JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)

Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)

B.E. Third Year **Branch : Electrical Engineering** **Sem :Sixth**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM					
		L	T	P	TA	CT	TOTAL	ESE	SUB TOTAL	
EE-23	Microprocessor & Microcontroller	3	1	-	10	20	30	70	100	4
EE-27	Signal and Systems	3	1	-	10	20	30	70	100	4
EE-28	Utilization of Electrical Energy	3	1	-	10	20	30	70	100	4
EE-32	Control System	3	1	-	10	20	30	70	100	4
EE-34	Electrical Machine Design	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
EE-24L	Microprocessor Lab	-	-	2	20	-	20	30	50	2
EE-29L	Utilization of Elect.Energy Lab	-	-	2	20	-	20	30	50	2
EE-33L	Control System Lab	-	-	2	20	-	20	30	50	2
EE-35L	Minor Project	-	-	2	20	-	20	30	50	2
EE-63L	Professional Activity			2	50	-	50	-	50	2
EE-64L	Seminar/Group Discussion			2	50	-	50	-	50	2
	Total	**15**	**5**	**12**	**230**	**100**	**330**	**470**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800
Total Periods : 32, Total Credits : 32

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**MICROPROCESSOR & MICROCONTROLLER**	EE-23	Min "D"	Min "D"	5.0

MICROPROCESSOR & MICROCONTROLLER

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 retums, 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:

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.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**SIGNAL AND SYSTEMS**	EE-27	Min "D"	Min "D"	5.0

SIGNAL AND SYSTEMS

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.

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

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**UTILIZATION OF ELECTRICAL ENERGY**	EE-28	Min "D"	Min "D"	5.0

UTILIZATION OF ELECTRICAL ENERGY

Unit I : Illumination Engineering:

Nature of Light, units, sensitivity of eye, luminous efficiency, glare, production of light, incandescent lamps, arc lamps, gas discharge lamps – fluorescent lamps – polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting, and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

Unit II : Heating, Welding and Electrolysis:

Electrical heating – advantages, methods and applications, resistance heating, design of heating element, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating, principle and special applications, arc furnaces: direct arc furnaces, indirect arc furnaces, electrodes, design of heating elements, power supply and control.

Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro-beam welding and electrical equipment for them.

Arc furnaces transformer and welding transformers

Review of electrolytic principles, laws of electrolysis, electroplating, anodizing, electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

Unit III : Traction:

Special features of traction motors, Different system of electric traction and their advantages and disadvantages, diesel electric locomotives, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion.

Unit IV : Traction Motors:

DC motors, single phases and three phase motors, starting and control of traction motors, braking of traction motors: plugging, rheostatic and regenerative braking, Modern 25 kV ac single phase traction systems: advantages, equipment and layout of 25 kV, line and current selection, single phase power frequency AC traction.

Unit V: Electric Drives:

Individual and collective drives – electrical braking, plugging, rheostatic and regenerative braking, load equalization, use of fly wheel, criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

References:

1. Tailor, E.O., Utilization of electric energy.
2. H. Pratap, Art and Science of Utilization of Electric Energy.
3. Gupta, J.B., Utilization of electric energy.
4. Hancock, N. N., Electric Power Utilization.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**CONTROL SYSTEM**	EE-32	Min "D"	Min "D"	5.0

CONTROL SYSTEM

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.

REFERENCES:

- I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
- K. Ogata, Modern Control Engineering, PHI.
- B.C. Kuo, Automatic Control systems, PHI
- Gopal M., Control System : Principles & Design, TMH.
- N.K. Sinha, Control Systems, New Age International
- Stefani, Shahian, Savant, Hostetter – "Design of feed back control System's", Oxford

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**ELECTRICAL MACHINE DESIGN**	EE-34	Min "D"	Min "D"	5.0

ELECTRICAL MACHINE DESIGN

Unit I : GENERAL CONCEPT AND CONSTRAINTS ON DESIGN OF ROTATING MACHINES

Relation between rating and dimensions of rotating machines, symbols, Main dimensions, 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 ,Separation of D and L for d. c. machine , Separation of D and L for induction machine, Separation of D and L for Synchronous machines , Standard Frames.

Unit II : TRANSFORMERS

Introduction, Core and shell type transformers, single and three phase transformers, three phase transformers connections, Core cross-section ,construction with hot rolled laminations ,Yoke cross sections, Clamping of core , Core construction of Modern Core type power Transformer ,Cooling of cores, Core earthing , transformer windings , Continuously transposed conductor windings, , Methods of cooling of transformers ,Transformer tank , Cooling ducts ,Transformer oil, Terminals and leads, Bushings ,Tapping and Tap changing, Conservator and Breather, Temperature indicator, Buchholz Relay, Transformer assembly.

Unit III : **THREE PHASE INDUCTION MOTORS**

Introduction ,Stator ,stator frames, Rotor, Rotor windings, Comparison of squirrel cage and wound rotors, slip rings, Shaft and bearings, Design- Output equations, Choice of average flux density in air gap, , Main Dimensions, Stator winding Turns per phase, Stator conductors, shapes of stator slots, ,Area of stator slots, length of mean turns, Stator teeth, stator core,Design of single phase induction motors

Unit IV : **SYNCHRONOUS MACHINES**

Types of construction, Types of synchronous machines, Prime movers for generators ,run-away speed, Construction of hydro generators, stator core, stator winding, Bracing of stator overhang, Rotor body, Poles, Field winding, Damper winding, Bearing , Brakes and Jacks, slip ring, construction of turbo-alternators, stator core, stator winding, rotor, Output equation, choice of specific magnetic loading, choice of specific electric loading.

Unit V : COMPUTER AIDED DESIGN

Introduction, advantage of digital computer, computer aided design- different approaches, analysis method, synthesis method, hybrid method, optimization, general procedure for optimization, variable and constraints, computer aided design of three phase induction motors, list of symbols used, general design procedure.

References:

A.K.Sahney," Electrical Machine Design", Dhanpat Rai & sons
V.N.Mittle," Electrical Machine Design"

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**MICROPROCESSOR LAB**	EE-24L	Min "D"	Min "D"	5.0

MICROPROCESSOR LAB

Suggested Exercise :

List of Experiments :

1. Assembly Language Programs Microprocessor 8086
2. Assembly Language Programs of Microcontroller 8051
3. Assembly Language Programs of Interfacing chips

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E.	**UTILIZATION OF ELECTRICAL ENERGY LAB**	EE-29L	Min "D"	Min "D"	5.0

UTILIZATION OF ELECTRICAL ENERGY LAB

LIST OF EXPERIMENTS :

1. Study of polar curves .
2. Determine MSCP of lamp using integrated sphere method.
3. Determine MHCP of lamp using flicker photometer.
4. Study of different types of lamps.
5. Study of different types of heating and welding & electroplating.
6. Study of different system of track electrification .
7. Study of speed torque characteristics of traction motors.
8. Study of different characteristics of dc series ,shunt ac series and induction motor.
9. Study of speed control of DC series motor & its operation
10. Study of different methods of breaking of DC series motor .

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**CONTROL SYSTEM LAB**	EE-33L	Min "D"	Min "D"	5.0

CONTROL SYSTEM LAB

LIST OF EXPERIMENTS :

- Time response of second order system.
- Characteristics of synchros.
- Effect of feedback on servomotors.
- Determination of transfer function of A-C servomotor.
- Determination of transfer function of D-C motor.
- Formulation of PI & PD controller and study of closed loop responses of I^{st} and II^{nd} order dynamic systems.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**MINOR PROJECT**	EE-35L	Min "D"	Min "D"	5.0

Study regarding field data/Laboratory investigating Analysis /Design of the subject related to Electrical Engineering.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**PROFESSIONAL ACTIVITY**	EE- 63L	Min "D"	Min "D"	5.0

PROFESSIONAL ACTIVITY
(Suggested Exercise)

- Student shall visit a nearby Industry and shall prepare a technical report suggesting some improvement in operation.
- Student shall Design and fabricate a new laboratory equipment. He shall prepare a design report.
- Student shall improve an existing lab equipment and prepare chart or lab manual .
- Student shall publish a review paper in some Indian Journal.
- Student shall make a report on an Industry employing latest technology/ Innovation.
- Student shall prepare a working model of a machine part.
- Student shall make a software/ comp. program for the Institute to enhance efficiency in its working.
- Student shall prepare a detailed project report to start a small-medium enterprise.
- A group of student shall register with the Industry cell and submit a report on work done there about Institute-Industry linkage.
- Experimental work on a new set of equipments.
- Seminar Presentation with a report submitted to the supervisor.

Note : The list of activities can be modified as per requirements of the department.

A hand written report of about 30 pages duly signed by the student and the concerned teacher should be submitted.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**SEMINAR/GROUP DISCUSSION**	EE-64L	Min "D"	Min "D"	5.0

Objectives of Group Discussion & Seminar is to improve the Mass Communication and Convincing/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.