PROPOSED CURRICULA AND SYLLABI
FOR

(Final Year)
B. Tech. (EXTC)

w.e.f.
Academic Year 2012-2013 and onwards

Department of Electronics and Telecommunication Engineering
Shri Guru Gobind Singhji Institute of Engineering and Technology
Vishnupuri, Nanded- 431606
[May 2012]
### SYLLABUS SCHEME for Final Year B.Tech.(Electronics and Telecommunication Engineering) 2012-13 and onwards

#### Semester -1

<table>
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<tr>
<th>Code</th>
<th>Course</th>
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<th>L</th>
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<td>Data Communication and Networking</td>
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<td>EC414B</td>
<td>Digital Image Processing</td>
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<td>Digital VLSI Design</td>
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<td>Biomedical Signal Processing</td>
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<td>RF Devices and Circuits</td>
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<td>Pattern Recognition</td>
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#### Semester -2

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<td>Medical Image Processing</td>
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SEMESTER I

EC411 Data Communication and Networking (Cr-4, L-3,T-0 P-2)

1. Introduction: Data Communications, Networks, the Internet, Protocols and Standards.
3. Data and Signals: Transmission Impairments, Data Rate Limits and Performance.
6. Error Detection and Correction: Introduction, Block Coding, Linear Block Codes, Cyclic Codes and Checksum.
7. Data link control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC and point to point protocol.
11. Domain Name System: Name Space, Domain Name space, Distribution of Name Space, DNS in Internet, Resolution, DNS Messages, Types of Records, Registrars, DDNS and Encapsulations.
12. Cryptography: Introduction, Symmetric Key Cryptograph and Asymmetric Cryptograph, and RSA Public Key Algorithm.

Text Books:

Reference Book:
1. William Stallings, Data and computer communication, Pearson Education

EC412 Embedded System (Cr-4, L-3,T-0 P-2)

1. Embedded System Introduction: Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions.
2. Custom Single-Purpose Design: Design of General purpose processor: Controller and data path design, Concept of FSM, RT level processor design using FSM, Optimization, concept of pipelining, superscalar and VLIW architectures, etc. Design of Custom Single purpose processors like: Soda vending machine design, UART design, GCD design, Elevator controller design, etc.
3. System Architecture: Introduction to ARM core architecture, LPC 2148, ARM extension family, operating modes, overview of instruction set, Pipeline, memory management, Bus architecture, Exception Handling and interrupt structure, etc.
4. Interfacing and Programming: Need of interfacing, interfacing techniques, Basic embedded C programs for GPIO and interfacing of different devices like switches, keypad, LED, LCD, Graphic LCD, Relay, Stepper Motor, Study and programming of on-chip peripherals like timers, counters, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, Can etc.
5. Real Time Operating System Concept: Need of RTOS in Embedded system software, Foreground/Background systems, multitasking, context switching, IPC, Scheduler policies,
Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to MUCOS-II RTOS, study of kernel structure of MUCOS-II, Synchronization in MUCOS-II, Inter-task communication in MUCOS-II, Memory management in MUSOS-II, porting of RTOS on ARM 2148, Application developments using MUCOS-II.

6. Memory: Common Memory types, Advanced RAMs, Memory hierarchy and Cache Memory management, hardware and software design

7. Communication protocol: Basic protocol concept, study of protocols like SPI, SCI, I2C, CAN, Ethernet, Wireless Protocols: IrDA, Bluetooth, IEE802.11, Zigbee, RF modules, GSM modem for AT command study etc.

8. Digital Camera Design: Introduction to simple digital camera, requirement specification, different ways to design of camera.

Reference Books:
2. Frank Vahid - Embedded Systems, Wiley India, 2002
3. ARM System-on-Chip Architecture, Steve Furber - Pearson 2005
5. DR.K.V.K.K. Prasad - Embedded / real time system, Dreamtech
6. Iyer, Gupta - Embedded real systems Programming, TMH
7. Embedded systems software primer, David Simon - Pearson
8. ARM System Developers Guide - Sloss, Symes, Wright, ElsevierMorgan Kaufman, 2005
9. LPC2148 Data Sheets [link]

EC413 Microwave and Satellite Communication (Cr-4, L-3,T-0 P-2)

1. Interaction between electrons and Fields: Introduction, Electron motion in an electric field, Electron motion in a magnetic field, Electron motion in an electromagnetic field.
2. Electromagnetic plane waves: Introduction, Electric and magnetic wave equation, Poynting theorem, Uniform plane waves and reflection, Plane wave propagation in free space and lossless dielectric, Planewave propagation in lossy media
3. Microwave transmission lines: Introduction, transmission line equations and solutions, Reflection coefficient and transmission coefficient Standing wave and standing wave ratio, Line impedance and Admittance, Impedance matching.
4. Microwave waveguide and components: Introduction, Rectangular waveguide and circular waveguide, Microwave cavities, Microwave hybrid circuits, Directional couplers, circulator and isolator
5. Transferred electron devices: Gunn diode, RWH theory, Microwave generation and amplification, LSA diode
6. Avalanche transit time devices: Read diode, IMPATT diode, TRAPATT diode, BARITT diode
7. Microwave linear and crossed Field tubes: Klyson, Reflex klyson, TWT, magnetron
8. Strip lines: Introduction, Microstrip lines, Parallel strip lines
9. Introduction, History of satellite communication, Satellite parameters and configurations, Satellite subsystems, Satellite transponder model
10. Multiple access formats Time division multiple access format, Frequency division multiple access format, Code division multiple access format, Application of the satellite communication

Reference Books:
1 Samuel Y Liao, Microwave Devices and Circuits, Third Edition, PHI Ltd.
2 David M Pozar, Microwave Engineering, Wiley Publication.
3 Robert M Gaglardi, Satellite communication
Elective-II (Any One from EC414A, B, C) (Cr-4, L-3,T-0 P-2)

**EC414A Digital Image Processing**
8. Representation and Description: Representation Schemes, Boundary Descriptors, Regional Descriptors, Morphology, and Relational Descriptors.

**Reference Books:**

**EC414B Digital VLSI Design**
1. Introduction: Issues in digital IC design; Quality metrics of a digital design.
2. The manufacturing process: CMOS IC manufacturing processes; Design rules; Packaging ICs.
3. The devices: The diode; The MOS(FET) transistor; Process variations.
4. The wire: Interconnect parameters; Electrical wire models; SPICE wire models.
5. The CMOS inverter: The static CMOS inverter; Evaluating robustness of CMOS inverter; Dynamic performance of CMOS inverter; Power, energy and energy delay; Technology scaling and its impact on the inverter metrics.
6. Designing Combinational logic gates in CMOS: Static CMOS design; Dynamic CMOS design; Perspectives.
7. Designing sequential logic circuits: Static latches and registers; Dynamic latches and registers; Alternative register styles; Pipelining - an approach to optimize sequential circuits; Non-bistable sequential circuits; Perspectives-choosing a clocking strategy.
8. Implementation strategies for digital ICs: From custom to semicustom and structured array design approaches; Custom circuit design; Cell-based design methodology; Array-based implementation approaches.
9. Designing Arithmetic Building Blocks: Datapath in digital processor architectures; The adder; The multiplier; The shifter; Other arithmetic operators; Power and speed trade-off in data path structures; Perspectives-design as trade-off.
10. Designing memory: SRAM; DRAM; Associated circuits.

Reference Books:
1. Digital integrated circuits: a design perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, PHI
2. Introduction to VLSI circuits and systems, John P. Uyemura, Wiley
3. CMOS VLSI Design, Weste and Harris, Addison Wesley.

EC414C Biomedical Signal Processing

1. Essentials of continuous time signals and systems: convolution, Fourier transform, system transfer functions; Discrete time signals and systems: sampling and quantization, the sampling theorem and signal reconstruction; Frequency analysis of discrete signals and systems: the discrete Fourier transform, power spectrum estimation and system identification;
2. Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.
10. Analysis of non-stationary processes: examples using Wavelet analysis and Time-series models; Examples of physiological signals and systems including feedback systems.

Text Books
3. Biomedical Digital Signal Processing, Willis J.Tompkins, PHI.

Reference Books:
Elective-III (Any One from EC415A, B, C) (Cr-3, L-3,T-0 P-0)

EC415A RF Devices and Circuits

1. INTRODUCTION TO RF ELECTRONIC: The electromagnetic spectrum; unit and physical constant; Microwave band; RF component layout and construction; Cox cable transmission line; Tuned resonant circuit Tuned RF/IF Transformer; Variable capacitor in RF circuit; Measuring inductor and capacitor at RF frequency; Impedance matching.

2. LINEAR RF AMPLIFIER: Introduction; power gain; Neutralization; unilateral transducer gain; stability consideration; stability an active two port; stabilization of a bipolar transistor Transistor at radio frequency; RF power transistor characteristics; transistor biasing.

3. SMALL SIGNALS RF AMPLIFIER: Introduction to small signals RF amplifier; Bilateral RF amplifier design for maximum small signal gain; multistage amplifier; Broadband amplifier; Noise in RF.

4. ACTIVE RF DEVICE AND MODELING: The diode model; two port device model; the output terminal of at two port RF device The bipolar transistor; the heterojunction bipolar transistor; the GaAs MESFET High electron mobility transistor; Silicon LDMOS and CMOS technique.

5. HIGH POWER RF TRANSISTOR AMPLIFIER: Nonlinear concept; Quasi linear power amplifier design; categories of amplifier (class A; class B; class F); switching mode amplifier; cascade amplifier; distortion reduction.

6. RADIO SYSTEM APPLICATION: Mobile telephony system; software defined ratio; A 1.9 GHz radio chip set design overview; integrated system chip (RF receiver fronts end; RF up converter and Transistor driver amplifier; power amplifier modules)

7. DEVICE PARASITICS: RF modeling; Parasitics sensitive to RF. Issue in RF IC a brief review; Impedance matching; use and design of passive circuits; LNA Design; Matching Techniques using algebra techniques; Basic Bond circuits; UHF Mixer design.

Text Book:

Reference Books:

EC415B Mechatronics

1. Introduction: Mechatronics Systems, Measurement systems, Control systems, Microprocessor-based controllers, Mechatronics approach

Temperature, Light sensors, Selection of sensors, signal conditioning circuits

3 Pneumatic, Hydraulic, and Mechanical Actuation Systems: Acquisition systems, Pneumatic and hydraulic systems, Pressure control valves, Cylinders, Process controlled valves, Rotary actuators, Mechanical systems, Types of motion, Kinematic chains, Cams, Gear trains, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection

4 Representation and Electrical Actuation Systems: Data Displays, Data presentation elements, Data acquisition systems, Testing and calibration, Electrical systems, Solid state switches, solenoids, D. C. Motors, A. C. Motors, stepper motors.

5 Systems Models Review: Mathematical models, Mechanical system building blocks, electrical system building blocks, fluid system building blocks, thermal system building blocks, Rotational-translational systems, Electromechanical systems, hydraulic mechanical systems, System transfer function, dynamic response of systems, frequency response.

6 Programmable logic controllers: closed loop controllers, PLCs, Basic structure, input output processing, programming, mnemonics, timers, interval relays and counters, shift registers, master and jump controls, data handling, analogue input/output, selection of a PLC

7 Fault finding: Fault detection techniques, watchdog timer, parity and error coding checks, common hardware faults, microprocessor systems, emulation and simulation, PLC systems

8 Design and mechatronics: Possible design solutions, case studies of mechatronic systems, A robotic arm

9 Robotics: Types of robots, types of robot control, robot drive system, selection parameter of a robot, application of robot

Reference Books:
2 Dan Necsulescu, Mechatronics, Pearson Education, Asia
3 David Alciatore and Histand, Introduction to Mechatronics and measurement system, TMH
4 M D Singh, J G Joshi, Mechatronics, PHI

EC415C Pattern Recognition

Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification− zero−one loss function, classifiers, discriminant functions, and decision surfaces

Normal density: Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation−Gaussian case


Component analyses: Principal component analysis, non-linear component analysis; Low dimensional representations and multi dimensional scaling

Discrete Hidden Markov Models: Introduction, Discrete−time markov process, extensions to hidden Markov models, three basic problems for HMMs

Introduction to Soft Computing approaches in pattern recognition.

Reference Books:

EC416 Project-I (Credit -8)
The projects in semesters-I and II should preferably be on a single topic. The topic may include two components, hardware and software implementation (hardware design, implementation and/or simulation). A project batch may consist of two or three students.

At the end of semester-I, students will have to submit a Progress report of the project. Students must maintain a Project diary duly signed by their guides weekly. It is mandatory on the part of the students to submit the project diary during the internal end semester evaluation.

EC417 Industrial Training/Seminar (Cr-2, L-0,T-2 P-0)
The students will undergo industrial training for duration of one month after sixth semester examination. The student shall submit a report regarding industrial training, duly certified by the authorities from industry. The assessment of the students will be based on the confidential feedback from the industry and the report submitted by the student.
SEMESTER -II

EC421 Wireless and Mobile Communication (Cr-3, L-3,T-0 P-0)

Reference Books:
1. Theodore S Rappaport, Wireless Communications, second edition, Pearson Education
2. T L Singal, Wireless Communications, Tata McGraw Hill Education
3. Jochen Schiller, Mobile Communications, Pearson Education

EC422 Industrial Organization (Cr-2, L-2,T-0 P-0)
1. Introduction Management, administration, organization, concept, definition, scope and importance of management
2. Principles of Management Division of labor, authority, responsibility, discipline, unity of command, and direction/centralization.
3. Functions of Management Planning, organizing, staffing, directing, controlling, coordination, decision making, locus of control innovation.
4. Types of Organization Proprietorship, partnership, and joint stock company, private limited, public sector, cooperatives, their comparison.
5. Industrial Law Indian Factories Act, Payment of wages act, Employees, State insurance Act, Strike and Lockouts, Causes, prevention, and settlement.
6. Financial Management Concepts, capital structure, fixed capital, working capital, depreciation, assignment and management budget and budgetary control, rent interest and profits distinction between profits and interest.

Text/Reference Books:
2. O. P. Khanna, Industrial Engineering and Management.
4. Banga and Sharma, TIDM.

EC423 Elective-IV (Any One from EC423 A, B, C) (Cr-4, L-3,T-0 P-2)

EC423A Analog VLSI Design

1. Introduction to Analog Design, MOS FET as analog device, MOS Device Models, Single Stage Amplifiers, Common Source, Source Follower, Common Gate, Cascode, Folded Cascode
2. Differential Amplifiers, Single ended Differential operation, Basic Differential pair, qualitative and quantitative analysis, Common mode response, Differential pair with MOS loads
3. Passive and active current mirrors, Basic current mirrors, Cascode Current Mirrors, Active current mirrors, Large and small signal analysis, Common Mode properties
4. Frequency response of Amplifiers: General Considerations, Miller effect, Association of poles with nodes, Common Source stage, Source Followers, Common gate stage, Cascade stage, differential pair
5. Noise: Representation of noise in circuits, Noise in single stage amplifiers, Common source, common gate, Source followers, cascode stage, noise in differential pairs, noise bandwidth
6. Feedback: General considerations, Feedback topologies, Effect of loading, effect of feedback on noise
7. Operational amplifiers: One stage and two stage op amps, gain boosting, common mode feedback, Input range limitation, Slew rate, Power supply rejection, Noise in Opamp
8. Stability and Frequency compensation: Multi pole system, Phase margin, Frequency compensation, Compensation of two stage opamps, other compensation techniques
9. Band gap references: Supply independent biasing, temperature independent references, PTAT current generation, speed and noise issues
10. Phase locked loops: Simple PLL, Charge pump PLLS, Nonideal effects in PLL, delay locked loops, applications

Reference Books:

EC423B Multimedia Systems

1. Introduction to Multimedia: Multimedia, Hypermedia, www, Representation of text, Audio, Image and Video data, data types and file formats
2. Color in Image and Video: Color Science, Color models in images, color models in video
5. Lossless Data Compression: Basic information theory, RLC, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, DPCM, Lossless JPEG
6. Lossy Compression: Rate Distortion Theory, Distortion Measures, Quantization, Transform based coding, Wavelet based coding, EZW, SPIHT
7. Image Compression Standards: JPEG, JPEG2000,
8. Basic Video Compression: Motion Compensation, Search Algorithms, H.261, H.263, MPEG-1, MPEG-2, MPEG-4 and 7
9. Multimedia Communication Networks: Overview of computer network, Quality of service and resource management, Multimedia over IP, Multimedia over ATM, Transportation of MPEG-IV, Wireless Networks, Multimedia over Wireless Network

Reference Books:
3. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communications and Application, Perason Education
4. J. F. Koegel Buford, Multimedia Systems, Pearson Education

EC423C Medical Image Processing

1. Introduction: Basics of image processing.
2. Image and Signal Processing: Sampling theory, and interpolation methods, including nearest-neighbour, linear, cubic and highorder, and Fourier (using the FFT). We will use these methods to implement spatial image transformations (rigid and non-rigid).
3. Sources of Medical Images: physics of X-ray, CT, PET, MRI, and ultrasound; the properties of the resulting images, and discuss the advantages and disadvantages of each imaging modality.
4. Image Enhancement: Contrast adjustment, denoising (convolution, FFT), deblurring (solving an ill-conditioned sparse linear system), edge detection (numerical approximation to a partial derivative), anisotropic diffusion (numerical solution of partial differential equations), super-resolution.
5. Registration (alignment): intensity-based methods, including a variety of cost functions (correlation, least squares, mutual information, robust estimators), and optimization techniques (fixed-point iteration, gradient descent, Nelder-Mead simplex method, etc.). Implement registration for rigid and non-rigid transformations.
6. Segmentation (tissue classification): simple methods such as thresholding, region growing and watershed. Texture based tissue classification methods. More depth on the method of snakes (adaptive mesh), level set method (numerical solution of partial differential equations), and clustering (classifiers).
7. Reconstruction Methods: Reconstruction techniques for CT (filtered back projection) and MRI (using the FFT). The Radon transform, the Fourier transform, and how they relate to each other.

Reference Books:

EC424 Elective-V (Any One from EC424 A, B, C, D) (Cr-4, L-3,T-0 P-2)

EC424A Neural Networks and Fuzzy Logic
1. Introduction: Fundamentals and Models of Artificial Neural Systems, Neural computation: Examples
and applications, Biological neurons and their artificial models, Models of artificial networks, Neural processing, Learning and adaptation, Neural network learning rules, Overview of neural networks
2. Single-Layer Perception Classifiers: Classification model, features, and decision regions, Discriminate functions, Linear machine and minimum distance classifier, Non parametric training concept, SDPTA, SCPTA, R-category discrete Perception training algorithm
3. Multilayer Feed forward Networks: Linearly non separable pattern classification, Delta learning rule for multiperceptron layer, Generalized delta learning rule, feed forward recall and error back propagation training, Learning factors
4. Single Layer Feedback Networks : Basic concepts and dynamical systems, Mathematical foundations of discrete-time and gradient-type Hopfield networks
5. Applications of Neural Networks: Introduction to applications in characters recognition and control systems.
7. Fuzzyfication and Defuzzification: Membership functions, Membership assignment, lambda cuts, Defuzzification methods.
8. Fuzzy Arithmetic: Fuzzy numbers, vectors, extension principle, crisp functions, mapping, fuzzy transforms, interval analysis
9. Applications of Fuzzy Logic : Introduction to applications in data classification, image processing, and control systems.

Reference Books:
2. T. M. Ross, Fuzzy logic, Mc-Graw Hill Inc.
3. Kosoko, Neural Networks and Fuzzy Systems, PHI

EC424B Digital Signal Processors
1. Introduction to Programmable DSPs: Comparison of GP Processors and DSP processor Architecture, Multiplier and MAC, Modified Bus structures and Memory Access schemes, Multiple Access Memory, Dual port memory, VLIW Architecture, Pipelining, Special Addressing Modes, On-Chip Peripherals, RISC Vs CISC design
3. TMS32054X Assembly Language Instructions, Programming in Assembly language
4. Application Programmes in C54X: Code Composer Studio, Application Programmes in C54X
5. TMS320C6xx DSPs: Features, Architecture, Memory Interfacing, Addressing Modes, Pipeline operation, Peripheral, C-Programming and DSP Application development like Speech coding Image processing and coding applications
6. Recent trends in DSP System design, Media processor, FPGA Based DSP System Design

Reference Books:

EC424C Optical Communication Engineering

2. Light propagation through fiber: Types of optical fibers, Optical fiber fabrication, Propagation of light in a cylindrical dielectric rod, ray model, wave model. Modes of propagations in step index fiber and graded index fiber. Attenuation characteristics, Dispersion, Distortion in fiber, Integrated optic components.


4. Optical Sources: Light-emitting diodes, Laser diodes, Modal, partition and reflection noise, Power Launching and Coupling. Source to fiber power launching, lensing schemes for coupling improvement, fiber-to-fiber joints, LED coupling to single-mode fibers, fiber splicing, optical fiber connectors.


Reference Books:

EC424D VLSI Signal Processing

1. Introduction to digital processing systems.
2. Iteration bound: data-flow graph representations; loop bound and iteration bound; algorithms for computing iteration bound; iteration bound for multi-rate data-flow graphs.
3. Pipelining and parallel processing: pipelining for FIR digital filters, parallel processing; pipelining and parallel processing for low power.
4. Retiming: definitions and properties; solving system inequalities; retiming techniques.
5. Unfolding: an algorithm for unfolding; properties for unfolding; critical path, unfolding and retiming; applications of unfolding.
6. Folding: folding transformation; register minimization techniques; register minimization in folded applications; folding of multi-rate systems.
7. Systolic architecture design: systolic array design methodology; FIR systolic array; selection of scheduling vectors; matrix-matrix multiplication and 2D systolic array design; systolic design for space representations containing delays.
8. Fast convolution: Cook-Toom algorithm; Winograd algorithm; Iterated convolution; cyclic convolution; design of fast convolution algorithm by inspection.
9. Algorithm strength reduction in filters and transforms: parallel FIR filters; DCT and IDCT; parallel architecture for rank order filters.
10. Pipelined and parallel recursive and adaptive filters: pipeline interleaving in digital filters; pipelining in 1st order IIR digital filters; pipelining in higher order IIR digital filters; parallel...
processing for IIR filters; combined pipelining and parallel processing for IIR filters; low-power IIR filter design using pipelining and parallel processing; pipelined adaptive digital filters

11. Low-power design: scaling versus power consumption; power analysis; power reduction techniques; power estimation approaches.

Reference Books:

1. VLSI signal processing systems: design and implementation, Keshab Parhi, John Wiley and Sons 2003.

EC425 Project-II (Credit -12)

The projects in semesters- II shall be the continuation of the project in Semester-I. The topic may include two components, hardware and software implementation (hardware design, implementation and/or simulation). Project batches in semester – I shall continue in semester-II.

At the end of semester-II, students will have to submit a Final Report of the project. Students must maintain a Project diary duly signed by their guides weekly. It is mandatory on the part of the students to submit the project diary during the internal end semester evaluation.
**Signature of DUGPC Members:**

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