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)

M.E. Ist Sem. Branch : Electrical Engg. Specialization : Control Engineering

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM					
		L	T	P	TA	CT	TOT	ESE	SUB TOTAL	
MA-103	Higher Engineering Mathematics	3	1	-	10	20	30	70	100	4
EE-101	Linear & Non-Linear Control System	3	1	-	10	20	30	70	100	4
EE-102	Digital Control System	3	1	-	10	20	30	70	100	4
EE-103	Operation Research & Optimization	3	1	-	10	20	30	70	100	4
EE-104	Industrial & Process Instrumentation	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
EE-105L	CS Engg Lab - I	-	-	2	60	-	60	90	150	6
EE-106L	CS Engg Lab - I I	-	-	2	60	-	60	90	150	6
	Total	**15**	**5**	**4**	**170**	**100**	**270**	**530**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800
Total Periods : 24 Total Credits :32

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	
	Higher Engineering Mathematics	MA-103	Min "D"	Min "D"	5.0

HIGHER ENGINEERING MATHEMATICS

UNIT -I

Solution of Partial Differential Equation (PDE), by separation of variable method, numerical solution of PDE (Laplace , Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT -II

Probability, compound probability and discrete random variable. Binomial, Normal and Poisson's distribution, Sampling distribution, elementary concept of estimation and Theory of hypothesis, recurred relations.

UNIT -III

Stochastic process, Markov process, transition probability, transition probability matrix, just and higher order Markov process, Markov chain, Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of Queuing models (M/M/1: Infinity/Infinity/FC FS), (M/M/S: Infinity/ Infinity/FC FS)

UNIT -IV

Operation of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations , fuzzy logics. Artificial neural network and its application.

UNIT - V

Introduction and definition of reliability, derivation of reliability function, failure rate, hazard rate, mean time future & their relation, concept of fault tolerant analysis, elementary idea about decision theory and goal programming.

References :

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kresvig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C.Chapra, TMH.
4. Introductory Methods of Numerical Analysis by S.S.Shastry,
5. Introduction of Numerical Analysis by Forberg.
6. Numerical Solution of Differential Equation by M.K.Jain
7. Numerical Mathematical Analysis by James B. Scarborogh
8. Fourier Transforms by J.N.Sheddon
9. Fuzzy Logic in Engineering by T.J.Ross
10. Fuzzy Sets Theory & its Applications by H.J.Zimmersoms.

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	
	LINEAR AND NON LINEAR CONTROL SYSTEM	EE-101	Min "D"	Min "D"	5.0

LINEAR AND NON LINEAR CONTROL SYSTEM

UNIT -I

State transition matrix and solution of state equations, continuous and discrete systems.

UNIT -II

Controllability and Observability, stability analysis, Liapunov stability, generation of Liapunov function, Liapunov Stability for discrete systems.

UNIT -III

Classification of Non Linear Phenomena, Linearization, harmonic, piecewise, point transformation method, Describing function analysis, phase plane method, singular points, poi care and Bendixsou's theorem.

UNIT -IV

Various methods of stability, Second method of Liapunov Canonical forins of Lure, Zubov method, popovs stability criterion.

References :

1. State Space Analysis of Control Systems by Ogata : Prentice Hall
2. Linear Systems Theory by C.T.Chan
3. System Theory by Schults and Melsa : Mc Graw Hill
4. System Theory by Zadeh and Polok : Mc Graw Hill
5. "Discrete Data Control Systems by B.C.Kuo : Prentice Hall
6. Non Linear Automatic Control" by H.J.E. Gibson,
7. "Non Linear oscillations by Hayashai : Mc Graw Hill
8. "Modern Control Theory by Lendes (Ed) : Mc Graw Hill
9. "Stability by Lyapunovs Direct Method by Lasalle and Lafachets : Academic Press.
10. Theory and Application of Laipunovs direct method by Hahn : Prentice Hall

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	
	DIGITAL CONTROL SYSTEM	EE-102	Min "D"	Min "D"	5.0

DIGITAL CONTROL SYSTEM

UNIT -I

Sampling Process : Reconstruction of sampled-data system and modified transformation, frequency and time response analysis of sampled data system

UNIT -II

Design and optimization of digital controllers, multirate and sampling, design and compensation of sampled data system.

UNIT -III

Discrete time state equations, discrete time system response, the characteristic value problem, Uncoupling state equations, Observability and controllability

UNIT -IV

Observability and state observation, Estimation and identification, Controllability and state control, state feedback, output feedback.

UNIT - V

Full order state observer, Observer design, Lower-order observers, Eigen value placement with observer feedback.

References :

1. Digital Control System by Gene H. Hostetter, : Second Edition Holt, Rinehart and Winston, Inc.U.S, 1997.
2. Discrete Time Control System by Ogata K, : Pearson Education, 2001.
3. Digital Control and State Variable Methods by Gopal M : Second Edition, Tata Mc Graw Hill, New Delhi, 2003.

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	
	OPERATIONS RESEARCH AND OPTIMIZATION	EE-103	Min "D"	Min "D"	5.0

OPERATIONS RESEARCH AND OPTIMIZATION

UNIT – I : LINEAR PROGRAMMING

Inequality constraints, general definition of linear programming, graphical solution of two variable linear programming, simplex method, revised simplex method duality and degeneracy, application of the linear programming formulations to the problems like transportations, assignment and production planning. Non existing a feasible solution in the simplex tableau

UNIT- II : DISCRETE DYNAMIC PROGRAMMING

Optimality principle, concept of multistage decision process, general approach to recursive optimization, forward and backward computations, problem of dimensionality.

UNIT- III : NON LINEAR PROGRAMMING

Optimization with nonlinear objective function, method of steepest descent, direct linearization, maximizing convex objective function, large step approaches, simplex method optimization with non linear constraints, method of feasible direction, Kuhn- Tucker conditions.

UNIT – IV : QUADRATIC PROGRAMMING

Simplex algorithm, decomposition of linear programming

UNIT – V : INTEGER PROGRAMMING

Integer programming formulation, integer linear programming, branch and bound algorithm.

References :

1. Introduction to System Engineering Deterministic models by T.Au. and T.E.Stelson : Addison Wesley Publication.
2. "Integer Programming, by H.M.Salkin : Addison Wesley Publication
3. Prnciples of Operations, Research with Applications to Managerial Decisions by H.M.Wagner : Prentice Hall of India
4. Optimization Theory and Application by S.S.Rao : Wiley Eastern Ltd.

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	
	INDUSTRIAL & PROCESS INSTRUMENTATION	EE-104	Min "D"	Min "D"	5.0

INDUSTRIAL & PROCESS INSTRUMENTATION

UNIT - I : TRANSDUCER FUNDAMENTAL

Review of transducers for non- electrical quantities their characteristics and classification.

UNIT - II : TRANSDUCERS FOR INDUSTRIAL MEASUREMENT

Working principle and characteristics of transducers used for measuring weight, density, vibration, distance, thickness, opacity etc. Working principles of pneumatics, electrical optical magnetic and nucleonic transducers used for measuring pressure, level, temperature, flow, moisture, humidity and pH value.

UNIT - III : PROCESS CONTROLLERS

Introduction of different control concepts like feedback, feed forward, cascade etc. steady state analysis dynamic response of linear and non linear elements, transient and frequency response analysis of processes with controllers PID controller design (pneumatic and electrical) comparative study of pneumatic and electric controllers.

UNIT - IV : FINAL CONTROL ELEMENTS

Selection of instruments for a given process and their placements in the loop instrumentation diagram with standard symbols.

UNIT - V

Case studies of Design of instrumentation schemes used in Thermal and Nuclear Power Plants, Pulp and paper plants, Distillation Plants.

References :

1. Electrical Measurement & Instrumentation by A.K.Sawney
2. Industrial Instrumentation by M.S.Berde
3. Control System by Nagrath, Gopal
4. Control System by B.S.Manake

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	
	C.S. ENGINEERING LAB - I	EE-105L	Min "D"	Min "D"	5.0

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

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	
	C.S. ENGINEERING LAB - II	EE-106L	Min "D"	Min "D"	5.0

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)