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. IIISem. Branch : E & C Engg. Specialization : Microwave Engineering

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM			ESE	SUB TOTAL	
		L	T	P	TA	CT	TOT			
EC-132	Optimization Techniques in RF & Microwave	3	1	-	10	20	30	70	100	4
	Elective - III (Any One)									
EC-133A	Smart Antenna for mobile Communication	3	1	-	10	20	30	70	100	4
EC-133B	RFID									
(PRACTICAL/DRAWING/DESIGN)										
EC-134L	Seminar/ Project	-	-	4	100	-	100	-	100	4
EC-135L	Industrial Training (4 weeks)	-	-	-	-	-	-	100	100	4
EC-136L	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	
	OPTIMIZATION TECHNIQUES IN RF & MICROWAVE	EC-132	Min "D"	Min "D"	5.0

OPTIMIZATION TECHNIQUES IN RF AND MICROWAVE

UNIT I.: Taguchi's Optimization Method, Introduction, Orthogonal Arrays Linear Antenna Array Designs, Planar Filter Designs, Ultra-Wide Band (UWB) Antenna Designs. OA-PSO Method.

UNIT II.: Arrays of Point and Line Sources, and Optimization: The Problem of Antenna optimization , Arrays of Point Sources, Maximization of Directivity and Super-gain, Dolph-Tschebysheff Arrays, Line Sources.
Discussion of Maxwell's Equations: Introduction, Geometry of the Radiating Structure ,Maxwell's Equations in Integral Form, The Constitutive Relations, Maxwell's Equations in Differential Form, Energy Flow and the Poynting Vector ,Time Harmonic Fields, Vector Potentials ,Radiation Condition, Far Field Pattern, Radiating Dipoles and Line Sources, Boundary Conditions on Interfaces, Hertz Potentials and Classes of Solutions, Radiation Problems in Two Dimensions.

UNIT III : Optimization Theory for Antennas: Introductory Remarks, The General Optimization Problem, Far Field Patterns and Far Field Operators, Measures of Antenna Performance.
The Synthesis Problem: Introductory Remarks, Remarks on Ill-Posed Problems, Regularization by Constraints, the Tikhonov Regularization, The Synthesis Problem for the Finite Linear Line Source, Basic Equations.

UNIT IV : Boundary Value Problems for the Two-Dimensional Helmholtz Equation: Introduction and Formulation of the Problems, Rellich's Lemma and Uniqueness, Existence by the Boundary Integral Equation Method, $L2-$Boundary Data, Numerical Methods.
Boundary Value Problems for Maxwell's Equations: Introduction and Formulation of the Problem, Uniqueness and Existence, $L2-$Boundary Data.

UNIT V : Some Particular Optimization Problems: General Assumptions, Maximization of Power, The Null-Placement Problem, The Optimization of Signal-to-Noise Ratio and Directivity.
Conflicting Objectives: The Vector Optimization Problem: Introduction, General Multi-criteria Optimization Problems, The Multi-criteria Dolph Problem for Arrays, Null Placement Problems and Super-gain, The Signal-to-noise Ratio Problem.

Textbooks:

1. Thomas S. Angell Andreas Kirsch "Optimization Methods in Electromagnetic Radiation" 2004 Springer-Verlag New York
2. Wei-Chung Weng, Fan Yang and Atef Elsherbeni "Electromagnetics and Antenna Optimization Using Taguchi's Method" Morgan and Claypool Publishers.The University of Mississippi, Oxford, Mississippi.

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	
	SMART ANTENNA FOR MOBILE COMMUNICATION	EC-133A	Min "D"	Min "D"	5.0

SMART ANTENNA FOR MOBILE COMMUNICATION

UNIT I.
Introduction: What Is Smart. What Are the Problems, Some Historical Smart Antenna Types and Applications, Some Present and Future Smart Antennas. Antenna Fundamentals:1 Electromagnetic Waves, Waves in Space , Polarization, The Short Dipole, The Smart Loop, Directionality, Efficiency, and Gain, Bandwidth and Quality Factor, Impedance Matching and System Efficiency, Reception, Ground Effects, Improvements.

UNIT II.
Introduction to Numerical Modeling of Wire Antennas: General Concepts, The Mathematical Basics of the Numerical Electromagnetic Code (NEC), Using NEC in the Command Window, Modelling Guidelines, NEC in a Graphical User Interface (GUI).

UNIT III.
Programmed Modeling: Introduction, Using Wire-List Generators in NEC, Using Code to Generate a Wire List.

UNIT IV.
Open-Ended Antennas:Introduction, Thick Monopoles, Top Loading, Coil Loading, Using Resonance.
Loops and Other Closed-Wire Antennas: Introduction, Thick Loops, Solenoid Antennas, The Contrawound Toroidal Helix Antenna (CTHA), The Folded Spherical Helix Monopole, Final Comments.

UNIT V.
Receiving Antennas:Introduction, External Noise, The Ferrite Rod Antenna, Active Receiving Antennas.
Measurements: Measurements Through a Transmission Line, Ranges and Test Enclosures, The Wheeler Cap and Variations.

Textbooks:

1. Douglas B. Miron "Small Antenna Design" 2006, Elsevier Inc.
2. Constantine A. Balanis, Panayiotis I. Ioannides "Introduction to Smart Antennas"

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	
	RFID	EC-133B	Min "D"	Min "D"	5.0

RFID

UNIT I. : Introduction: Automatic Identification Systems, a Comparison of Different ID Systems, Components of an RFID System.**Differentiation Features of RFID Systems:** Fundamental Differentiation Features, Transponder Construction Formats, Frequency, Range and Coupling, Information Processing in the Transponder, Selection Criteria for RFID Systems.

UNIT II : Fundamental Operating Principles: 1-Bit Transponder, Full and Half Duplex Procedure, Sequential Procedures.**Physical Principles of RFID Systems:** Magnetic Field, Electromagnetic Waves, Surface Waves.

UNIT III : Frequency Ranges and Radio Licensing Regulations: Frequency Ranges Used, European Licensing Regulations, National Licensing Regulations in Europe, National Licensing Regulations.
Standardisation: Animal Identification, Contactless Smart Cards, ISO 69873 — Data Carriers for Tools and Clamping Devices, ISO 10374 — Container Identification, VDI 4470 — Anti-theft Systems for Goods, Item Management.
UNIT IV : Coding and Modulation: Coding in the Baseband, Digital Modulation Procedures. **Data Integrity:** The Checksum Procedure, Multi-Access Procedures — Anticollision. **Data Security :** Mutual Symmetrical Authentication, Authentication Using Derived Keys, Encrypted Data Transfer.
UNIT V : Sensors & sensing technology and interfacing Techniques, Transponder with Memory Function, HF interface, Example circuit — load modulation with subcarrier, Example circuit — HF interface for ISO 14443 transponder, Address and security logic, Read-only transponder, Writable transponder, Transponder with cryptological function, Segmented memory, MIFARE application directory, MIFARE plus, Modern concepts for the dual interface card, Measuring Physical Variables, Transponder with sensor functions, Measurements using microwave transponders, Sensor effect in surface wave transponders.
Readers: Data Flow in an Application, Components of a Reader, Low Cost Configuration — Reader IC U2270B, Connection of Antennas for Inductive Systems, Reader Designs.
Applications: Contactless Smart Cards, Public Transport, Ticketing, Access Control, Transport Systems, Animal Identification, Electronic Immobilisation, Container Identification, Sporting Events, Industrial Automation, Medical Applications. Interfacing technology, Zigbee

Textbooks:

1. Klaus Finkenzeller"RFID Handbook"Second Edition John Wiley & Sons Ltd.
2. STEPHEN B. MILES, SANJAY E. SARMA, JOHN R. WILLIAMS"RFID Technology and Applications" Cambridge University Press 2008.
3. Yan Zhang and Paris Kistos "Security in RFID and sensor networks" CRC press 2009.

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	EC-134L			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	EC-135L	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	EC-136L	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