Jabalpur Engineering College, Jabalpur

Semester VI Credit Based Grading System (CBGS) w.e.f. July 2017

Scheme of Examination

Bachelor of Engineering B.E. (Electrical Engineering)

Subject wise distribution of marks and corresponding credits

Scheme of Examination w.e.f. July-2017 (Academic Session-2017-18)

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours / week.			Total Credits	Total Marks
			Theory			Practical		Total Marks					
			End Sem	Mid Sem. MST	Quiz, Assign ment	End Sem.	Lab Work		L	T	P		
1	**EE6001**	Analog & Digital Communication	70	20	10	-	-	100	3	1	-	4	
2	**EE6002**	Power System Protection	70	20	10	30	20	150	3	1	2	6	
3	**EE6003**	Power System Analysis	70	20	10	30	20	150	3	1	2	6	
4	**EE6004**	Microprocessors & Microcontrollers	70	20	10	30	20	150	3	1	2	6	
5	**EE6005**	Elective-II	70	20	10	-	-	100	3	1	-	4	
6	**EE6006**	Departmental Lab-III (Electrical Software Lab II)	-	-	-	30	20	50	-	-	2	2	
7	**EE6007**	Creativity and Entrepreneurship Development (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	**EE6008**	Startup / Industrial Lectures (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
Total			**350**	**100**	**50**	**120**	**180**	**800**	**15**	**5**	**12**	**32**	**800**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

- **Students have to go for Industrial Training /Internship of 4 weeks at the end of VI Semester.**

Department Elective-II (Four Subjects)	
Subject Code	**Subject Name**
EE6005A	Control System
EE6005B	Intellectual Property Rights
EE6005C	Computational Mathematics
EE6005D	Electrical Machine Design

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B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
ANALOG & DIGITAL COMMUNICATION

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Analog &Digital Communication	EE6001	Min. "D"	Min. "D"	5.0

Unit-I:

Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation.

Unit-II:

Base band signal, need of modulation, Introduction of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.

Unit-III:

Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-IV:

Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error.

Unit-V:

Information theory and coding- Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes. Line Encoding: Manchester coding, RZ, NRZ coding.

Books References:

1. Singh & Sapre, Communication System, TMH
2. Taub & shilling, Communication System, TMH
3. Hsu; Analog and digital communication (Schaum): TMH
4. B.P. Lathi, Modern Digital and analog communication system,
5. Simon Haykins, Communication System. John Willy
6. Wayne Tomasi, Electronic Communication system.
7. Martin S. Roden, Analog & Digital Communication System; Discovery Press.
8. Frank R. Dungan, Electronic Communication System, Thomson/Vikas.

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Semester-VI

EE6001 Analog and digital communication

After completion of this course students will be able to-

CO1. Determine Fourier transform of continuous time signals.
CO2. Explain different modulation and demodulation techniques used in analog communications.
CO3. Elaborate time division multiplexing and frequency division multiplexing techniques.
CO4. Analyze different transmitter and receiver circuits used in digital modulation.

CO5. Compare various coding methods used in communication systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life Long Learning**	**Machine**	**Power System**
EE6001(1)		2	-	-	-	-	-	-	-	-	-	-		
EE6001(2)	1			-	-	-	-	-	-	-	-	-		
EE6001(3)	2				-	-	-	-	-	-	-	-		
EE6001(4)	2		-		-	-	-	-	-	-	-	-		
EE6001(5)			1											
EE6001	**1**	**0.4**	**0.2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
POWER SYSTEM PROTECTION

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Power System Protection	EE6002	Min. "D"	Min. "D"	5.0

Unit-I:

Relays: General consideration, sensing of fault, primary and back up protection, basic requirements of protective relaying, classification of relays, construction of electromagnetic relays, induction type relay principle, inverse time and definite time characteristics, over current, over voltage, directional, distance relays, differential buchholz and negative phase sequence relays.

Unit-II:

Advance relays: Static Relays : Classification of static relays, block diagram & components of static relays, comparators, static over current, static directional, static distance and static differential relays. Microprocessor Based Relays: General considerations, flow chart and software development for protection, microprocessor based over current relay, directional relay, distance relay, security and reliability.

Unit-III:

Protection : Types and detection of faults and their effects, alternator protection scheme, power transformer protection, generation-transformer unit protection scheme, busbar protection, transmission line protection, frame leakage protection, pilot relay scheme.

Unit-IV:

Switchgear: Fuse : Characteristics, types of fuses, selection of fuses, construction and application of HRC fuses. Circuit breaker : basic principle of operation, are phenomenon, initiation and maintenance of are, arc interruption methods, are voltage and current waveform in AC circuit break in, re-striking and recovery voltage, current chopping, rating of circuit breakers, breaking capacity, making capacity, short time rating, working principle and important features of oil CB, minimum oil CB, air blast CB,.Vacuum CB and SF6CB, auto high speed re-closing.

Unit-V:

Over voltage protection and neutral grounding : Surge over voltages : Causes of over voltages, lightning phenomenon, protection of transmission line against over voltages, klydonograph and magnetic link, switching surges, surge diverters peters ion coil and insulation coordination. Neutral grounding: Resistance ear thing, reactance ear thing, resonance ear thing, voltage transformer ear thing, ear thing transformer.

Books References:

1. S.L. Uppal, Power System
2. Sunil S.Rao, Switchgear and Protection, Khanna Pub New Delhi, 1986
3. C.L. Wadhwa, Electrical Power Systems, Newage International (P) Ltd 2000
4. B.Ravindranath and N. Chander Power System Protection & Switchgear, wiley Erstern Ltd 1977
5. Badri Ram, Vishwakarma, Power System Protection and Switchgear, Tata Mc Graw Hill 2001

POWER SYSTEM PROTECTION LAB

List of Experiments:

1. To plot IDMT characteristics of the over current relay.
2. To plot microprocessor based over current relay characteristics.
3. To plot Electromechanical based UV Relay characteristics.
4. To plot microprocessor based UV/OV Relay characteristics.
5. To plot the trip voltage and time interval of Under Voltage Relay (Electromechanical)
6. To plot Under Voltage Relay trip time characteristics curve.
7. To plot the bias curve with mean bias current in X-axis and differential current in Y-axis.

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8. To plot the percentage biased differential curve for static relay.
9. To plot the fault current and trip time graph to analyse Negative Sequence Relay.
10. To find out the pickup and reset value of the instantaneous relay.
11. To check the operation of over current relay.
12. To check the percentage setting of the percentage differential Relay.
13. To plot the directional characteristics of directional over current relay on R-X diagram.
14. To plot the characteristics of Buchholz Relay.
15. To plot the characteristics of

a) Electromagnetic Relays
b) Static Relays
c) Microprocessor based Relays

16. Determine the characteristics of Micro controller based

a) Over/Under Voltage Relay
b) Directional Over Current Relay
c) 3 phase differential relay.

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EE6002 POWER SYSTEM PROTECTION

After completion of this course students will be able to-

CO1.	Explain Various types of relay's.
CO2.	Categorized Advance Relays
CO3.	Illustrate Protection of Busbar, transmission line, alternator
CO4.	Employ switchgear equipments for protection system.
CO5.	Analyze causes of surge overvoltages.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE6002(1)	3	-	-	-	-	-	-	-	-	-	-	-	-	2
EE6002(2)	2		-	-	-	-	-	-	-	-	-	-	-	2
EE6002(3)	2	-		-	-	-	-	-	-	-	-	-	2	2
EE6002(4)				1										2
EE6002(5)		3		-	-	-	-	-	-	-	-	-	-	3
EE6002	**1.4**	**0.6**	**0**	**0.2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.4**	**2.2**

B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
POWER SYSTEM ANALYSIS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Power System Analysis	EE6003	Min. "D"	Min. "D"	5.0

Unit – I:

Power flow studies – Bus Classification, bus admittance matrix, Formulation of static power flow equations, the power-flow problem, Gauss-seidel, Newton Rap son and Fast decoupled power flow methods, comparison of these methods.

Unit – II:

Faults Calculations- Representation of Power system, Per unit system representation, Transient RL series circuit, 3 phase sudden short circuit of an alternator, limitation of fault currents, analysis of symmetrical faults in power system networks, consideration of pre fault load current, current limiting reactors.

Short circuit calculation of unsymmetrical faults- synthesis of unsymmetrical phasors from their symmetrical components, power in terms of symmetrical components, sequence circuits of star delta impedances, sequence circuits of symmetrical transmission lines, synchronous machine and transformers. Sequence networks. Unsymmetrical faults in power system.

Unit – III:

Fundamentals of power economics- Economic Load Dispatch- distribution of loads in plant, transmission loss equation, System constraints, Economic Dispatch neglecting losses, classic Load Dispatch Including transmission losses. *Modern interconnected power Systems*-General Problems associated with modern interconnected power Systems deregulation. Power system restructuring distributed generation congestion available transfer capacities pricing of energy and transmission service.

Unit – IV:

Power System stability- the stability problem, rotor dynamics and swing equation power angle equation, synchronizing power coefficients, Equal Area criterion, Critical clearing angle, multi machine system, step by step solution of swing equation, factors affecting transient stability.

Unit – V:

Load frequency and voltage control- Load frequency problem, speed governing systems, reasons for limits on frequency. Methods of voltage control(sources and sink of reactive power, shunt capacitors and reactors, series capacitors, comparison between shunt and series capacitors, synchronous capacitors, tap changing transformer, booster transformer)

List of Experiments-

1. To develop a 3 bus system with AGC (Automatic generation control) on in power world.
2. To develop y bus matrix for n bus system in power world.
3. Load flow studies using guass siedle method in power world.
4. Symmetrical fault analysis of n bus system in power world.
5. Line to ground fault analysis of n bus system in power world.
6. Line to Line fault analysis of n bus system in power world.
7. Line to Line to ground fault analysis of n bus system in power world.

Suggested readings:

Text books:

1. Electrical Power Systems by C.L. wadhwa New Age International (p) LTd 2nd exition 1998
2. Power system analysis by John J.Grainger and William D. Stevenson,Jr. McGraw-Hill Series in Electrical and Computer Engineering

Books References:

1. Modern Power System Analysis by I.J. Nagrath & D.P. Kothari Tata Mc Graw Hill Pub. Co. Ltd. 2nd edition.
2. A course in power system by J.B. Gupta, SK katara and sons.
3. Reactive power control in Electric Systems by T.JE Millar John wiley &Son
4. T.K. Nagarkar, MS. Sokhija Power System Analysis, Oxford University press.
5. Elgerd O.I. Electric Energy Systems Theory. TMH New Delhi Second Edition 1983

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6. Prabha Kundur Power system stability and control Mc Graw hill inc New York 1983
7. Taylor C.W. Power System Voltage Stability MC Graw Hill inc New Yark 1993
8. Weedy B.M. Electric Power System John Wiley and Sons 3rd edition.
9. P.S. R. Murthy Power System Operation and Control B.S. publication.

POWER SYSTEM ANALYSIS LAB

List of Experiments-

1. Load flow studies of n bus system using Newton Rapson Method in MATLAB.
2. Load flow studies of n bus system using Guass Siedle method in MATLAB.
3. Symmetrical fault analysis of n bus system using MATLAB.
4. Unsymmetrical fault analysis of n bus system using MATLAB.
5. Economic power sharing between generators neglecting transmission losses using MATLAB.
6. Economic power sharing between generators including transmission losses using MATLAB.
7. Analysis of 3 phase fault using Equal Area Criteria using MATLAB.
8. Transient stability studies of multimachine system using MATLAB.
9. Automatic generation control in single area system using MATLAB.
10. Automatic generation control in multimachine system using MATLAB.

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EE6003 Power System Analysis

After completion of this course students will be able to-

CO1.	Use power flow methods in the power-flow problem.
CO2.	Calculate symmetrical and unsymmetrical faults in power system networks.
CO3.	Design loads for Economic Load Dispatch.
CO4.	Apply equal area criteria for Power System stability.
CO5.	Analyze Load frequency control and voltage control of power system.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE6003(1)		3		-	-	-	-	-	-	-	-	-	-	3
EE6003(2)		3												3
EE6003(3)			2	-	-	-	-	-	-	-	-	-	-	2
EE6003(4)				2	-	-	-	-	-	-	-	-	-	2
EE6003(5)				2	-	-	-	-	-	-	-	-	-	2
EE6003	**0**	**1.2**	**0.4**	**0.8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2.4**

B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
MICRO PROCESSORS & MICRO CONTROLLERS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Micro Processors & Micro Controllers	EE6004	Min. "D"	Min. "D"	5.0

Unit -I :

Microprocessor 8086: Introduction to 16-bit 8086 microprocessors, architecture of 8086, pin configuration, interrupts, minimum mode and maximum mode, tinning diagram. Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.

Unit- II :

Microprocessor 8086 Programming: Introduction set of 8086, Addressing mode, assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,

Unit- III:

Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, QSART 8251, 8 bit ADC/DAC interfacing and programming.

Unit –IV:

Microcontroller 8051 : Intel family of 8 bit microcontrollers, Architecture of 8051. I/O Configuration, interrupts, Interrupt structure and interrupt priorities, port structure and operation, Accessing internal & external memories and different mode of operation, Memory organization, Addressing mode, instruction set of 8051 and programming.

Unit –V:

8051Interfacing. Applications and serial communication:8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/counter function, 8051 based thruster firing circuit, 8051 connections to Rs-232, 8051 Serial communication, Serial communication modes, Serial communication programming, Serial port programming in C.

Books Reference:

1. Hall Douglas V. Microprocessor and interfacing, Programming and Hardware, second edition, Macmillan McGraw Hill.
2. Ray A.K. Bhurchandi K.M. Advance Microprocessor and peripheral, first edition, TMH
3. Kenneth J. Ayala, The 8086 microprocessor. Programming and interfacing the PC, Indian edition CENGAGE Learning.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005
5. Kenneth J. Ayala,The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
6. V. Udayashankara and M.S. Mallikarjunaswany , 8051 Microcontroller, McGraw Hill.
7. McKinley, The 8051 Microcontroller and Embedded Systems-using assembly and C,PHI, 2006/Pearson, 2006.

MICRO PROCESSORS & MICRO CONTROLLERS LAB

List of Experiments:

1. Write an 8086 ALP to find the average of a series of 8-bit numbers.
2. Write an 8086 ALP to find the HCF of 2, 16-bit numbers.
3. Write an 8086 ALP to find the LCM of 2, 16-bit numbers.
4. Write an 8086 ALP to reverse a given string.
5. Write an 8086 ALP to find out a larger number from a given unordered 8 bit numbers.
6. Write an 8086 ALP to arrange the given series of 8-bit numbers in ascending order.
7. Write an 8086 ALP to find the factorial of a number.
8. Write an 8086 ALP to print 'n' Fibonacci numbers.
9. Write an 8086 ALP to perform Decimal to Binary conversion.
10. Write an 8086 ALP to perform Decimal to Hexadecimal conversion.

EE6004 Microprocessor & Microcontroller

After completion of this course students will be able to-

CO1.	Explain the architecture and Software model of Intel's 8086 -bit Microprocessor.
CO2.	Develop 8086 assembly level programs and manually translate them to Machine Language Programs
CO3.	Interface various peripheral ICs like 8255, 8257, 8251, and 8254 with 8086 Microprocessor.
CO4.	Apply 8051 interrupt system to interface peripheral and IOs in interrupt driven data transfer mode.
CO5.	Program the 8051 microcontroller for serial communication modes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life Long Learning**	**Machine**	**Power System**
EE6004(1)	2		-	-	-	-	-	-	-	-	-	-	-	-
EE6004(2)			2	-	-	-	-	-	-	-	-	-	-	-
EE6004(3)	2			-	-	-	-	-	-	-	-	-	-	-
EE6004(4)			1		-	-	-	-	-	-	-	-	-	-
EE6004(5)		2												
EE6004	**0.8**	**0.4**	**0.6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
(ELECTIVE- II) CONTROL SYSTEM

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	(Elective- II) Control System	EE6005A	Min. "D"	Min. "D"	5.0

Unit-I:

Modeling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function, State space description of dynamic systems: Open and closed loop systems, Signal flow graph, Mason's formula, Components of control systems: Error detectors (Synchros & Potentiometer), Servomotors (AC & DC), techogenerators, power amplifier, stepper motors.

Unit -II:

Time-domain analysis of closed loop systems: Test signals, time response of first and second order systems, Time domain performance specifications, Steady state error & error constants, Feedback control actions: Proportional, derivative and integral control.

Unit –III:

Concept of stability, Necessary condition for stability Hurwitz, Stability criterion, Relative stability analysis, Root locus technique.

Unit -IV:

Frequency response analysis and stability in frequency domain: Correlation between time and frequency response analysis, Polar plots, Bode plots, Effect of adding pole and zeros, Nyquist stability criterion, gain margin and phase margin, Relative stability from Nyquist plot, Frequency domain compensation, lead, lag, lag-lead compensation.

Unit -V:

State space analysis: Concept of state, state space representation of systems, Block diagram for state equation, Transfer function decomposition, Solution of state equation, Concept of controllability and observability.

Books Reference:

1. I.J. Nagrath and M. Gopal, "Control system engineering", New Age International.
2. K. Ogata, Modern Control Engineering, PHI.
3. B.C. Kuo, Automatic Control systems, PHI
4. Gopal M., Control System: Principles & Design, TMH.
5. N.K. Sinha, Control Systems, New Age International
6. Stefani, Shahian, Savant, Hostetter – "Design of feedback control System's", Oxford

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EE6005 Control System

After completion of this course students will be able to-

CO1.	Analyze electrical, mechanical and hydraulic system and transfer function.
CO2.	Determine time response of first and second order systems and steady state error.
CO3.	Estimate stability using Routh Hurwitz criteria and Root-locus technique.
CO4.	Plot Polar, Nyquist and Bode of systems in frequency domain.
CO5.	Develop state space representation of systems and its solution.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life Long Learning**	**Machine**	**Power System**
EE6005(1)	-	2	-	-	-	-	-	-	-	-	-	-	-	-
EE6005(2)	-	1	-	-	-	-	-	-	-	-	-	-	-	-
EE6005(3)	-	2	-	-	-	-	-	-	-	-	-	-	-	-
EE6005(4)	-	-	3	-	-	-	-	-	-	-	-	-	-	-
EE6005(5)	-	-	-	1	-	-	-	-	-	-	-	-	-	-
EE6005	**0**	**1**	**0.6**	**0.2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
(ELECTIVE- II) INTELLECTUAL PROPERTY RIGHTS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	(Elective- II) IPR (Intellectual Property Rights)	EE6005B	Min. "D"	Min. "D"	5.0

Unit -I :

Introduction: Introduction and Justifications of IPR, Nature of IP, Major forms of IP- Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property. Major international documents relating to the protection of IP - Berne Convention, Paris Convention, TRIPS. The World Intellectual Property Organization (WIPO).

Unit -II :

Copyright: Meaning and historical development of copyright, Subject matter, Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and license of rights, Infringement of copyright, Exceptions of infringement, Remedies, Civil, Criminal, Administrative, Registration Procedure.

Unit -III:

Patents: Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory license, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

Unit -IV :

Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorized user.

Unit -V:

Contemporary Issues & Enforcement of IPR: IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR.

Books References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.

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B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
(ELECTIVE- II) COMPUTATIONAL MATHEMATICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	(Elective- II) Computational Mathematics	EE6005C	Min. "D"	Min. "D"	5.0

Unit-I:

Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, iteration method, Graffes root squaring method.

Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, relaxation method, Jacobi and Gauss-Seidel methods.

Unit-II:

Interpolation: Finite difference operator and their relationships, difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences, Lagrange Interpolation and Newton's divided difference interpolation.

Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons 1/3rd and 3/8th rules with errors and their combinations, Gauss Legendre 2-points and 3-points formulae.

Unit-III:

Numerical Solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method, Modified Euller method, Runge-kutta Method, predictor corrector method.

Numerical solution of Partial Differential Equations :Classification, Finite –difference approximation to derivatives, solution of Laplace's equation by Jecobi's and Gauss Seidel method, parabolic equation, Iterative method for the solution of equations, Hyperbolic equation and its numerical solution.

Unit-IV:

Sampling: Brief idea of sampling, t, F and χ^2 distribution and their applications, ANOVA, Statistical quality control, control charts, sampling inspection, acceptance sampling, Producers and consumers risk, O.C. curve, Taguchi method.

Unit-V:

Queuing Theory: Queuing systems, Transient and steady state, traffic intensity, Distribution of queuing systems, classifications of queuing models (M/M/1: infinity/FCFS, M/M/1: N / FCFS, M/M/1: infinity/SIRO, M/M/S: infinity/ FCFS)

Books Reference:

1. Numerical Methods in Engineering and science by B.S. Grewal, Khanna Publishers.
2. Numerical Methods by E. Balagurusamy, Tata Mc Graw- Hill Publishing CompanyLtd., New Delhi.
3. Numerical Methods for Scientific and Engineering Computation by Jain, M. K. , Iyengar, S. R. K. and Jain, R. K., New Age Pvt. Pub.New Delhi.
4. Operation Research, Taha H.A; PHI.
5. Introduction to OR, Hiller and Lieberman; TMH.

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B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
(ELECTIVE- II) ELECTRICAL MACHINE DESIGN

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	(Elective- II) Electrical Machine Design	EE6005D	Min. "D"	Min. "D"	5.0

Unit-I

General Concept and Constraints on Design of Rotating Machines

Relation between rating and dimensions of rotating machines, Total loading, Specific loadings ,Output coefficient ,Factors affecting size of Rotating machines, Choice of specific magnetic loading, choice of specific electric loading , Variation of output and losses with linear dimensions ,Separation of D and L of machine, Unconstrained optimization problems, constrained optimization problems.

Unit-II :

Design of DC machine

Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-III:

Design of power transformer

Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-IV :

Design for 3-phase alternator

Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-V :

Design of 3-phase induction motor

Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

Books Reference:

1. Design and Testing of Electrical Machines, MV Deshpandey PHI Learning
2. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.
3. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
4. Principles of Electrical Machine Design with Computer Programs by- S.K. Sen, Oxford & IBH Publishing Co.
5. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

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B.E. (CBGS) VI SEMESTER
ELECTRICAL ENGINEERING
DEPARTMENTAL LAB-III (CONTROL & COMPUTING LAB)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Departmental Lab-III Electrical Software Lab II	EE6006	Min. "D"	Min. "D"	5.0

List of Experiments-

1. Determinations of transfer function of AC servo motor.
2. Determination of transfer functions of DC servo motor.
3. Stability analysis of linear system.
4. To analyze characteristics of relay.
5. To simulate the performance of a second order system with a digital P, PI, PID controller.
6. To plot the frequency response of the lead, lag-lead lag process.
7. To determine the digital P, PI and PID control action on the simulated second order process.
8. Validation of level sensor through open loop control and PID feedback control using process trainer kit.
9. Validation of flow control valve through open loop control and PID feedback control using process trainer kit.
10. Modeling of inverted pendulum parameters.
11. Determination of balance control parameters for swing up control of inverted pendulum.
12. Write a MATLAB program for root locus.
13. Write a MATLAB program for Bode plot.

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