Jabalpur Engineering College, Jabalpur

Semester IV 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, Assignment	End Sem.	Lab Work		L	T	P		
1	**MA4201**	Mathematics-III	70	20	10	-	-	100	3	1	-	4	
2	**EE4002**	Electrical Machine I	70	20	10	30	20	150	3	1	2	6	
3	**EE4003**	Power System-I	70	20	10	30	20	150	3	1	2	6	
4	**EE4004**	Digital Electronics	70	20	10	30	20	150	3	1	2	6	
5	**EE4005**	Signals & Systems	70	20	10	-	-	100	3	1	-	4	
6	**EE4006**	Departmental Lab-I (Electrical Workshop)	-	-	-	30	20	50	-	-	2	2	
7	**EE4007**	Programming Tools (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	**EE4008**	Professional Ethics/ Security and regulation act (Drawing Estimation & Costing) (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 IV Semester.**

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
MATHEMATICS- III

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Mathematics- III	MA4201	Min. "D"	Min. "D"	5.0

Unit-I:

Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms and their elementary properties, Convolution theorem, Applications of Laplace and Fourier transformations to solve the Boundary value problems.

Unit-II:

Hankel and Mellin transformations. Their elementary properties. Wavelet Transforms, CWT, Properties of CWT, Z – transform and inverse Z-transform of elementary functions, Shifting theorems, convolution theorem, Initial and final value theorem, Applications of Hankel and Mellin transformations to solve the Boundary value problems.

Unit -III:

Vector space and Linear transformation: Some basic concepts, Vector space, General properties of vector spaces, Vector subspaces, Linear combination, finite dimensional vector space, Linearly dependent and independent vectors, Basis, Linear and Direct sum of two sub spaces.

Unit -IV:

Analytic functions, Cauchy Reimann equations in Cartesian and polar coordinates, harmonic and conjugate harmonic functions.Complex integration, line integral, Cauchy's integral theorem, Cauchy integral theorem, Residue theorem, evaluation of simple real integrals, Taylors and Laurent series.

Unit -V:

Conformal mappings, mappings of elementary functions, Bilinear transformations, Joukvowaski's transformation, Schwarz - Christoffel transformation. Basic concepts of reliability, failure law, Evaluation of reliability of a component from test data, system reliability, Components in series and parallel, Redundancy.

Books Reference:

1. Advanced Engineering mathematics by E. Kreyszig John Willey & Sons
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Numerical Methods in Engineering and science by B.S. Grewal, Khanna Publishers .
4. Higher Engineering Mathematics by B.V. Ramana TMH.
5. Numerical Methods by E. Balagurusamy, Tata Mc Graw- Hill Publishing CompanyLtd., New Delhi.

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
ELECTRICAL MACHINE I

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Electrical Machine I	EE4002	Min. "D"	Min. "D"	5.0

Unit- I:

Transformer: Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, all day efficiency, Excitation phenomenon. Autotransformer: working, advantages, its equivalent circuit and phasor diagram. Three phase transformer: its construction, groups and connections, their working and applications; Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers

Unit- II:

DC Machine I: Constructional features, emf equation, classification on the basis of excitations, armature winding, lap winding, wave winding, operation as generator, operating characteristics, armature reaction & commutation, compensating winding, losses efficiency, power output equation.

Unit- III:

DC Machines II: Operation as motor, torque equation, operating circuits of motor, types of DC motors, starting and speed control, ward Leonard method, solid state control, Swinburne's test, Hopkinson's test, braking. Applications of DC Machines.

Unit –IV:

Induction Motor and Generator: Construction, working principle, double revolving field theory, Phasor diagram, equivalent circuit. Determination of equivalent circuit, parameter by no load and block rotor test, starting methods and types of 1-φ Induction motor.

Unit –V:

Special Electric Motors: Construction and working principle of Brushless DC Motor and servo motor.

Books References:

1. Nagrath and Kothari "Electrical Machines", TMH Publication.
2. P.S.Bhimbra ,"Electrical Machinery" Khanna. Publication
3. Langs Dorf "AC machines" TMH Publication
4. Ashfaq Hussain "Electrical Machines" Dhanpat Rai. Publication

ELECTRICAL MACHINE I LAB

List of Experiment:

1. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage and frequency by conducting no load tests at different frequencies keeping V/f constant.
2. To perform open circuit & short circuit test on 1-Ø transformer & determine the equivalent circuit parameters.
3. To conduct open circuit and short circuit tests on a 3-Ø three winding transformer and determine the equivalent circuit parameters in pu.
4. To operate two single phase transformer of different KVA rating in parallel and plot the variation of current shared by each transformer v/s load current.
5. To conduct Sumpner's test identical single phase transformer and determine their efficiency at various loads.
6. To perform direct load test on a DC shunt motor and plot the variation of (a) Input current (b) speed (c) torque (d) efficiency v/s output power.

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7. To obtain magnetization characteristics of a DC machine. Estimate field circuit resistance of a DC shunt generator at rated speed. Measure field winding and armature winding resistance. Plot the external characteristics of DC shunt generator.
8. To make scott connection of two single phase transformer and to verify the current relation by drawing phasor diagram for balanced and unbalanced resistive load condition.
9. To conduct Swinburn's test on a dc shunt motor. Compute and plot the efficiency at various loads.
10. To conduct direct load test on DC Compound generator with (a) Shunt field alone (b) Cummulative and differential compounding for short shunt connections.
11. To study the three phase point starter for DC machine speed control of DC shunt motor using armature and field control plot the variation of speed with added resistance.
12. To study the starting method of single phase induction motors.
13. Study of three and four point starters for DC shunt & compound motors.

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
POWER SYSTEM-I

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Power System-I	EE4003	Min. "D"	Min. "D"	5.0

Unit –I:

Transmission Systems: Extra High Voltage (EHV) AC Transmission: Introduction to EHV Transmission, Necessity, Problems, Limitations and Design aspects of EHV-AC transmission system. High Voltage Direct current (HVDC) Transmission: Principal, advantage and disadvantages of HVDC transmission. Comparison between EHV-AC and HVDC transmission. Types of DC links

Unit –II:

Overhead Transmission Lines: Types of conductors, Line parameters: calculation of inductance and capacitance of single circuit transmission lines, three phase lines with stranded and bundle conductors, generalized ABCD constants and equivalent circuits of short, medium & long lines. Line performance, regulation and efficiency of short, medium and long lines, series and shunt compensation, FACTS. Real & Reactive power flow, surge impedance, SIL.

Unit- III:

Distribution systems: Primary and secondary distribution systems, concentrated and Uniformly distributed loads on distributors fed at one and both ends, ring distribution, voltage drop and power loss calculations, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Unit –IV:

Overhead Line Insulators: Types, string efficiency, grading ring, preventive maintenance. Mechanical design of transmission lines: Different types of tower, sag-tension calculations, strings charts, vibration dampers, line supports, spacing of conductors and ground. Corona losses, radio and audio noise, transmission line- communication line interference.

Unit –V:

Cables: Classification, construction and characteristics of different types. Insulation resistance and capacitance, it an ce and inter sheath), phenomenon of dielectric losses, dielectric stress and sheath loss in cables.

Books References:

1. Nagrath I J and Kothari DP; "Power System Engineering", Tata McGraw Hill.
2. John S. Grainger and W.D. Stevenson Jr., "Power System Analysis", McGraw Hill.
3. Deshpande M V; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modern Power System Practice", Vol 1-8 Pergamon Oxford.
5. James J. Burke, "Power Distribution Engineering: Fundamentals and Applications", Marcel Dekker.
6. Westinghouse Electric Corporation; Electric Transmission & Distribution Reference Book; East Pittsbrg.
7. Wadhwa C L ; "Electrical Power System" Wiley Eastern Limited.
8. Ashfaq Hussain; "Electrical Power System".
9. Gupta B R; "Power System Analysis and Design "Ray; "Electric Power System.

POWER SYSTEM-I LAB

List of Experiment:

1. To determine A, B, C, D constants of medium transmission line by T-method.
2. To determine A, B, C, D constants of medium transmission line by Π-method.
3. To find the Ferranti effect of transmission line.
4. To measure resistance of conductor using Megger.
5. To measure of Capacitance of 3-core Cables.
6. To calculate the string efficiency of suspension type insulator.
7. To build a model of electrical transmission tower.
8. To build a model of electrical substation.

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
DIGITAL ELECTRONICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Digital Electronics	EE4004	Min. "D"	Min. "D"	5.0

Unit-I:

Number Systems and Codes: Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes. Alphanumeric codes – ASCII code and BCD codes, concept of parity, complement r's & (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes.

Unit -II:

Boolean Algebra: Basic Theorems & Properties of Boolean algebra: AND, OR, NOT operators, laws of Boolean algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minterms & product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator & checkers.

Unit III:

Combinational Circuits: Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram.

Unit IV:

Sequential Logic Circuit : Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flip flop.

Unit V:

Registers and Counters : Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre- settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

Books References:

1. E W Golding & F C Widdis, Vedition, ," Electrical Measurement & Measuring Instruments ",Wheeler Publishing
2. A.K. Sawhney," Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai & Sons Publications
3. Buckingham & Price ,"Electrical Measurements", Prentice Hall

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DIGITAL ELECTRONICS LAB

List of Experiments:

1. Verification of all basic logic gates and their truth tables.
2. Verification of the law of Boolean algebra and De-Morgan's theorems.
3. Construction and verification of various types of Flip Flops using gates and ICs.
4. Design of Combinational circuits for:
   a) Half adder
   b) Full adder
   c) Half subtractor
   d) Full subtractor
5. Design of even/odd parity checker.
6. Construction and verification of Multiplexer (2 to1) and line Demultiplexer (4 to 2).
7. Construction and verification of Binary to Gray converter.
8. Construction and verification of Gray to Binary converter.
9. Design of 3-bit up and down counter.
10. Design of 3-bit synchronous ripple up counter.

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
SIGNALS AND SYSTEMS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Signals and Systems	EE4005	Min. "D"	Min. "D"	5.0

Unit-I:

Dynamic Representation of Systems: systems Attributes, Causality linearity, time-invariance. Special Signals, Complex exponentials, Singularity functions (impulse and step functions)..Linear Time-Invariant Systems: Differential equation representation convolution integral. Discrete form of special functions. Discrete Convolution and its properties. Realization of LTI system (differential and difference equations).

Unit-II:

Fourier Analysis of Continuous Time Signals and Systems: Fourier Series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems. Sampling Theorem.

Unit-III:

Fourier Analysis of Discrete Time Signals & Systems: Discrete-Time Fourier Series, Discrete-Time Fourier Transform (including DFT) and properties, Frequency response of discrete time LTI systems.

Unit-IV:

Laplace Transform: Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros. Z-Transform: Z-Transform and its inverse: Definition, existence, Region of convergence and properties, Application of Z-Transform for the analysis of discrete time LTI systems, Significance of poles and zeros.

Unit-V:

Sampling: The sampling theorem, reconstniction of Signal from its samples, sampling in the frequency domain, sampling of discrete-time signals.

Books References

1. Alan V. Oppenheim, Alan S. Will sky and H. Nawab, Signals and systems, Prentice Hall, 1997
2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995

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B.E. (CBGS) IV SEMESTER
ELECTRICAL ENGINEERING
DEPARTMENTAL LAB-I (ELECTRICAL WORKSHOP)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Departmental Lab-I (Electrical Workshop)	EE4006	Min. "D"	Min. "D"	5.0

List of Experiment:

1. Identification of different tools used in electrical engineering
2. Use different types of wire and determines their gauge
3. Practice different kind of joints in cable & Wires.
4. Develop incandescent lamp circuit and plot its V-I characteristics.
5. Develop tube-light circuit and plot its V-I characteristics.
6. Develop staircase switch connection.
7. Determine the resistance of various insulators.
8. Design and test starter circuit for DC Machine.
9. Design and test starter circuit for Induction motor.
10. Perform test to find rating of a drop out fuse.
11. Calculate DC/AC resistance of HV / LV windings in transformer of 11KV/433 Volt, 10KVA.

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