If, switch, do-while, while, for, enhanced for loop, Nested Loop, break, continue, return statements, Classes: Fundamentals of classes, Declaring objects, Assigning objects, Reference variables, Overloading methods, Constructors, this keyword, Wrapper classes, Using object as parameter, Argument passing, Command line arguments, returning object, static modifier, final modifier, Nested classes: inner classes, Garbage collection.

UNIT II:

Arrays, Vectors and Generics, String Handling: String and StringBuffer class, String constructors, Data conversion using valueOf(), toString() methods, Methods for String Comparison, Searching string and modifying string.

UNIT III:

Object class, Inheritance, Abstract classes and methods, Interfaces, Method Overriding, Packages: Package Fundamental, Access protection, Importing packages, Exception Handling: Fundamental Exception type: Checked, Unchecked and Uncaught Exceptions, throw and throws keywords, Creating user defined exceptions, Built-in Exceptions.

UNIT IV:

Multithreading: Fundamentals, Thread Life Cycle, Ways of creating threads, Creating multiple threads, isAlive (), join (), Thread Synchronization, Thread priorities, Interthread communication, Methods for suspending, resuming and stopping threads.

UNIT V:

I/O stream, Byte stream, Character stream, Pre-defined streams, Reading console input, Writing console output, PrintWriter class, Reading and Writing files, transient and volatile modifiers, instanceof, strictfp and native methods.

UNIT VI:

Introduction to Swings, AWT as a origin of Swing, Key swing features, Components and container, Swing packages, Event handling, Creating swing applets, Controls: label and image icons, JTextField, Swing Buttons, Tabbed Panes, JScrollPane, JList, JComboBox, JTable.

Text Books:

1. The Complete Reference (Seventh Edition) by Herbert Schildt, TATA McGRAW-HILL Publications

Reference Books:

1. Sun Certified Java Programmer for Java 6 by Kathy Sierra.
2. The Java™ Programming Language (3rd Edition) by Arnold, Holmes, Gosling, Goteti
3. Core Java for Beginners by Rashmi Kanta Das (III Edition) Vikas Publication
4. Programming in Java (Second Edition) by Sachin Malhotra and Saurabh Choudhary, Oxford University Press

BEIT505P

JAVA PROGRAMMING
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on JAVA PROGRAMMING syllabus (subject code: BEIT505T)
2. There should be at the most two practicals per unit
3. Minimum ten practicals have to be performed
4. Do not include study experiments

BEIT506T INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP DEVELOPMENT
(Theory Credit: 03)

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: Nil

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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Objective:

Study of this subject provides an understanding of the scope of an industrial economics and entrepreneurship development, key areas of business development, sources of finance, project preparation, methods of taxation and tax benefits, significance of entrepreneurship and economic growth, application of engineering skills in entrepreneurial activities etc.

UNIT I:

Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

UNIT II:

Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration- forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization. Business cycles, optimum size of firm.

UNIT III:

The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Capital formation, Inflation, Recession and stagnation, Inclusive growth, Public-Private partnership for development, Multiplier effect, Accelerator effect.

UNIT IV:

Entrepreneurship meaning, Major Motives Influencing an Entrepreneur, Factors Affecting Entrepreneurial Growth. Project Formulation, Product development, Market Survey and Research, Demand forecasting techniques, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT V:

Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Direct, Indirect Taxes.

UNIT VI:

Sickness in small Business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, safeguard measures against variation in currency value, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS

Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.

Modern Economic Theory By, K.K. Dewett. S.Chand.

Industrial Economics. By, Jagdish Sheth, Pearson Publication.

“Entrepreneurial Development” By, S.S.Khanka S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.

Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.

Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.

Entrepreneurial Development. By, S.Anil Kumar. New Age International.

Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:

Business Economics. By, K.Rajgopalchar. Atalantic Publishers.

Microeconomics. By, Robert Pindyk

Business Economics. By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.

Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

BEIT601T

COMPUTER NETWORKS
(Theory Credit: 05)

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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UNIT I: Introduction

Introduction to computer networks & Internet, Network architecture, layered approach, OSI reference model, TCP/IP protocol suite, performance issues in networks, throughput, delay, latency, jitter, packet delivery ratio, packet loss rate, reliability, Introduction to Wireless Networks, IEEE 802.11, Bluetooth and WiMAX, wireless transmission, infrared transmission

UNIT II: Data Link Layer

Design issues, framing, error control, flow control, error-correcting and detecting codes, Data link protocols, unrestricted simplex protocol, simplex stop-and-wait protocol, one-bit sliding window protocol, Go Back N ARQ protocol, selective repeat ARQ protocol, static and dynamic channel allocation, ALOHA, CSMA/CD, CSMA/CA

UNIT III: Network Layer

Design issues, classful and classless addressing, IPv4 addressing mechanism, Subnetting and Supernetting, Next generation IP, IPv6 addressing, transition from IPv4 to IPv6, ICMPv6, routing algorithms, shortest path routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical routing, congestion control algorithms, OSPF, BGP, Multicasting, firewalls

UNIT IV: Transport layer and Application Layer

Quality of service, transport service primitives, elements of transport protocol, addressing, establishing a connection, releasing a connection, flow control and buffering, multiplexing, crash recovery, client server model, concurrency, processes, sockets, socket system calls

UNIT V:

BOOTP and DHCP, packet formats, operation, error control, transition states, DNS (Domain Name System), DNS in the Internet, Resolution, FTP and TFTP, connection, communication, command processing, file transfer, messages

UNIT VI:

Mobile IP, addressing, agents, three phases, agent discovery, registration, data transfer, Internet Security, privacy, digital signature, application layer security, transport layer security, security at the IP layer IPSec, Real Time traffic over the Internet

Text Books:

1. Computer Networks, Fifth Edition, Andrew Tanenbaum(Pearson Education)
2. TCP/IP Protocol Suite, Behrouz A Forouzan, McGraw Hill Fourth Edition

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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UNIT I:

Introduction: What is Operating System(OS), structure of OS, history of OS, Types of OS: Time sharing, real-time, multiprocess (Asynchronous & Synchronous), multiprogramming (loosely coupled, tightly coupled), Distributed, web-based, client-server, peer-to-peer, services of OS, user view & machine view of OS, System calls, Spooling and buffering. Case Studies: Android, Linux, Windows 8.

UNIT II:

File Management: File Concept, file attributes, file operations, file system structure, file system implementation, file access methods, Disk Scheduling Algorithms, File protection, free space management on disk.

UNIT III:

Process Management: Process concept, process scheduling, operations on process, interprocess communication, communication between client-server, multithreaded model, process scheduling criteria, scheduling algorithm.

UNIT IV:

Memory Management: Preliminaries, Bare machine, resident monitor, swapping, multiple partitions, paging, segmentations, combined systems. Virtual Memory: Overlays, demand-paging performance, of demand paging, page replacement, virtual memory concepts, page replacement algorithms. Allocation algorithm, thrashing.

UNIT V

Process Synchronization: Critical Section problem, semaphores, classic problems: Dining Philosopher problem, producer-consumer, reader-writers problem, bounded buffer problem, monitors, Atomic transaction, synchronization examples.

UNIT VI:

Deadlock and Protection: System model, deadlock characterization, methods for handling deadlocks, prevention, detection, recovery, avoidance, Banker's Algorithm. Goal of protection, mechanism & policies, domain protection, access matrix, implementation of access matrix, dynamic protection structures, revocation, existing systems & language based protection, protection problem security.

Text Books:

1. Modern Operating Systems – A. S. Tanenbaum, Pearson Education
2. Operating System- A. S. Godbole, Tata McGraw Hill, third edition
3. Operating System Concepts- Silberchatz and Galvin, Addison Wesley
4. Android application Development for Java Programmers by James c. Sheusi, CENGAGE Learning.

Reference Books:

1. Operating Systems concepts and Design – Milan Milenkovic, Tata McGraw Hill

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BEIT603T

DATABASE MANAGEMENT SYSTEMS

(Theory Credit: 05)

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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UNIT I: Introduction to Database Systems

Database Systems: Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, DBMS Architecture, Functions of DBMS, Formal relational query languages: Relational Algebra, Tuple Relational calculus, Domain Relational Calculus.

UNIT II: File Organization, Indexing and Hashing

File organization, Organization of records in files, Data dictionary storage, Basic concepts of indexing, Ordered indices, B+ Tree index files, B+ Tree indexing, B+ Tree Extensions, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL.

UNIT III: Data Models and Relational Database Design

Evolution of Data Models, Entity Relationship Model, Development of ER Diagrams, Extended Entity Relationship Model. Relational model: Logical View of Data, Keys, Integrity Rules, Relational set operators, Data Dictionary and System Catalog, Indexes, Codd's Relational Database Rules. Normalization of Database Tables: Need and Significance, the normal forms - 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, normalization & database design, denormalization.

UNIT IV: Query Processing and Query Optimization

Overview of Query Processing, Measures of Query cost, Selection Operation, Sorting, Join Operation, Other Operations, and Evaluation of Expressions. Overview of Query Optimization, Transformation of Relational Expressions, Estimating Statistics of Expression results, Choice of Evaluation Plans, Materialized Views

Unit V: Transaction Management

Transactions: Concept, Transaction Model, Transaction atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation Levels and Implementations. Concurrency Controls: Lock Based Protocol, Deadlock Handling, Time-stamp Based Protocols, and Validation Based Protocols. Recovery System: Failure Classification, Log Based Recovery, Advanced Recovery Techniques.

UNIT VI: SQL and Advanced SQL

Introduction to SQL: SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Null values, Aggregate functions, Nested Sub-queries, Modifications of the Databases Intermediate SQL: Join Expressions, Views, Integrity Constraints, SQL Data types and Schemas, Authorization. Advanced SQL: Dynamic SQL and Embedded SQL, Functions and Procedures, Triggers.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill (SIE), 2013.
2. Carlos Coronel, Steven Morris and Peter Rob, Database Principles – Fundamentals of Design, Implementation and Management, 9th Edition, Cengage Learning, 2013.
3. Hector-Garcia Molina, Jeffrey Ullman and Jeniffer Widom, Database Systems – the Complete Book, 2nd Edition, Pearson Education, 2014.
4. Database Systems Concepts, Designs and Application(2e Pearson) by Shio Kumar Singh
5. The database book, Principles and Practice using MySQL by Narain Gehani, University Press.
6. An Introduction to Database Systems(8e Pearson) by Date, Kannan, Swamynathan

Reference Books:

1. Alexis Leon and Mathews Leon, Database Management Systems, Vikas Publishing, 2008.
2. Ramez Elmasri and Shamkant Navathe, Database Systems - Models, Languages, Design and Application Programming, 6th Edition, Pearson Education, 2009.

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BEIT603P

DATABASE MANAGEMENT SYSTEMS

(Practical Credit: 01)

Teaching Scheme:

Practical: 2 Hours/week

Examination Scheme:

Practical: P (U): 25 Marks P (I): 25 Marks

Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on DATABASE MANAGEMENT SYSTEMS syllabus (subject code: BEIT603T)
2. Practicals are to be performed using SQL
3. Minimum ten practicals have to be performed
4. Do not include study experiments

BEIT604T

INTERNET PROGRAMMING
(Theory Credit: 05)

Teaching Scheme:

Lecture: 4 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 80 Marks T (I): 20 Marks

Duration of University Exam. : 03 Hours

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UNIT I:

HTML and common tags: Introduction, www, Internet, URL, Common tags: Text formatting tags Line and Paragraph tags, Lists: ordered list Unordered List, definition List, anchor tag , Absolute and relative path, Tables and its attributes, Image tag- alt attribute, image mapping frames, forms , cascading style sheet, External style sheet, internal Style sheet.

UNIT II:

Java Scripts: Introduction Benefits of java script, Editing java scripts Displaying information, Alerts(), Prompts(), confirm box, Operators, conditional statements, conditional loops, functions, arrays, Objects-math, string, date, Boolean, number, document, windows. DHTML with java script, Object model collection, events in java script, filters and transitions-Flip filter, Image mask, shadow filter, alpha filter, Blur filter. Difference between HTML and DHTML

UNIT III:

XML: Introduction, Advantages, Difference between HTML and XML, XML Namespace, Well formed and valid XML, XML Document type definition, XML schemas, Data types Attribute Types, XML Transformation- xsl, Document object model (DOM) using XML processors: DOM and SAX.

UNIT IV:

The Server Side: Client side Vs. Server side, Transformation from static to dynamic sites, Java Servlets, reading environment parameters, accessing parameter data, state management, event driven tracking.

UNIT V:

Java Server Pages: Need of JSP, JSP Life Cycle, Elements in JSP Page, Implicit JSP Objects, JSP Objects scope, JSP tags, JSP exceptions ,Expression Language, JSP standard tag Library custom tag Library, JSP and Equivalent Technologies.

UNIT VI:

Android applications Project: android applications components, application design, the screen layout and main.xml file, component Ids, few simple controls, getting and configuring android emulator, Key Classes like Button, TextView, EditText, View. OnClickListener

Text Books:

1. Web Technology Theory and Practices by M. Shrinivasan, PEARSON publication.
2. Android application Development for Java Programmers by James c. Sheusi, CENGAGE Learning.

3. The Modern approach to Web Technologies by Dr. Vaka Murali Mohan and Mr. S. Pratap Singh SCITECH Publications.
4. Web Technologies TCP/IP architecture, and Java Programming by Achyut S. Godbole & Atul Kahate , Tata McGraw-Hill publication Second edition.

Reference Books:

1. HTML: The Complete Reference, by Thomas A. Powell, McGraw Hill
2. XML: The Complete Reference, by Williamson, McGraw Hill

BEIT404P

INTERNET PROGRAMMING
(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

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Note:

1. Practicals are based on INTERNET PROGRAMMING syllabus (subject code: BEIT404T)
2. Practicals are to be performed using Apache Tomcat and Eclipse IDE
3. There should be at the most two practicals per unit
4. Minimum ten practicals have to be performed
5. Do not include study experiments

BEIT605T

FUNCTIONAL ENGLISH
(Theory Credit: 03)

Teaching Scheme:

Lecture: 2 Hours/week

Tutorial: 1 Hour/week

Examination Scheme:

Theory: T (U): 40 Marks T (I): 10 Marks

Duration of University Exam. : 02 Hours

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Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTS/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.) to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure

Unit 1. Functional Grammar: (4 periods) (3+3+2+2=10)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs.

[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs)

Unit II. English for Competitive Exams & Interview Techniques: (6 periods)
3+3+2+2=10 or (10X1=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment : [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III (A) Formal Correspondence (8 periods) (10X1=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes

[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

(B) Analytical comprehension: [Four fictional & four non-fictional unseen texts]

Unit IV. Technical & Scientific Writing: (4 periods) (10X1=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers.

Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering

Reference Books:

1. Oxford Learners' Dictionary of Current English
2. Business Communication - KK Sinha, Galgotia Publishers
3. Developing Communication skills- Krishna Mohan & Meera Banerjee
4. Effective technical Communication –Barun K Mitra
5. Effective Business Communication – Herta A Murphy, Habert Hidebrandt, Jane P Thomas

Evaluation Pattern:**Internal Examination: Weightage = 10 mrks**

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks**Question Pattern for End Semester Examination.**

Q No.	Unit No	Que.type	No. of Questions	Weightage
1 or 2	I	objective	2 bunches of 4 questions each	(3+3+2+2)=10)
3 or 4	II	Objective	2 bunch of 4 questions each	(3+3+2+2)=10 or (10X1=10)
5 or 6	III	subjective	1 out of 2	(10X1=10)
7 or 8	IV	Subjective	1 out of 2	(10X1=10)

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BEIT606P

MINI PROJECT AND INDUSTRIAL VISIT
(Practical Credit: 02)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

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Course Objective:

1. To develop an understanding of applications in real life
2. To develop research skills of students
3. To help the students in exploring career opportunities in their areas of interest.
4. To give an insight into the overall functioning of the organisations where students visited.
5. To develop Institute-Industry Interaction
6. To provide means to immerse students in actual supervised professional experiences

Constraints:

1. The students shall work in groups of 4-5 each and work on small application or research based/Industry oriented real time problems.
2. Local Mentor and Industry Mentor shall work in coordination if students are doing project in industry.
3. Industry visit should be planned to explore students about real time problems.
4. Students shall work on providing solutions to identified problems
5. Detailed reports are expected to be submitted at the end
6. Evaluation should be done based on feedback of Local and Industry Mentor

Expected Outcome:

1. Problem Identification and Definition
2. Defining data requirements and Identifying data sources
3. Literature Survey
4. Primary data collection
5. Software and Hardware requirements
6. Overall Project development as per the phases of SDLC
7. Outcome of the project
8. Utility of the project to the organisation

Annexure - B

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

V Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks
BEME501T	Industrial Economics and Entrepreneurship Development	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME502T	Design of Machine Elements	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME503T	Advanced Production Processes	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504T	Heat Transfer	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504P	Heat Transfer	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME505T	Mechanical Measurement & Metrology	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME505P	Mechanical Measurement & Metrology	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME506P	Computer Applications – I	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME507P	Industrial Visit	-	-	02	Audit Course									
Total		15	07	08		-	400	100	500	-	100	100	200	-
Semester Total		30			26	Marks 700								

Industrial Economics and Entrepreneurship Development (BEME501T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VI Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks
BEME601T	Energy Conversion- I	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME602T	Control Systems Engineering	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME603T	Operations Research	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604T	Mechatronics	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604P	Mechatronics	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME605T	Dynamics of Machines	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME605P	Dynamics of Machines	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME606T	Functional English	02	-	-	02	02	40	10	50	20	-	-	-	-
BEME607P	Computer Applications - II	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME608P	Industrial Case Study	-	-	02	02	-	-	-	-	-	-	50	50	25
Total		17	07	08	-	-	440	110	550	-	100	150	250	-
Semester Total		32			30	800 Marks								

Functional English (BEME606T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering. Mechatronics (BEME604T/P) subject can also be taught by a teacher from Electronics/Instrumentation/Mechatronics/relevant disciplines.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): FIFTH SEMESTER

**BEME501T: INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP
DEVELOPMENT (Theory)**

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to create awareness about economics terminology and business organization, to understand relationship between business, market and society, to create awareness about entrepreneurship as a career avenue; financial agencies and government support systems for entrepreneurship. This course shall stimulate the potential to develop entrepreneurial orientation through innovation, creativity & students will understand the concept of innovation, invention, creativity and discovery in engineering context and shall also get awareness about IPR and Patents.

UNIT – I

[8 Hrs.]

Industrial Economics : Economics, classification of economics, Basics concepts, Law of demand, Demand analysis, Types of demand, Determinants of demand, Methods of demand forecasting, Supply, Law of diminishing marginal utility, Elasticity of demand, Types of elasticity of demand.

UNIT – II

[8 Hrs.]

Factors of production, Production function, Firm and Industry, Law of return, Cost concepts, Fixed variable, Average, Marginal and Total cost, Break even analysis Depreciation and methods for depreciation.

UNIT – III

[8 Hrs.]

Inflation, effect of inflation, Monetary and fiscal measures to control inflation, deflation, stagflation direct and indirect taxes. Market and market structures, Perfect competition, Monopoly, Monopolistic competition, Oligopoly, Price determination in these Situations. Concept & overview of share market, Effect of share market on economy, Share market terminologies.

UNIT – IV

[8 Hrs.]

Innovation & Creativity: Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.

UNIT – V

[8 Hrs.]

Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship. Theory of achievement, motivation, Maslow's experiment, Women entrepreneurship, Role of SSI, its advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.

UNIT – VI

[8 Hrs.]

Preparation of project report: Factors governing project selection, Market survey, Preparation of project report. Financial, technical & market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time)

Note: Group of students (Min 05 & Max 09) are expected to prepare a project report for business / industry on the knowledge acquired.

TEXT BOOKS:

1. Modern Economics, H. L. Ahuja, S.Chand Publishers
2. Modern Economic Theory, K. K. Dewett., S. Chand Publishers
3. Engineering Economics, D. N. Dwivedi, A. Dwivedi, Vikas Publishing House
4. Entrepreneurship Development, S. S. Khanka, S. Chand Publishers
5. Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business Publishers.

BEME502T: DESIGN OF MACHINE ELEMENTS (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the basic machine element design. It includes the procedure of design (w.r.t. basic failures) under various loading conditions. Students shall understand design of various mechanical joints, machine components such as shaft, keys, brakes clutches, power screws etc. Apart from this, students shall learn spring design & pressure vessel design. At the end of this course, students will get familiar with design of these mechanical components under various loading conditions.

UNIT – I

[12 Hrs.]

Introduction to Mechanical Engineering Design, Design methods, Aesthetic and Ergonomics Consideration in design, Material properties and their uses in design, Basic principles of Machine Design, Modes of failures, I. S. codes, Preferred Series and numbers. Design of Knuckle joint, Socket & Spigot type cotter joint. Design of riveted joint.

UNIT – II

[12 Hrs.]

Design of bolted and welded joints under axial and eccentric loading conditions. Design of Brackets & Levers.

Design of Cylinder & Pressure Vessels: Types of pressure vessel, stresses induced in pressure vessel, Lame's, Clavarino's and Bernie's equations. Design of cylindrical & spherical pressure vessels. Design of nut, bolt, gasket & covers for pressure vessel.

UNIT – III

[12 Hrs.]

Design of shaft for power transmission, static and fatigue criteria for shaft design, ASME codes for shaft design, Design of keys.

Design of Springs: Spring material, Helical compression & tension springs under static and variable loads, Leaf spring, Laminated Springs.

UNIT – IV

[12 Hrs.]

Design of power screw: Thread forms, multiple threaded screws, terminology of power screw, design of screw jack.

Design of clutches and brakes: Single and multiple plate clutch, constant wear and constant pressure theory for plate clutches, Internal and external shoe brakes.

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TEXT BOOKS:

1. Design of Machine Elements, B.D.Shiwalkar, Central Techno Publications
2. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill Pub.
3. Mechanical Engineering Design, J. E. Shigley, McGraw Hill.
4. Design Data Book, B.D.Shiwalkar, Central Techno Publications.
5. Design Data Book, PSG.
6. Design Data Handbook Book, K. Mahadevan, CBS Publishers.
7. Mechanical Design of Machine Elements & Machines, J.A.Collins, Wiley India
8. Machine Components Design, Robert C., Juvinall & Kurt M. Marshek, Wiley India
9. Machine Design, U.C. Jindal, Pearson Publications
10. Machine Design : An Integrated Approach, Robert L Norton, Pearson Publications
11. Machine Design Fundamental and Applications, P.C. Gope, PHI Learning.
12. Design of Machine Elements, Sharma C.S. & Purohit K, PHI Learning.

REFERENCE BOOKS:

1. Design of Machine Elements, Spotts M. F. and Shoup T. E., Pearson Publications.
2. Machine Design, Black P. H. and O. Eugene Adams, McGraw Hill Book Co Inc.

BEME503T: ADVANCED PRODUCTION PROCESSES (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This subject is designed to make conversant with non conventional machining processes, advanced Joining Processes, Die Cutting Operations, Jig and Fixtures, Super -finishing operations & Machining centre. Upon completion of this course, student shall understand the unconventional machining processes and will be able to select and apply suitable processes for engineering products.

UNIT – I

[8 Hrs.]

Non- conventional machining Processes: Introduction & classification, Electrochemical machining, Electrical Discharge machining, Ultrasonic machining, Laser beam machining, Electron beam machining, Water jet machining, Abrasive jet machining. Advantages, disadvantages and applications of above processes.

UNIT – II

[8 Hrs.]

Advanced joining Processes : Introduction and classification of welding techniques, Advanced welding processes such as TIG, MIG welding, Plasma arc welding, Plasma welding, Oxyacetylene welding , Atomic hydrogen welding , Laser beam welding , Electron beam welding , Electro slag welding.

UNIT – III

[8 Hrs.]

Advanced machining Processes: Introduction, Classification, Capstan and turret lathe, Tool layout for capstan and turret lathe, Machining center. Introduction to micromachining, nanofabrication, high energy rate forming.

UNIT – IV

[8 Hrs.]

Die cutting operations: Introduction, Sheet metal cutting, Sheet metal forming, Sheet metal drawing, defects in drawn parts, Spinning, Equipments for sheet metal working, Die and punch.

UNIT – V

[8 Hrs.]

Jigs and fixtures: Introduction, principles of jig and fixture, Principle of location, jig bushes, drilling jigs, type of clamps, classification of fixtures.

UNIT – VI

[8 Hrs.]

Super finishing processes: Introduction, Principle of super finishing process, Lapping, Honing, Buffing & Electroplating.

Principle of operation, advantages, disadvantages and applications of above processes. Application of LASER in surface modification.

Note: All the teachers are advised to show the relevant videos for the above processes.

TEXT BOOKS:

1. Production Technology, P.C. Sharma, S.Chand Publication.
2. Manufacturing Engineering and Technology, Serope KalpakJan, Pearsons.
3. Manufacturing Technology, D.K. Singh, Pearsons.
4. Unconventional Manufacturing Processes, M.K. Singh, New Age Publications.
5. Non-Conventional Manufacturing Processes, H.S. Shan, Tata Mc-Graw Hill.

BEME504T: HEAT TRANSFER (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to learn the various modes of heat transfer and laws associated with it. During this course, students can distinguish between steady state and unsteady state heat transfer; will be able to apply their knowledge of Dimensional Analysis to forced and free convection. Students will also be able to analyse radiation with and without radiation shield. Apart from this, students will also be able to analyse & design heat exchangers.

UNIT – I

[8 Hrs.]

Introduction to basic modes of heat transfer, conduction, convection & radiation. Laws of heat transfer & conservation of energy requirement. General heat conduction equation in cartesian, cylindrical and spherical coordinates. One dimensional steady state heat conduction equation for the plane wall, cylinder and sphere, overall heat transfer coefficient. Thermal resistance of composite structure, contact resistance, variable thermal conductivity, critical thickness of insulation.

UNIT – II

[8 Hrs.]

Conduction with internal heat generation for plane wall, cylinder and sphere. Extended surface, types of fins. Fins of uniform cross section area, temperature distribution and heat transfer rate, fin efficiency & effectiveness. Error in temperature measurement. Unsteady state heat transfer, lumped heat capacity analysis, Heisler's charts. Biot Number, Fourier's Number & its significance.

UNIT – III

[8 Hrs.]

Forced convection, physical significance of non-dimensional parameter. Flow of high, moderate & low Prandtl number, fluid flow over a flat plate. Concept of hydrodynamics & thermal boundary layer thickness, local and average heat transfer coefficient. Empirical co-relations for external, internal flows, laminar & turbulent flow through conduits. Dimensional analysis applied to forced convection.

UNIT – IV

[8 Hrs.]

Free or natural convection. Grashoff's number, Rayleigh number, flow over horizontal and vertical plate, Empirical Co-relations for cylinders and spheres, heat transfer with phase change, pool boiling curve & regimes of pool boiling, Film & Drop wise condensation, laminar film condensation on vertical surface, on horizontal tubes, effect of super heated & non-condensable gases on condensation heat transfer, Dimensional analysis applied to free or Natural convection.

UNIT – V

[8 Hrs.]

Radiation, spectrum of radiation, black body radiation, radiation intensity, laws of radiation- Kirchoffs, Plancks, Weins displacement law, Stefan Boltzmann & Lamberts Co-sine law. Emissivity, Absorbtivity, Transmissivity, Reflectivity, Radiosity, Emissive power, Irradiation. Radiation network, radiation exchange between parallel plate cylinder & sphere, shape factor & its laws, radiation between parallel plates, cylinder & spheres. Radiation shields.

UNIT – VI

[8 Hrs.]

Heat exchanger : Classification, overall heat transfer coefficient, fouling factor, LMTD & effectiveness, NTU method of heat exchanger analysis for parallel, counter flow & cross flow arrangement, design aspect of heat exchangers, Introduction to compact heat exchanger, Heat Pipe, Introduction to mass transfer.

TEXT BOOKS:

1. Heat Transfer, J.P. Holman, McGraw Hill Book Company, New York.
2. Fundamentals of Heat and Mass Transfer, K. N. Seetharam & T.R. Seetharam, Willey.
3. A Text Book of Heat Transfer, S.P. Sukhatme, University Press.

REFERENCE BOOKS:

1. Fundamentals of Heat and Mass Transfer, Venkanna B.K., PHI Publication.
2. Principles of Heat Transfer, Frank Kreith, Harper and Row Publishers, New York.
3. Heat Transfer - A Practical Approach, Yunus A. Cengel, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Heat & Mass Transfer, M.N. Ozisik, Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Heat & Mass Transfer, R.K. Rajput, Laxmi Publication.

DATA BOOK: Heat & Mass Transfer, Domkundwar, Dhanapat Rai & Sons Publication.

BEME504P: HEAT TRANSFER (Practical)

CREDITS: 01

Teaching Scheme

Practical: 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight out of the following shall be performed (Out of which Six must be experimental):

1. To determine the thermal conductivity of composite wall.
2. Determination of thermal conductivity of an insulating powder.
3. Determination of thermal conductivity of metal bar.
4. Determination of Stefan Boltzmann constant.
5. Determination of temperature distribution & heat transfer rate from fin under forced convection.
6. Determination of heat transfer coefficient in natural convection for vertical tube.
7. Determination of condensation heat transfer coefficient in film wise & drop wise condensation.
8. Determination of emissivity of non black body.
9. Study of various types of heat exchangers.
10. Computerized analysis of various parameters of heat exchanger using shell and tube heat exchanger.
11. Study of heat pipe.

BEME505T: MECHANICAL MEASUREMENT & METROLOGY (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to study various measurement systems and their significance along with the characteristics and order of the instruments. At the end of this course, students will be able to understand various instruments for the measurement of different parameters, tolerances, advanced concepts involved in measuring technology (Measurements) & use of precision measuring instruments. Students will appreciate the importance of accuracy and its effects on results and its uncertainty.

UNIT – I

[8 Hrs.]

Purpose, structure and elements of measuring system. Static characteristics of measurement system, elements including systematic, statistical characteristics, generalized model of system elements and calibration. Error measurement, error probability density function, error reduction. Introduction to dynamic characteristics of measurement system. Introduction to noise in measurement system.

UNIT – II

[8 Hrs.]

Classification, Principle, Sensing elements, Signal conditioning elements, Construction, Range and working of instruments for measurement of Linear and Angular Displacement, Speed, Load, Strain, Force, Torque and Power. (Analytical treatment not included)

UNIT – III

[8 Hrs.]

Classification, Principle, Sensing elements, Signal conditioning elements, Construction, Range and working of instruments for measurement of Pressure, Vacuum, Sound, Light and Temperature. (Analytical treatment not included)

UNIT – IV

[8 Hrs.]

Standards of Measurement, Line, End and Wavelength standard. Working standards, Requirement of interchangeability, Allowance and Tolerance, Selective assembly. Measurement of Straightness and Flatness. Instruments for Linear and Angular Measurement. (Vernier, Angle gauge, Sine bar, Level indicator, Clinometers and Taper gauge)

UNIT – V

[8 Hrs.]

Limits and Fits, Tolerance analysis of Limits and Fits, Types of limit gauges, Types of fit, Shaft and Hole basis system, Design of Limit gauge and Process planning sheet (Numerical treatment is expected).

UNIT – VI

[8 Hrs.]

Comparators: Mechanical, Optical, Electrical, Electronic, Pneumatic.

Study and use of Optical profile projectors, Tool maker's microscope and Autocollimator. Measurement of Screw thread and Gear tooth.

LIST OF TUTORIALS:

- 1) Study of Linear and Angular measurement instrument.
- 2) Study of various types of Comparators.
- 3) Preparation of Process Planning sheet.

TEXT BOOKS:

1. Mechanical Measurement and Control, D.S. Kumar, Metropolitan Book Co.
2. Instrumentation Measurement and Analysis, B.C. Nakra, K.K. Choudhary, TMH
3. Measurement Systems, Ernest O. Doebelin, Dhanesh N. Manik, TMH
4. Mechanical Measurement, Thomas G. Beckwith, Pearson
5. Metrology and Measurement, Anand K. Bewoor, Vinay A. Kulkarni, TMH
6. Metrology, R. K. Jain, Khanna Publishers.
7. A Textbook of Engineering Metrology, I. C. Gupta, Dhanpat Rai & Sons Publication.

REFERENCE BOOKS:

1. Principles of Measurement Systems, John P. Bentley, Pearson

BEME505P: MECHANICAL MEASUREMENT & METROLOGY (Practical)

CREDITS: 01

Teaching Scheme

Practical: 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight out of the following shall be performed:

1. Static characteristic of at least one Instrument.
2. Static calibration of at least one Instrument.
- 3, 4 & 5. – Measurement of parameters by minimum three different types of Instruments.
6. Measurement of Linear, Angular dimensions (Using Vernier, Sine bar, Clinometers)
7. Measurement of Flatness & Straightness.
8. Study and Measurement of Parameters using Toolmaker's microscope.
9. Study and Measurement of Parameters using Optical profile projector.
10. Use of Optical flat.
11. Design of Limit gauge.

BEME506P: COMPUTER APPLICATIONS – I (Practical)

CREDITS: 04

Teaching Scheme

Practical: 2 Hours/Week

Tutorial: 2 Hour/Week

Examination Scheme

University Assessment: 50 Marks

College Assessment: 50 Marks

Course Objectives and Expected Outcomes: This course is designed to acquaint the students to solve engineering problems using computers with knowledge of C/C++ programming. Students will be able to write the programs for Numerical Methods & for problem solving in the area of Mechanical Engineering. Students will also understand the concept of OOPs and will get introduced with mathematical softwares.

Review – C/C++ Programming basics, algorithm, types of algorithms, data type, variables, control structures, arrays, vectors, pointers, functions, file handling etc., Basic of OOPS, and Object modeling.

Exposure to Software/s like MATLAB/ MATHCAD/ SCILAB / MATHEMATICA or any other relevant commercial software/s or freeware/s.

LIST OF PRACTICALS:

Minimum eight practicals in following areas shall be performed.

1. Development of application programs in C / C++ exploring use of functions, vectors, arrays etc.
2. Development of programs in C / C++ for any Numerical methods like Newton Raphson, Gauss-Elimination, Gauss-Jordan, Crout's method and Gauss-Seidel Method.
3. Development of programs in C / C++ for any Numerical methods like Taylor's series method, Runge Kutta method, Euler's modified method, Milne's predictor corrector method, Iterative methods for eigen value & eigen vector determination.
4. Development of programs in C / C++ to solve the problem in the following areas of Mechanical Engineering like, Mechanics, Kinematics of Machines, Engineering Thermodynamics, Hydraulic Machines, Mechanics of Material, Design of Machine elements, Heat Transfer etc.
5. Application of Mathematical Software/s for solution of problems in the areas of Mechanical Engineering.

Note:

During University practical examination of 50 marks, students are expected to prepare & execute computer program/s in C/C++ and/or problem solving using mathematical softwares

of total 30 marks in two hours duration. Viva-Voce of 20 marks shall be conducted during University practical examination.

TEXT BOOKS:

1. An Introduction to Data Structures with Applications, Trembly J. P. And Sorenson P. G., Tata McGraw Hill Pub. Co. Ltd.
2. Fundamentals of Computer Algorithms, Horowitz E. And Sahani S., Galgotia Publications Ltd.
3. Programming in C, Gotterfield B., Schaums Outline Series.
4. Mastering C, R. Venu Gopal Prasad, Tata McGraw Hill Pub. Co. Ltd.

REFERENCE BOOKS: User/Command/Tutorial Manuals of relevant Softwares.

BEME507P: INDUSTRIAL VISIT

CREDITS: Nil (Audit Course)

Teaching Scheme

Practical: 02 Hour/Week

Course Objectives and Expected Outcomes: This subject aims at giving practical exposure to students and to provide opportunities for acquiring knowledge regarding manufacturing and service industries/organizations and to acquaint them with industrial culture. Upon completion of this course, students will be able to describe the usage of different technologies/tools/concepts related to Design process, operation of various machines, mechanical drives, manufacturing processes, machining processes, various process equipments, production techniques, quality control, maintenance practices, automation in industries, management etc.

Students shall visit different industries (at least two). Students shall be preferably divided into small groups to tour around the industry.

After each visit, each batch of students is required to submit a written report and shall give a brief oral presentation.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): SIXTH SEMESTER

BEME601T: ENERGY CONVERSION- I (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to expose the students to the practical applications of thermodynamics. At the end of this course students will gain the knowledge of various components of the thermal power plant like boiler, nozzles, turbines and condensers and will be able to assess the performance of these components.

UNIT – I

[8 Hrs.]

Introduction to layout of thermal power plant, principle of steam generation, fuel for steam generators, necessity of water treatment, classification of steam generators, fire tube and water tube boilers, high pressure boilers, boiler mountings and accessories.

UNIT – II

[8 Hrs.]

Draught and its classification, calculations for chimney height, chimney diameter & efficiency. Condition for maximum discharge. Performance of steam generators: Evaporation capacity, equivalent evaporation, boiler efficiency.

UNIT – III

[8 Hrs.]

Fluidized bed boiler: Bubbling fluidized bed boilers, circulating fluidized bed boilers (Elementary treatment expected), coal handling, ash handling.

Cogeneration: Introduction to cogeneration, need, working principle and applications. Topping cycle and bottoming cycle.

UNIT – IV

[8 Hrs.]

Steam nozzles: Adiabatic expansion in nozzles, maximum discharge, critical pressure ratio and effects of friction, calculation of throat and exit areas, supersaturated flow, Wilson Line.

Steam turbines: Working principle of steam turbines, classification of steam turbines, comparison of impulse and reaction turbines, compounding of steam turbines, governing of turbines.

UNIT – V

[8 Hrs.]

Energy losses in steam turbines, flow of steam through turbine blades, reheat factors, velocity diagrams, graphical and analytical methods, work done, thrust and power, dimensions and proportioning of the blades, steam turbine efficiencies, condition for maximum efficiencies, reheat and regenerative cycles.

UNIT – VI

[8 Hrs.]

Steam condensers: Types of condensers, classification of condensers, quality and quantity of cooling water required, calculations for surface condenser, Dalton's law of partial pressure, sources of air leakages and air removal, air ejectors.

Cooling towers: wet cooling towers, dry cooling towers, cooling ponds.

LIST OF TUTORIALS:

- 1) Three problems on draught.
- 2) Two problems on performance of boiler.
- 3) Two problems on heat balance sheet of boiler.
- 4) Two problems on nozzle.
- 5) One problem on metastable flow.
- 6) Two problems on impulse turbine.
- 7) Two problems on reaction turbine.
- 8) One problem on reheat cycles.
- 9) One problem on regenerative cycle.
- 10) Two problems on condenser.

TEXT BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications.
2. A Course in Power Plant Engineering, Arora & V.M. Domkundwar, Dhanpat Rai & Sons
3. Thermal Engineering, R. K. Rajput, Laxmi publications.
4. Thermal Engineering, M.M. Rathode, TMH publication.
5. A Course in Thermal Engineering, Anand Domkundwar, C.P. Kothandaraman, S. Domkundwar, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Thermal Engineering, Mathur & Mehtra, Jain Brothers Publications, New Delhi.
2. Heat Engineering, V.P. Vasandani & D.S. Kumar, Metropolisian Book Publishers.
3. Power Plant Engineering, A.K. Raja, Shrivastava and Dwivedi, New age International Publishers.
4. Fluidized Bed Combustion, S. Oka and E. Anthony, Marcel Dekker Inc.
5. Power Plant Engineering, M. M. El- Wakil, McGraw Hill International.

BEME602T: CONTROL SYSTEMS ENGINEERING (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is formulated to familiarize the students with concepts related to the operation, analysis and stabilization of control systems. The main objective of this course is to make understanding of various control systems and its stability analysis using analytical and graphical techniques, to understand the concepts of Time Domain and Frequency Domain analysis of control system, Mathematical modeling and Transfer function of engineering systems. At the end of this course, student will be able to understand various control systems & their stability analysis.

UNIT – I

[8 Hrs.]

Control System controls: Study of Control System components such as hydraulic actuators, Servomechanism D.C. and A.C. motor, liquid level control, Automobile Power Steering Control, Speed Control, Position control of Robotic Manipulator etc. Study and Analysis of performance characteristics, the concept of various types of system like machine tools, Prime movers, system generators, etc.

Modeling of Mechanical System: Basic Elements of Control System – Open loop and Closed loop systems – Differential equation – Laplace Transform – Transfer function, Modeling of physical system like Translational, rotational mechanical systems, Electric systems, Electronic system and Electro-mechanical system. Concept of transfer function & its determination for physical systems.

UNIT – II

[8 Hrs.]

Transfer Function system Representation through Block Diagram and Signal Flow Graph: Block Diagram representation, Reduction Techniques for single and multiple input/output, Conversion of Block Diagram into Signal Flow Graph, Conversion of algebraic equation into Block Diagram and Signal Flow Graph. Transfer function through Block Diagram Simplification using Masons Gain Formula.

UNIT – III

[8 Hrs.]

System Response & Time Domain Response Analysis: First and second order systems response to impulse, ramp and sinusoidal inputs, properties of unit step response of second order system, systems with velocity lag, Steady state errors and Error constants.

Signals: Step, Ramp, Impulse, Parabolic and Periodic signals with their mathematical representation and characteristics.

Mode of Controls: Basic control actions and Industrial controllers, Introduction to P, PI and PID controllers their characteristics, representation and applications. Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on system performance.

Controller Mechanisms: Pneumatic, hydraulic and electric controllers, general principles for generating various control actions.

UNIT – IV

[8 Hrs.]

Control system analysis: Concept and types of stability, Routh-Hurwitz Criterion and its application for determination of stability, limitations.

Root locus plot: Simple transfer functions transient response from root locus. Concept of stability, necessary condition for stability, Root locus concept, construction of Root loci.

UNIT – V

[8 Hrs.]

Frequency Domain analysis - Correlation between time and frequency responses of a second order System.

Bode & Polar plot: Determination of Gain Margin, Phase Margin and their Stability from Bode and Polar plots. Inverse Bode Plot, Transportation lag, System Identification from Bode plot.

UNIT – VI

[8 Hrs.]

State space representation of Continuous Time systems: State equations, Transfer function from State Variable Representation – Solutions of the state equations, Concepts of Controllability and Observability, State space representation for Discrete time systems.

Stability criterion: Introduction to control system design lag lead compensation, Feed Back Compensation and Pole -Zero placement.

LIST OF TUTORIALS:

- 1) Mathematical Modeling of Mechanical and Electrical System.
- 2) Numerical examples of Block Diagram Reduction Technique and Signal Flow Graph.
- 3) Numerical of Time response analysis.
- 4) Numerical of Frequency Domain analysis.
- 5) Numerical of Routh's Criteria.
- 6) Numerical of Polar Plot.
- 7) Numerical of Root Locus.
- 8) Numerical of Bode plot.
- 9) Numerical of State space representations.
- 10) Numerical of Root Locus using MATLAB.

At least **six** exercises are expected.

TEXT BOOKS:

1. Control System Engineering, J. Nagrath and M.Gopal, New Age International Publishers, 5th Edition, 2007
2. Control System – Principles and Design, M. Gopal, Tata McGraw Hill, 2nd Edition, 2002.
3. Control Systems Engineering, S. K. Bhattacharya, Pearson.
4. Control System Engineering, Baxi and Goyal, Technical Publication, Pune.
5. Control Systems, Dhanesh N. Manik, Cengage Learning.
6. Control Systems -Theory & Application, Smarajit Ghosh, Pearson.
7. Control Systems, Anand Kumar, PHI.

REFERENCE BOOKS:

1. Automatic Control Systems, Benjamin. C. Kuo, Prentice Hall of India, 7th Edition, 1995.
2. Digital Control and State Variable Methods, M. Gopal, 2nd Edition, TMH, 2007.
3. Feedback and Control Systems, Stubberud, Schaum's Outline Series, Tata McGraw-Hill, 2007.
4. Linear Control System Analysis and Design, John J. D'azzo & Constantine H. Houppis, Tata McGraw-Hill, Inc., 1995.
5. Modern Control Systems, Richard C. Dorf & Robert H. Bishop, Addison – Wesley, 1999.
6. Modern Control Engineering, K. Ogata, Prentice Hall of India.
7. Control System Engineering Using MATLAB, S.N. Sinanandam, S.N. Deepa, Vikas Publication.
8. Digital Control System, V.I. George, C.P. Kurian, Cengage Learning.
9. Control Systems - Problem and Solutions, K.R. Varmah, McGraw Hill Education.

BEME603T: OPERATIONS RESEARCH (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: The objectives of this course are to provide a formal quantitative approach to problem solving and perception about situations where such an approach is appropriate, to introduce some widely used mathematical models and to provide tools that students can use to solve management problems. After going through this course, students will gain proficiency with tools for optimization, simulation, including fundamental applications of those tools in industry in context of uncertainty and scarce or expensive resources.

UNIT – I

[8 Hrs.]

Introduction to O. R. & basic O.R. Models, Characteristics, phases & Methodology of O.R., Limitations & Applications.

Linear Programming:- Introduction, Linear programming problem formulation, LPP Solution by Graphical Method, Simplex Method, Principle of Duality & Formulation of Model only, Sensitivity Analysis Concept Only.

UNIT – II

[8 Hrs.]

Transportation Model – Introduction, Formulation, Optimal Solution by MODI method, Unbalanced Transportation Problem, Degeneracy, Transshipment Problem.

Assignment Model – Introduction, Variants of Assignment Problems.

Traveling Salesman Problem – Branch & Bound Technique.

UNIT – III

[8 Hrs.]

Game Theory- Introduction, Minimax and Maximin, Criteria and Optimal Strategy, Solution of games with Saddle Points, Games without Saddle Points, 2x2 games, Dominance Principle, mx2 & 2xn games. (No Graphical Method).

Sequencing Model – Introduction, Sequencing Model: n job two machines problem, n job 3 machines problem, 2 jobs m machine problem.

Inventory Model: Inventory control costs, analysis of inventory models with deterministic demand (Single Product), ABC analysis.

UNIT – IV

[8 Hrs.]

Network Model – Project Management, Formation of Network, CPM & PERT analysis, Probability of Completion of Project, Cost Analysis of Project, and Concept of Crashing.

UNIT – V

[8 Hrs.]

Replacement Model – Replacement Analysis – Replacement of items that deteriorated with time, Replacement of items that fails suddenly, Group Replacement.

UNIT – VI

[8 Hrs.]

Queuing Theory, M/M/1 model (without derivation).

Simulations – Concept, applications in waiting line situations, inventory and network.

TEXT BOOKS:

1. Operation Research, D.S. Hira & P. Gupta, S. Chand Publications.
2. Operation Research, J. K. Sharma, Macmilan Publishers.
3. Operation Research, H. Taha, Dorling Kindersley.
4. Operation Research, R. D. Askhedkar & R.V. Kulkarni, Dhanpat Rai & Sons.

BEME604T: MECHATRONICS (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand key elements of mechatronics systems, to identify various inputs and output devices in an automated system, to understand and draw ladder diagrams, to understand interfacing of input and output devices, to get awareness about actuating systems, microprocessors & microcontroller. At the end of this course students shall be able to understand the working of mechatronics systems & shall acquire the insight to build the mechatronics systems.

UNIT – I

[8 Hrs.]

Introduction to mechatronics:

Review of sensors, transducers and solid state electronic devices (*Only review, no questions to be set on these topics*).

Scope and elements of mechatronics, mechatronics design process, measurement system, requirements and types of control systems, feedback principle, Basic elements of feedback control systems, Classification of feedback control system.

Examples of Mechatronics Systems such as Boat Autopilot, High-Speed Tilting trains, Automatic Car Park system, Coin counter, Engine management system, Antilock braking system (ABS) control, traffic controller, temperature controller, weigh-bridge, weather prediction, Automatic washing machine etc. General remarks on applications.

UNIT – II

[8 Hrs.]

System Interfacing and Data Acquisition:

DAQs: Data acquisition systems (DAQS), data loggers, Supervisory control and data acquisition (SCADA), Communication methods.

I/O hardware and Software at the Microprocessor: Level and commutation, I/O operations, Data width, interfacing requirement, Buffers, Handshaking, Polling and interrupt, Digital communication, Parallel communication, Serial communication, Peripheral interface device (PIA), Analogue interfacing.

Analogue to Digital and Digital to Analogue Conversations: Introduction to digital signal processing (DSP), Data flow in DSPs, Block diagrams and typical layouts.

Components of interconnections and Impedance Matching: Impedance characteristics, Cascade connection of devices, Impedance matching in mechanical systems, interfacing microcontroller output with actuators.

Interfacing Motor Drives: Drives units- DC drives, Variable frequency drives (VFD), Scalar and Vector drives, Stepper motor driver and controller.

UNIT – III

[8 Hrs.]

Actuating Systems:

Review of Mechanical Actuating Systems: Mechanical systems, Types of motion, Cams, Gears, Ratchet and Pawl, Belt & chain drives, Bearings, Preload, Mechanical aspects of motor selection. *(Only review, no questions to be set on these topics)*

Electrical Actuating Systems: Mechanical switches and relays, solenoids, state switches-solenoids, DC Servomotors, Stepper motor, Induction Motors, speed control, pulse four-quadrant servo drives, Pulse width modulation (PWM) frequency drive, vector drive.

Pneumatics & Hydraulic Actuating Systems: Pneumatics & Hydraulic Systems, directional control valves, pressure control valves, servo and proportional control valves, Process control valves, cylinder sequencing and cascade control, rotary actuators, Identifications of graphical symbols for Pneumatic and Hydraulic circuits.

UNIT – IV

[8 Hrs.]

Digital logic: Number system, Logic gates, Boolean algebra, Karnaugh map, Applications of gates, Sequential logic.

Introduction – Components of Microprocessors: Number systems, arithmetic operations on binary numbers, 8-bit, 16-bit, 32-bit microprocessors.

8085 Microprocessor: Pin configurations of 8085, architecture of the execution unit, memory segmentation in 8085, architecture of bus interface unit of 8085, building of microprocessor subsystems.

UNIT – V

[8 Hrs.]

Programmable Logic Controller: Introduction to PLCs, Basic structure of PLC, Principle of operation, input and output processing, PLC programming language, ladder diagram, ladder diagrams circuits, timer counters, internal relays, master control, jump control, shift registers, data handling, and manipulations, analogue input and output, selection of PLC for application.

Application of PLC control: Extending and retracting a pneumatic piston using latches, control of two pneumatic pistons, control of process motor, control of vibrating machine, control of process tank, control of conveyer motor etc.

UNIT – VI

[8 Hrs.]

Introduction to SCADA: Functionality, applications, development, evaluation and benefits of SCADA.

Introduction to Electronics Interface Subsystems: Transistor- Transistor logic (TTL), Complimentary metal-oxide semiconductor (CMOS) interfacing, sensor interfacing, motor isolation schemes, buffer IC breakers, over current sensing, resettable fuses.

Introduction to Micro Electro Mechanical Systems (MEMS): Fabrication methods - Working and applications of MEMS based accelerometer, pressure sensor and gyroscope.

TEXT BOOKS:

1. Mechatronics - Integrated Mechanical Electronics System, K.P. Ramachandran, Wiley India Pvt. Ltd. New Delhi
2. Mechatronics & Microprocessors, K.P. Ramachandran, Wiley India Pvt. Ltd., New Delhi.
3. Programmable Logic Controllers, John W Webb and Ronald A Reis, Prentice Hall, Inc., 1999.
4. Mechatronics, Bolton W, Pearson Education, Second Edition, 1999.
5. Pneumatic Application, Kemprath Reihe, Wemer Depper and Kurt Stoll, Vogel Buch Verlag Wurzburg, 1987.
6. An Introduction to MEMS Engineering, Nadim Maluf & Kirt Willams.
7. RF MEMS & their Applications, Vardhan, Wiley India Pvt. Ltd.
8. MEMS: Introduction and Fundamentals, Mohamed gad-el-hak, CRC Press, 2nd ed.

REFERENCE BOOKS:

1. Pneumatic Application, Wemer Deppert and Kurt Stoll, Kemprath Reihe, Vogel Verlag, Wurzburg, 1976.
2. Pneumatic Tips, Festo K G, Festo, Germany, 1987.
3. Mechatronics, N. P. Mahalik, Mc Graw-Hill Education.
4. Mechatronic Systems Fundamentals, Rolf Isermann, Springer, 2003.
5. Mechatronics: Introduction, Robert H Bishop, Taylor and Francis, 2006.
6. Mechatronics System Design, D. Shetty, Cengage Learning (Indian Ed.)

BEME604P: MECHATRONICS (Practical)

CREDITS: 01

Teaching Scheme

Practical: 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight practicals out of the following areas shall be performed:

1. Identification & study of solid state electronic devices.
2. Identification, study & demonstration of different sensors.
3. Identification, study & demonstration of different actuators.
4. Demonstration of working of various digital to analog and analog to digital Converters.
5. Development of ladder diagram, programming using PLC for any of the following.
 - a) Motor start and stop by using two different sensors.
 - b) Simulation of a pedestrian traffic controller.
 - c) Simulation of four road junction traffic controller.
 - d) Lift / elevator control.
 - e) Washing machine control.
 - f) Tank level control.
 - g) Soft drink vending machine control
 - h) Any other suitable application.
5. Trace, interpret and demonstrate working of electro pneumatic systems.
6. Trace, interpret and demonstrate working of electro hydraulic systems.

BEME605T: DYNAMICS OF MACHINES (Theory)

CREDITS: 04

Teaching Scheme

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination Scheme

Duration of Paper: 03 Hours

University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the method of dynamic force analysis of machinery, the concept of vibratory systems and their analysis and also to study the effect of undesirable effects of unbalances in rotors and engines.

UNIT – I

[8 Hrs.]

Concepts in machine element dynamics. D'Alembert principle. Application of these approaches for simple two degree of freedom systems. Simple precession and gyroscopic couple. Gyroscopic effect on airplane, ship, vehicles and grinding mills.

UNIT – II

[8 Hrs.]

Dynamic force analysis of planar linkages such as four bar chain and reciprocating mechanism by graphical method, virtual work method. Cam dynamics and jump-off phenomenon.

UNIT – III

[8 Hrs.]

Static & Dynamic balancing in rotating machines. Balancing machines and field balancing by vector diagram.

Balancing in reciprocating mechanism.

UNIT – IV

[8 Hrs.]

Turning moment Vs crank angle diagram for single- cylinder and multiple-cylinder engines, punching machines etc. Flywheel selection.

Speed governors, centrifugal and inertia type, Watt, Portal, Proel, Hartnell governors, operating characteristics of governors.

UNIT – V

[8 Hrs.]

Derivation of equation of motion for vibratory system. Free vibration of single-degree-of-freedom system with and without damping. Logarithmic decrement and damping estimation. Forced vibration of single-degree-of-freedom system and vibration isolation, whirling of shaft and critical speed of rotors.

UNIT – VI

[8 Hrs.]

Equation of motion for two-degree-of-freedom system. Natural frequencies and mode shapes, vibration absorber. Torsional oscillation of two-disc and three disc rotors. Introduction to FFT analyzer for vibration measurements.

TEXT BOOKS:

1. Mechanical Vibrations, S. S. Rao, Addison Wesley Publishing.
2. Mechanical Vibrations, V. P. Singh, Dhanpat Rai & Sons.
3. Mechanical Vibrations, G. K. Grover, Nem Chand & Bros.
4. Fundamentals of Mechanical Vibration, Graham Kelly, Tata McGraw Hill.
5. Theory of Machines, Jagdish Lal, Metropolitan Publishers.
6. Theory of Machines, Rattan S. S, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
7. Vibration and Noise for Engineering, Pujara, K, Dhanpat Rai and Company.
8. Theory of Machine, Thomas Bevan, Pearson Publications.
9. Mechanics of Machines, V. Ramamurti, Narosa Publications.
10. Mechanism & Machine Theory, A.G. Ambekar, PHI Publication.

REFERENCE BOOKS:

1. Theory of Mechanisms and Machines, Ghosh A. and Mallick A.K., Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
2. Theory of Machines and Mechanisms, Shigley J.E. and Uicker J.J., McGraw-Hill, Inc., 1995.
3. Mechanism and Machine Theory, Rao J.S. and Duggipati R.V., Wiley-Eastern Limited, New Delhi, 1992.
4. Mechanics of Machines, John Hannah and Stephens R.C., Viva Books.
5. Theory of Machines, Sadhu Singh, Pearson Education.

BEME605P: DYNAMICS OF MACHINES (Practical)

CREDITS: 01

Teaching Scheme

Practical: 2 Hours/Week

Examination Scheme

University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum eight out of the following shall be performed:

1. Determination of jump-of speed of a typical cam- follower system.
2. Dynamic balancing of rotating masses(study of wheel balancing machine along with performance by visiting any automobile workshop).
3. Balancing of reciprocating mechanism.
4. Critical speed of shafts.
5. Performance characteristics of Gyroscope.
6. Free vibration of single DOF and two DOF spring mass system.
7. Natural frequency determination of cantilever beam.
8. Damping determination through free vibration logarithmic decay of a simple damped system.
9. Natural frequency determination of two and three rotor system.
10. Torsional vibration of bifilar or trifilar pendulum.
11. Transmissibility of single degree of freedom system
12. Dynamic vibration absorber.
13. Dynamic force analysis of four bar mechanisms.
14. Dynamic force analysis of slider crank mechanism.
15. Flywheel selection and parameter design for a typical multi-cylinder engines.
16. Performance characteristics of governors.
17. Study of any mechanism in workshop/industry..
18. Use of FFT analyzer for determination of natural frequencies of machine components.

BEME606T**FUNCTIONAL ENGLISH**

BEELE607T	FUNCTIONAL ENGLISH	L = 2	T = 0	P = 0	Credits = 2
Examination Scheme	College Assessment	University Examination		Total	Univ. Exam. Duration
	10	40		50	2 Hrs

Syllabus

Total Credits: 02**Teaching Scheme****Theory: 2 hrs per week****Duration of University Examination :2 hrs****Examination Scheme****T (University): 40 marks****T (Internal): 10 marks**

Objective: At the end of the semester, students will have enough confidence to face competitive examinations (IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure**Unit 1. Functional Grammar:**

(4 hours)

Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs.
[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

Unit II. English for Competitive Exams & Interview Techniques:

(6 hours)

IPA (vowel & consonant phonemes), Word building (**English** words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment : [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III. Formal Correspondence

(4 hours)

Business Letters, e-mail etiquettes [Orders, Complaints , Enquiries, Job applications and Resume Writing ,Writing Memorandum, Circulars, notices]

Unit IV. Analytical comprehension:

(4 hours)

[Four fictional & four non-fictional unseen texts]

Unit V. Technical & Scientific Writing:

(6 hours)

Features of Technical Writing, Writing Scientific Projects, Technical Report writing, Writing Manuals, Writing Project Proposals, Writing Research papers.

Assignment: (Any one project/review as assignment)

RECOMMENDED BOOKS

• Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal, Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober, Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

EVALUATION PATTERN:

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question pattern for end semester examination

Unit No	Q. No	Question type	No. of Questions	Weightage
Unit 1	1(A)	objective	3 out of 5	3+3+4=10
	1(B)	objective	3 out of 5	
	1(C)	objective	4 out of 6	
Unit 2	2 (A)	objective	3 out of 5	3+3+4=10
	2(B)	objective	3 out of 5	
	2(C)	subjective	1 (no choice)	
Unit 3 &	3 (A)	Subjective	1 set (out of 2 sets)	5
Unit4	3(B)	subjective	1(no choice)	5
Unit 5	4(A)	subjective	1 out of 2	5
	4(B)	subjective	1 out of 2	5

BEME607P: COMPUTER APPLICATIONS – II (Practical)

CREDITS: 04

Teaching Scheme

Practical: 2 Hours/Week

Tutorial: 2 Hour/Week

Examination Scheme

University Assessment: 50 Marks

College Assessment: 50 Marks

Course Objectives and Expected Outcomes: This course is designed to give theoretical & practical exposure to DBMS. During this course, students will understand the concepts & applications of DBMS.

An Introduction to DBMS, concept and meaning, Disadvantages of file systems. Advantages and Disadvantages of DBMS. Database languages, database administrator & user, system structure.

Entity Relationship Model: Entities and Entity sets, Relationship and sets, Mapping constraints, Keys, E-R diagrams, E-R diagrams diagram to table, Generalization, Aggregation, Design of an E-R database scheme.

Relational database & SQL, set operations, aggregate functions Nested sub queries, derives relations. Modification of the database, Data Definition language (DDL), Embedded SQL.

LIST OF PRACTICALS:

At least eight Practicals in applications like Material Management, Inventory Management, Office automation etc. based on above syllabus shall be conducted using suitable DBMS packages like ORACLE, MS ACCESS etc. or relevant freeware/s.

Note:

During University practical examination of 50 marks, students are expected to workout problem/s of total 30 marks using DBMS software in two hours duration. Viva-voce of 20 marks shall be conducted during University practical examination.

TEXT BOOKS:

1. An Introduction to Database System, C.J. Date, Perarson
2. Database and System Concept, A Silberschatz, H F Korth, A Sudarshan., TMH publications
3. User/Command/Tutorial manuals of relevant softwares.

BEME608P: INDUSTRIAL CASE STUDY

CREDITS: 02

Teaching Scheme

Practical: 02 Hour/Week

Examination Scheme

College Assessment: 50 Marks

Course Objectives and Expected Outcomes: This course is designed to acquaint the students with various industrial/organizational problems and how they can be solved using methods/techniques/theories etc. studied in curriculum.

Industrial case study should be based on the study of some specific case/issue/problem related to any industrial/business establishment. Data should be collected from industry or organization with objective of studying some specific case/issue/problem. The collected data should be analyzed using one or more theories studied in curriculum. The results should be worked out and conclusions should be drawn. The industrial case study can be also be based on the study of report prepared by any industry/business organization related to issues/problems. Group of students (Max 09 & Min 05) can be considered for this study. A report should be submitted. The report should consist of the problem/issue identified, methodology of data collection, data collected, methods of analysis, results and conclusions. Student is expected to give presentation based on this report.