SIR PADAMPAT SINGHANIA UNIVERSITY
Udaipur

School of Engineering
Department of Electronics & Communication Engineering

Semester VI					
Code	**Name of the Subject**	**L**	**T**	**P**	**Total Credits**
EC 305	Microcontrollers & Real Time Applications	3	0	1	4
EC 306	VLSI design	3	0	2	5
EC 307	Information Theory and Coding	3	1	0	4
EC 308	Power Electronics	3	0	1	4
EC 309	RF & Microwave Engineering	3	0	1	4
MB 301	Foundations of Economic Science	2	0	0	2
EC 300	Technical Seminar	0	0	2	2
	Total				**25**
Students will go for an industrial training programme of 8 weeks in the summer after the end of the third year even semester examination.					

EC 305 MICROCONTROLLERS AND REAL-TIME APPLICATIONS

L-T-P-C
3-0-1-4

Objective: This course familiarizes students with the fundamental principles of microcontrollers, different programming techniques, and hardware and software development tools required for developing real world interfaces and low cost dedicated applications.

Introduction to Microcontroller: Microcontroller evolution and development, various families of the 8051microcontroller, Comparison between microprocessor and microcontroller, Criteria to be considered for choosing a microcontroller, Microcontroller application examples.

Architecture of Microcontrollers: Architecture of the 8051 Microcontroller, register bank organization, internal and external memory organization, timing cycle, interrupt structure, input/output port structure, external program/data memory interface with the microcontroller and memory address decoding.

Instruction Set of The 8051 Microcontroller: Basic assembly language programming - instruction sets, addressing modes, logical operations, arithmetic operations, branching instructions, Boolean instructions, subroutines, timing subroutine, serial data communications and interrupt process, Assemble language programming examples.

Interfacing, Programming and Real-Time Applications: I/O interfacing, Timer and Counter operation and programming, Serial Communication and interrupt handling, LCD and keyboard Interfacing, DS12887 RTC Interfacing, Interfacing ADC and DAC, Interfacing with the 8255 PPI chip, sensor interfacing and programming for real-time data acquisition, operation and interfacing of a relay/an opto-isolator with the microcontroller, interfacing and programming microcontroller for controlling speed of DC motor/stepper motor.

Microcontroller Development Tools: Introduction to hardware and software development tools: Logic Analyzer, In-Circuit Emulator, Assembler, Compiler, Cross-Compiler and integrated development environment (IDE).

Recommended Texts:

1. The 8051 Microcontroller and Embedded Systems by Mazidi, Mazidi and McKinlay, Pearson Education.
2. The 8051 Microcontroller by MacKenzie and Phan, Pearson Education
3. The 8051 Microcontroller by K.J. Ayala, Penram International
4. Microcontrollers by Ajay Deshmukh, TMH Pub

EC 306 VLSI DESIGN

L T P C
3-0-2-5

Objective: VLSI technology is a driving force in fabricating integrated circuits for reducing cost, thereby increasing operational efficiency. This course will introduce the fundamental concepts and techniques involved in the fabrication of VLSI circuits using EDA tools.

Hardware Description Languages: VHDL and Verilog: an introduction, objects and data types, concurrent and sequential statements, simulation and synthesis, finite state machines, subprogram, packages, configurable and scalable designs.

Introduction to VLSI design: Methodologies, hierarchical design, design abstraction, design quality, packaging technique and computer-aided design.

MOS Transistor Theory: Basic electrical and physical properties of MOS structures, threshold voltage and body effect, current-voltage characteristics of MOSFETS, MOSFET design equations (MOS1, MOS2 and MOS3) and second order effects.

Inverter: NMOS and CMOS inverters, W/L ratio for NMOS and CMOS inverters, β_p/β_n ratio, noise margin, voltage transfer characteristics, CMOS delay, interconnect delay and power dissipation.

VLSI circuit design: Inverter equivalent of series and parallel MOS circuits, logic design with delay and power constraints, worst case design, complex logic design, structured logic, ASIC, standard cell, FPGA and CMOS memory.

Stick Diagram & Layout: Stick diagrams, NMOS and CMOS design style, lambda based design rules, layout design.

VLSI System Design: Structural gate Level modeling, Switch Level modeling, behavioral and RTL modeling, sub system and system design considerations.

Text Books:

1. Kang, S.M. and Leblebici, Y., "CMOS Digital Integrated Circuits: Analysis and Design", Tata McGraw Hill Publishing Co. Ltd., 3rd ed, 2005.
2. Eshraghian, K., Pucknell, D.A. and Eshraghian, S., "Essentials of VLSI Circuits and Systems", Prentice Hall of India Pvt. Ltd., 2005.

Reference Books:

1. Baker, R.J., W. Li, Harrr and Boyce, D.E., "CMOS Circuit Design, Layout, and Simulation", Prentice Hall of India Pvt. Ltd., 2000.
2. Uyemura, J.P., "Introduction to VLSI Circuits and Systems", John Wiley & Sons

EC 307 INFORMATION THEORY AND CODING

L T P C
3-1-0-4

Objective: This course helps develop an understanding about the methods used in measuring and coding information for error free transmission, and the methods for detecting and correcting information. Linear, cyclic and convolutional codes are also discussed.

Information Theory: Concept of amount of information -units, Entropy - marginal, conditional and joint entropies -relation among entropies Mutual information, information rate, channel capacity, redundancy and efficiency of channels.

Discrete Channels: Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary asymmetric channel, Shannon theorem. Continuous channels: - Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Trade off between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system

Source Coding: Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem, Construction of basic source codes: -Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding.

Codes For Error Detection And Correction: Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes. Cyclic codes: - Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction.

Convolutional Codes: Encoding- State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes -Viterbi algorithm, Sequential decoding -Stack algorithm, Interleaving techniques - Block and convolutional interleaving, CIRC encoding and decoding, interpolation and muting. ARQ: - Types of ARQ, Performance of ARQ, Probability of error and throughput.

References:

1. B. P. Lathi- “Modern analog & digital communication”, OXFORD Publications
2. Communication Systems: Simon Haykin, John Wiley & Sons. Pvt. Ltd.
3. Principles of Communication Systems: Taub & Schilling, Tata McGraw-Hill
4. Principles of Digital Communication: Das, Mullick & Chatterjee, Wiley Eastern Ltd.

5. Error Control Coding Fundamentals and Applications: Shu Lin & Daniel J.Costello Jr.,
Prentice Hall Inc.
6. Digital Communications Fundamentals and Applications: Bernard Sklar,Person Education Asia

EC 308 POWER ELECTRONICS

L T P C
3-0-1-4

Objective: Power electronics are used in industry for industrial drive and control applications. This course familiarizes students with the working principles of power semiconductor devices, power converters, inverters, choppers, cycloconverters and their applications in industries.

Power Semiconductor Devices and Characteristics: Role of power electronics, review of construction and characteristics of power diode, types of power diodes, series and parallel operation of diodes, power transistor, BJT, MOSFET, SCR, DIAC, Triac, GTO & IGBT.

Silicon Controlled Rectifier (SCR): Construction and modes of operation, transistor analogy, switching characteristics, Ratings and protections, series and parallel connections, R, RC and UJT firing circuit, firing circuits based on ICs and microprocessors, turn-off characteristics, commutation techniques, condition for commutation, performance of SCR with different loads.

Converters: Principle of phase control, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant / dual converter, power factor improvement techniques, forced commutated converter, MOSFET and transistor based converters.

Inverters: Basic circuit, classification of inverters and process of inversion, commutation processes, performance parameters of inverters, half bridge and full bridge inverters, brief description of parallel and series inverters, three phase inverters, pulse width modulated inverters, transistor and MOSFET based inverters.

Choppers: Chopper classification and configuration, output voltage control techniques, one, two, and four quadrant choppers, step up and step down choppers, voltage and current commutated choppers, MOSFET and transistor based choppers.

Cycloconverters: Basic principle of frequency conversion, types of cycloconverter, features of cycloconverters, load commutation of cycloconverters.

Power Electronics Drives: Introduction to electric drives, comparison between DC and AC drives, choice between DC and AC drives.

Text Book:

1. Power Electronics by M.H. Rashid, Pearson Education
2. Modern Power Electronics & AC Drives by Bose, Pearson Education

Reference Books:

1. Power Electronics by P.C. Sen, TMH Publication
2. Power Electronics by H.C. Rai, Galgotia Publication
3. Thyristorised Power Controllers by G.K. Dubey, PHI Publication
4. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh, Dhanpat Rai
5. Power Electronics: P.S. Bhimra.

EC 309 RF AND MICROWAVE ENGINEERING

L T P C
3-0-1-4

Objective: This course familiarizes students with the devices used in RF and microwave engineering and helps develop an understanding of customized system interfacing.

Introduction to RF: Introduction of Microwaves and their applications. Microwave signal propagation. Band designation in RF, Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements.

Waveguide Components: Scattering matrix representation of networks. Rectangular cavity and circular cavity resonators, Waveguide Tees, Magic Tees, Hybrid rings. Waveguide corners, Bends and twists, Directional couplers, Circulators and isolators.

Klystrons : Construction and operation of two cavity & multicavity klystrons, Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity klystrons, Construction, working and operation of Reflex klystron, Velocity modulation, power output and frequency characteristics of a Reflex klystron, Electron admittance.

Traveling Wave Tubes (TWT): Construction, operation and practical consideration of helix type TWT, Introduction to CW power, pulsed dual mode TWT, Coupled cavity TWT, Applications of TWT.

Magnetron: Types of Magnetron. Construction, operation, analysis and practical consideration of cavity or traveling wave magnetron, Introduction to coaxial, frequency angle and voltage tunable magnetrons. Backward cross field oscillator, Forward wave cross field amplifier.

Striplines: Introduction to microstrip lines, Parallel striplines, Coplanar striplines, Shielded striplines, Slot lines, Integrated Fin line, Non-radiative guide, Transitions, Bends and Discontinuities.

Microwave Semiconductor Devices: Construction, Operation and Practical applications of Gunn diode, IMPATT, TRAPTT diodes.

TEXT BOOKS :

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

REFERENCES :

1**.** Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
5. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
6. Microwave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998

MB 301 FOUNDATIONS OF ECONOMIC SCIENCE

L T P C
2-0-0-2

Objective: This course is designed to expose engineering students to economic theories and their applications related to consumer behavior, production, marketing and developmental needs of countries.

Engineers and economics: Meaning of economics, why engineers should know economics, scope, important basics: consumption, production, exchange, distribution and public finance, cost of production and revenue through sales, Factors of Production: Land, Labour, Capital, Organization, Enterprises.

Consumption and Pricing: Cardinal and Ordinal approach to Utility, Laws of Diminishing Marginal Utility and Equi Marginal Utility, Demand: Meaning, Law, Types, Elasticity of Demand: Meaning and Degrees. Laws of Supply, Pricing of all products: Theory and practice.

Production of Markets: Factors of production: Land, Labour, Capital, Organization and Enterprise, Laws of Returns, Classification of Markets: Perfect and Imperfect competition, Oligopoly.

Financial Engineering: Money and Finance, An overview of Banking, Money Market, Capital Market, Public Finance and Private Finance, Public Enterprises, Debts, Direct and Indirect Taxes, Canons of Taxation, National Income.

Developmental Engineering: Underdevelopment, Stages of economic development, Economic Growth, Growth Theories, Industrial Policy, Growth of Public sector, Economic Reforms: LPG.
Application of financial accounting techniques for engineering projects analysis.

Suggested Readings:

1. Paul A. Samuelson and William D. Nordhaus, Economics, Mc Graw Hill
2. Kautsoyiannis, A modern Micro Economics, New York Macmillan
3. Economics: K.K. Dewett
4. Macro/Micro Economics: H.L.Ahuja-Sultan Chand, Delhi