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. III 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	
EE-134	Robotics	3	1	-	10	20	30	70	100	4
	Elective - III (Any One)									
EE-135A	State Estimation System Identification	3	1	-	10	20	30	70	100	4
EE-135B	Sensor Technology									
(PRACTICAL/DRAWING/DESIGN)										
EE-136L	Seminar/ Project	-	-	4	100	-	100	-	100	4
EE-137L	Industrial Training (4 weeks)	-	-	-	-	-	-	100	100	4
EE-138L	Preliminaries of Dissertation Presentation	-		4	40	-	40	60	100	4
	Total	**6**	**2**	**8**	**160**	**40**	**200**	**300**	**500**	**20**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 500
Total Periods : 16 Total Credits : 20

NOTE : The students shall go on industrial training at the end of second semester and the evaluation shall be done at the end of third semester. The student has to present a report on the training and also has to face a viva voice examination infront of a panel headed by head of the department. The seminar /project shall be asigned by the supervisor

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	
	ROBOTICS	EE-134	Min "D"	Min "D"	5.0

ROBOTICS

Unit I Basic concept in robotics, classification and structure of robotics systems, the manipulators. Drives and control systems, Kinetic analysis and coordinate transformation. The inverse kinematics problems, work space analysis and trajectory planning. Different motion and statics, joint space singularities, the manipulator Jacobin, induced joint torques and forces.

Unit II Manipulator Dynamics: Languages equation, kinetic and potential energy, Generalized force, Lagrange-Euler dynamic model, dynamic model of a two axis and three axis robot, direct and inverse dynamics, recursive Newton-Euler formulation, dynamic model of a one axis robot (Inverted Pendulum)

Unit III ROBOT CONTROL The control problem, state equations, constant solutions, linear feedback systems, single axis PID control PD-gravity control, computed torque control, variable-structure control, impedance control.

Unit IV ROBOT VOSION Image representative template matching, polyhedral objects Shape analysis, segmentation, iterative processing, and perspective transformation structures illumination.

Unit V TASK PLANNING Task- level programming, uncertainty configuration space, gross motion planning, gross planning fine motion planning, simulation of planar motion, A task-planning problem.

BOOKS RECOMENDED:

1. Robert J.Schilling ,"Fundamentals of Robotic Analysis and Control", Robert J.Schilling Prentice- Hall of India, Pvt. Ltd,1997 Edition.
2. Yoram-Koran , "Robotics for Engineers ", Mc Graw-Hill book company.

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	
	STATE ESTIMATION &SYSTEM IDENTIFICATION	EE-135A	Min "D"	Min "D"	5.0

STATEESTIMATION &SYSTEM IDENTIFICATION

UNIT I Estimation : Introduction, development of parameter estimators, estimation of stochastic processes, application. Least – square estimation. Linear least squares problem, generalized least square problem. Sequential least squares, non – linear least squares theory.

UNIT II Characteristics of estimators, Sufficient statistics, good estimators, Analysis of Estimation errors. Mean, square and minimum variance estimators.

UNIT III Maximum s posteriori and maximum likelihood estimators, Numerical solution of least – square and maximum likelihood estimation problems. Sequential estimators and some asymptotic properties.

UNIT IV The least square method estimate – determining the model dimension- Best linear Unbiased estimation under linear constraints, updating the parameter estimates for linear regression models, Best linear unbiased estimates for linear regression models with possibly singular residual covariance matrix, Input Signals and Models parameterizations.

The least square method revisited – description of prediction error methods – optimal prediction – relationships between prediction error methods and other identification methods – theoretical analysis.

UNIT V The recursive least square method – real time identification – the recursive instrumental variable method – the recursive prediction error method.

Identifiability considerations – direct identification – indirect identification- joint input – output identification

TEXT BOOK

1. Childers," Probability and Random Process", The McGraw – Hill Companies inc, 1997
2. Harold W. Sorenson,' Parameter Estimation, Principles and Problems", Marcel
3. Ljung. L, "System Identification: Theory for the user", Prentice Hall, Englewood Cliffs, 1987 Lennart Ljung, System Identification
4. Ljung, L. and Soderstorm, T., "System Identification Theory and Practice of Recursive Identification", MIT Press, Cambridge, 1987.

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	
	SENSOR TECHNOLOGY	EE-135B	Min "D"	Min "D"	5.0

SENSOR TECHNOLOGY

UNIT I Basic concepts and working principles of sensors and transducers. Transducers and signal conditioners for measuring process variables. Transducers and Sensors : Present and future Applications.

UNIT II Modeling and simulation of micro sensors and actuators; smart structures; micro-opto-electro-mechanical sensors, Biosensors and Fiber-Optic Sensors and systems.

UNIT III Recent advances and trends in miniature, sensors compatible with Microelectronic, Nanoelectronic and Molecular electronics technology.

UNIT IV Smart transducers and intelligent instrumentation systems.

UNIT V Telemetry systems, Short-range radio telemetry, Multi-channel telemetry schemes. Comparative study of Pneumatic and Electrical Sensors and Controllers, Single stage and multistage fluid amplifiers, Hydraulic motor, Linear and rotary actuators.

Books:

1. Krishnakant, " Computer based Industrial Control", PHI, 2001.
2. Alloca, John A and Allen Stuart, "Transducers: Theory and Applications", Reston publishing Company, Pluce,1994.
3. Liptak, B.G," Instrumentation Engineering Handbook", Chilton Book Company, 1985.
4. J.A. Alloca, "Electronic Instrumentation", Prentice Hall, 1987.
5. A.J. Bowels," Digital Instrumentation", McGraw-Hill, 1986.

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	
	SEMINAR/PROJECT	EE-136L			5.0

SEMINAR/PROJECT

The student shall take up a small project under the supervision of a supervisor and shall complete the task. He has to present the report before a committee credit by H.O.D. and answer the queries

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 TRAINING	EE-137L	Min "D"	Min "D"	5.0

INDUSTRIAL TRAINING

The student shall go to an Industry at the end of Second Semester during summer and shall prepare a report on the Practical Training undergone there. He has to present the report at the time of practical examination of Third Semester.

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	
	PRELIMINARIES OF DISSERTATION PRESENTATION	EE-138L	Min "D"	Min "D"	5.0

PRELIMINARIES OF DISSERTATION PRESENTATION

The student shall prepare a literature review of the dissertation work to be undertaken. He shall also prepare the scheme of dissertation