FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABI

AND THE

REGULATIONS

FOR

Regular & Modular
M.E. (Electronics & Communication Engineering)
2015-16

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### Scheme of Examination for Master of Engineering (Electronics & Communication)

#### Scheme of Examination 2015-16

**FIRST SEMESTER:**

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<tr>
<th>Subject Code</th>
<th>Subject Name</th>
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Total Marks: 750
Credits = 20

**Elective-I**
- ECE 6104: Advanced Mathematics
- ECE 6107: Bioinformatics
- ECE 6108: Modeling & Simulation of Communication Systems
- ECE-6109: Information Theory & Coding
SECOND SEMESTER:

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Total Marks: 750  
Credits = 20

**Elective-II**  
(ECE-6204) Advanced Computer Networks  
(ECE-6205) Network Programming  
(ECE-6208) Advanced Antenna Systems

**Elective-II Lab**  
(ECE-6254) Advanced Computer Networks  
(ECE-6255) Network Programming  
(ECE-6258) Advanced Antenna Systems

**Elective -III**  
(ECE-6207) PLCs & SCADA  
(ECE-6211) VLSI Design  
(ECE-6213) Nano Electronics  
(ECE 6214) Multimedia Communication
THIRD SEMESTER

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Total Marks: 300
Credit = 18

Elective- IV
(ECE-7101) Neural Network & Fuzzy Logic
(ECE-7102) RF & Microwaves
(ECE-7103) Simulation & Modeling

Elective-V
(MTE-7201) HRD & Training Methods
(MTE-7202) Research Methodology
(ECE-7105) Satellite Communications
(ECE-7108) Cryptography & Network Security

FOURTH SEMESTER:

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Total marks: 100
Credits = 15

Total Marks: 1900
Total Credits: 75

Thesis (ECE 7201) will be graded as follows:

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M. E. Modular Programme

In each of the Modular programme, there are a total of 12 theory subjects, each of 100 marks (including sessional of 50 marks), 9 practical subjects, each of 50 marks, two research seminars, Preliminary Thesis and Thesis with a total of 1900 marks. A candidate will study 12 theory subjects in 1st to 6th spells; Preliminary Thesis work in 7th spell, and Thesis in 8th spell. The courses of study and evaluation scheme for ME Modular programme are the same as described for ME Regular programme and is detailed here.

Spell-1

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Elective-I

ECE 6104: Advanced Mathematics
ECE 6107: Bioinformatics
ECE 6108: Modeling & Simulation of Communication Systems
ECE-6109: Information Theory & Coding

Spell-3

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### Elective-II

- (ECE-6204) Advanced Computer Networks
- (ECE-6205) Network Programming
- (ECE-6208) Advanced Antenna Systems

### Elective-II Lab

- (ECE-6254) Advanced Computer Networks Lab
- (ECE-6255) Network Programming Lab
- (ECE-6258) Advanced Antenna Systems Lab

### Elective -III

- (ECE-6207) PLCs & SCADA
- (ECE-6211) VLSI Design
- (ECE-6213) Nano Electronics
- (ECE 6214) Multimedia Communication

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Elective- IV
(ECE-7101) Neural Network & Fuzzy Logic
(ECE-7102) RF & Microwaves
(ECE-7103) Simulation & Modeling

Elective-V
(MTE-7201) HRD & Training Methods
(MTE-7202) Research Methodology
(ECE-7105) Satellite Communications
(ECE-7108) Cryptography & Network Security

Spell-7

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Thesis (ECE 7201) will be graded as follows:

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<td>3.</td>
<td>B+</td>
<td>Publication from Thesis in Proceedings of Conference which is Scopus indexed</td>
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<td>5.</td>
<td>C</td>
<td>Presented Paper in National Conference</td>
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FIRST SEMESTER

ECE-6101  ADVANCED DIGITAL SIGNAL PROCESSING

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Transform Theory:
Review of Z-Transform, Solution of Linear Difference Equations, Fourier series and Fourier Transform, Discrete Fourier Transform, Radix-2 FFT.
Introduction to Radix-4 and Split Radix FFT, Discrete Cosine Transform, DCT as Orthogonal Transform, Walsh Transform, Hadamard Transform, Wavelet Transform. (6)

Digital Filters:

Multirate Digital Signal Processing:
Sampling Rate Alteration Devices, Multirate Structures for sampling rate conversion, Multistage design of Decimator and Interpolator, The Polyphase Decomposition, Arbitrary Rate Sampling Rate Converter, Filter Banks, QMF banks, Multilevel Filter Banks, Sub-band Coding, Discrete Wavelet Transform. (7)

PART B

Linear Prediction and Optimum Linear Filters:
Forward and Backward Linear Prediction, Properties of Linear Prediction-Error Filters, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction. (5)

Adaptive Digital Filters:
Concepts of Adaptive Filtering, LMS Adaptive Algorithm, Recursive Least Squares Algorithm, Applications, Introduction to Active Noise Control (5)

Power Spectrum Estimation:

DSP Chips:
Introduction to fixed point and floating point processors, TMS320C6x series: Architecture, Instruction set, Memory, Addressing Modes, Interrupts, Applications. (6)
Practice Task:
(Implement the following programs in MATLAB)
2. Circular Convolution.
3. DFT and FFT of Discrete time sequences.
4. Design of FIR Filters.
5. Design of IIR Filters.
8. Decimation and Interpolation of Discrete time sequences.
9. Implementation of an Arbitrary rate Sampling Rate Converter.
10. Illustrate Adaptive Filtering using LMS Algorithm.

Recommended Books:
8. “Digital Signal Processing and Applications with the TMS320C6713 and TMS320C6416 DSK”, R Chassaing, and D Reay, Wiley India.

ECE-6102 FIBER-OPTIC COMMUNICATION SYSTEMS

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

Course Objective
- To explain the need and significance of Optical Communication system.
- To impart knowledge of types, basic laws, and transmission characteristics of optical fibers.
- To study different lightwave systems, system components and applications.
• To develop research interest and expertise in the field of guided & unguided lightwave systems and optical sensors & systems.

PART A

Review of Optical Fiber Technology:
Ray Theory of Transmission: Total Internal reflection, Acceptance Angle, Numerical Aperture, Electromagnetic mode theory for optical communication; Types of Fiber; Splices and Connectors, Signal Degradation in Optical Fibers: Attenuation, Dispersion, Nonlinear Effects; Optical Sources and Detectors

Lightwave systems

PART B

Optical Amplifiers:
Basic concepts and types of optical amplifiers, Semiconductor optical amplifiers, Erbium doped fiber amplifiers, Raman Amplifiers, System Applications.

Optical Components and Sensors:
Coupler/splitter, optical switches, optical add/drop multiplexers, fiber grating, classifications of fiber-optic sensors, Intensity modulated sensors, phase-modulated sensors, wavelength-modulated sensors, polarization fiber sensors, fiber-optic biomedical sensors.

Unguided Lightwave Systems:
Introduction to visible light communication: system description, Home access networks; Light detection and ranging, Introduction to Free Space optics, Propagation of light in the atmosphere and phenomena that affect light propagation.

Recommended Books
1. Govind P. Agrawal, "Fiber optic communication systems" third edition, Wiley India.
4. International (P) Ltd.
7. Z. Ghassemlooy, W. Popoola, S. Rajbhandari, "optical wireless communications: system and channel modeling with MATLAB", CRC Press.

Practical task:
1. Simulation exercise on comparison of different dispersion compensation techniques: Pre-DCF, Post-DCF and symmetric dispersion compensation.
2. Simulation exercises on the designing on WDM systems and performance evaluation through eye diagram, optical spectrum, OSNR, Q-factor & BER rate.

ECE-6103 ADVANCED DIGITAL COMMUNICATION

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A
Elements of a Digital communication system 5
Communication channels and their characteristics, mathematical models for communication channels, recent trends in digital communication, Deterministic and Random Signal Analysis, Band pass and Low pass Signal Representation, Signal space representation of waveforms.

Digital modulation Schemes 10
Representations of digitally modulated signals, memory less modulation methods, PAM,PM,QAM, multidimensional signaling, Signaling scheme with memory, CPFSK,CPM, Power spectrum of Digitally modulated signals, PSD of a digitally modulated signals with memory, PSD of linearly modulated signals.

Optimum Receivers for Additive White Gaussian Noise Channels 10
Waveforms and vector channel models, waveforms and Vector AWGN channels, Optimum detection for the Vector AWGN channel, Implementation of the optimal receiver for AWGN channels, the correlation receiver, matched filter receiver, frequency domain interpretation of the matched filter, Performance analysis of wire-line and radio communication systems.

PART B
Carrier and symbol synchronization 8
Signal parameter estimation, the likelihood function, carrier recovery and symbol synchronization in signal demodulation, carrier phase estimation, maximum likelihood carrier phase estimation, phase locked loop, effect of noise on the phase estimation, symbol timing estimation, maximum likelihood timing estimation, non–decision directed timing estimation.

Multichannel and Multicarrier System 8
Multichannel Digital Communication in AWGN channels, binary signals, M-ary orthogonal signals, Multicarrier communication, single-carrier versus multicarrier modulation, Capacity of a Nonideal linear filter channel, orthogonal frequency division multiplexing (OFDM), modulation and demodulation in an OFDM system, Spectral characteristics of multicarrier signals, Bit and Power allocation in multicarrier modulation.

Spread Spectrum Signals for Digital Communication 4
Model of spread spectrum digital communication system, direct sequence spread spectrum signals, frequency hopped spread spectrum signals, CDMA system based on FHSS signals, Synchronization of spread spectrum systems.
Practical Task:
1. Digital Modulation techniques using MATLAB
2. Study of Spread spectrum signals
3. Simulation of digital communication system

Books:

ECE 6104 ADVANCED MATHEMATICS

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A
Series solution of differential equations, Power series methods, Legendre’s polynomial, Generating functions, Recurrence relations. (08)
Frobenius method, Series solution of Bessel’s differential equation, Modified Bessel’s functions, Generating functions, Recurrence relations. (08)
Equations reducible to Bessel’s equation. (04)
Sturm Liouville’s problem, orthogonal functions, Orthogonality of eigen functions, Eigen function expansions. (06)

PART B
Conformal mapping, Exponential function, Trigonometric functions, Hyperbolic functions, Inverse trigonometric functions, Logarithmic function, Power function, Bilinear and Schwarz-Christoffel transformation, Applications to engineering problems. (08)
Matrices, Functions of square matrices, Quadratic and Hermitian forms, Solution of linear simultaneous equations by Gaussian elimination and its modifications, Crout’s triangularization method, Iterative method’s-Jacobi’s method, Gauss-Seidel method, Eigenvalue by iteration. (10)
System simulation, Technique of simulation, Monte Carlo method, Comparison and simulation with analytical method, Numerical computation techniques. (08)

Recommended Books:
3. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall of India
5. Geoffrey Gordon System Simulation, Prentice Hall of India
ECE-6105                        DIGITAL SYSTEM DESIGN

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

Objectives:
- To understand theoretical and practical aspects of all the combinational & sequential circuits.
- Ability to identify and design the code using different modeling styles and synthesize the VHDL code.
- Acquired knowledge about FSM and how to design a code for FSM.
- To understand the future outlook and challenges for designing of digital system.

PART A
Introduction to Digital Design Concepts:
Design Constraints and Logic Representation of System. (02)

Analog interfacing:
A/D conversion concepts, Analog & Digital Conversion related errors. (03)

Combinational Logic Design and Implementation:
Multiplexer/Decoder, PLA/Pal/GAL,ROM,CPLD and FPGA level customized design, ALU, VHDL models and simulations of combinational circuits. (18)

PART B
Sequential Logic Design and Implementation:
Practical Synchronous and asynchronous circuit design. Design and Implementation of sequential digital system, state representation, analysis of digital systems, synchronization, design criteria, design procedure. High level modeling of digital systems, controller realization, Timing & Frequency consideration, system examples. VHDL models and simulation of sequential circuits (18)

Design for Testability:
Fault and Fault coverage in digital circuits, internal scan test methodology, BIST and Boundary scan (JTAG) techniques. (04)

Practice Task:
Practical tasks related to theory.

Recommended Books:
1. Combinational design & testing using PLA/PAL/ROM chips.
2. Combinational design, simulation, synthesis & implementation.
3. An Engineering Approach to Digital Design –W.J.Fletcher
4. Digital Design –M. Morris Mano
5. Digital Design principles and practices by J.F.Wakerly
6. Digital Systems-Principles and applications-Ronald Tocci.
ECE 6107 BIOINFORMATICS

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

The NCBI Data Model:
Introduction, PUBs: Publication of perish, SEQ-Ids, BIOSEQs, Sequences, BIOSEQ-SETs, Collection of Sequences, SEQ-ANNOT, Annotating the sequence, SEQ-DESCR, Describing the sequence, using the Model. (04)

The GenBank Sequence Database:

Submitting DNA Sequences to the Databases:
Introduction, DNA/RNA, Population, phylogenetic and Mutation Studies, Protein- only submissions, submission on the World Wide Web, submission on Sequin updates, Consequences of the data model, EST/STS/GSS/HTG/SNP and Genome Centers. (09)

Structure Databases:
Introduction to Structures, PDB: Protein data bank at the research collaboratory for structural file formats, Visualizing structural information, Database structure viewers, advanced structure modeling, Structures similarity searching. (10)

PART B

Genomic Mapping and Mapping Databases:
Interplay of mapping and sequencing Genomic map elements, Types of maps complexities and pitfalls of mapping, Data repositories, and mapping projects and associated resources, Practical uses of mapping resource. (05)

Sequence Alignment and Database Searching:
Introduction, The evolutionary basis of sequence alignment, The modular nature of proteins, optimal alignment methods, Substitution scores and gap penalties Statistical significance of alignments, Database similarity searching, FASTA, BLAST, Database searching artifacts, Position – Specific scoring matrices, Spliced alignments. (08)

Predictive Methods using DNA Sequences:
GRAIL, FGENEH/GENES, MZEF, GENSCAN, PROCRUSTES, Strategies and considerations. (05)

Expressed Sequence Tags (ESTs):
EST, EST Clustering, TIGR Gene Indices, STACK, ESTs and Gene Discovery, The human Gene Map, Gene prediction in Genomic DNA, ESTs and Sequence Polymorphisms, Assessing levels of Gene expression using ESTs. (06)

Recommended Books:
2. David W. Mount, “Bioinformatics: Sequence & Genome Analysis.”
ECE 6108  MODELING AND SIMULATION OF COMMUNICATION SYSTEM

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART-A

Modelling Of Communication System
Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system Models.

Simulation of Random Variables And Random Process
Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

PART-B

Estimation of Performance Measures
Quality of an estimator, estimator of SNR, Probability density functions of analog communication system, BER of Digital communication systems, Montre Carlo method and Importance sampling method, estimation of power, Spectral density of a process

Communication Networks
Queuing models, M/M/I and M/M/I/N queues, little formula, Burke’s theorem/G/I queue, Embedded Markov Chain analysis of TDM systems, Polling, Random access systems

Network of Queues
Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow Chart, Routing model, Network layout and Reliability

Reference Books:

ECE-6109  INFORMATION THEORY & CODING

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.
PART A

The Communication process and the nature of information. (02)

Information Sources, measurement of information and the Entropy Function:
Entropies defined, and why they are measures of information, marginal entropy, joint entropy, Conditional entropy and the Chain Rule for Entropy. (06)

Sources with and without Memory:
Sources coding theorem, Prefix, Variable and Fixed-length Codes. Error Correcting Codes. (06)

Channel Types, Properties, Noise and Channel Capacity:
Perfect communication through a noisy channel. The binary symmetric channel, their classification and capacity of a noiseless discrete channel. The Hartley and Shannon laws for channel capacity. (08)

PART B

Continuous Information; Density; Noisy Channel Coding Theorem:
Extensions of the discrete entropies and measures to the continuous case. Signal-to-noise ratio; power spectral density, Gaussian channels, Relative significance of bandwidth and noise limitations. The Shannon rate limit and efficiency for noisy continuous channels (06)

Error Control Coding:
Linear blocks codes and their properties, hard-decision decoding, cyclic codes, Convolution codes, Soft-decision decoding, Viterbi decoding algorithm. (08)

Advanced Coding Techniques and Cryptography:
BCH codes, Trellis coded modulation, introduction to cryptography, overview of encryption techniques, symmetric cryptography, DES, IDEA, asymmetric algorithms, RSA algorithm. (09)

Recommended Books:
2. Richard B. Wells, Applied Coding and Information Theory for Engineers, Pearson
4. R.G.Gallager, Information Theory and Reliable Communication, Wiley
8. Thomas Cover & Joy Thomas, Elements of Information Theory, John Wiley & Sons
SECOND SEMESTER

ECE-6201 EMBEDDED SYSTEM DESIGN

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

Part A

Introduction to Embedded System:
Their classification & characteristics, Concepts and Processes of system level design of embedded system. (04)

Microcontrollers:
Introduction to PIC 16F8XX Flash Microcontrollers, CPU architecture, Register file structure, Instruction Set, Programs, Timers and Interrupts, Interrupt Service Routine, Features of Interrupts, Interrupt vector & Priority, Timing Generation & Measurements, Interfacing Methods, I/O Interface, LCD interfacing, Seven segment interfacing, i²C Bus, DAC, ADC, UART. (11)

Program Modeling Concepts in Single and multiprocessor system Software- Development Process:
Modeling Processes for software Analysis before software implementation, Program model for event controlled, Modeling of Multiprocessor Systems. (08)

Part B

Embedded Core Based Design:
System-on-Chip, Application specific Integrated circuit, Overview of Embedded Processors like ARM, MIPS and Intel MMX series, Architecture, Organization and instruction set, Memory management, High level logic synthesis. Data parallel issues e.g SIMD, MIMD, MISD, SISD. Introduction to FPGA, Basics of FPGA, RTOS overview (15)

Applications of Embedded Systems in Embedded Networking

Practice Task:
1. PIC Programming
2. FPGA Programming

Recommended Books:
1. Microcontrollers (Theory and Applications)- Ajay V. Deshmukh
2. An Embedded System Primer, by David E. Simon
3. Embedded system Design by Steve Heath
4. PIC Microcontroller by John B. Peatman
5. ARM system architecture by Steve Furber (Addison Wesley)
6. Programming Embedded System in C/C++ by M.Barr
7. Real Time Systems by H. Kopetz
8. Embedded Systems- Raj Kamal
9. Embedded Systems by K. V. Shibu

ECE-6202 DIGITAL IMAGE PROCESSING

Max Marks/credit: 50/3

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Introduction:
Fundamental concept of digital image processing, Fields of Digital Image Processing, Component of image processing system, Image acquisition. (04)

Image Transformation, Filtering and Restoration:
Relationship between pixels, Mathematical Tools used in image processing, Camera Angles and Perspective Transformation, Intensity Transformation Functions, Histogram Processing, Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Frequency domain filters, Noise Models, Restoration in the presence of noise and degradations, Inverse Filtering. (12)

Color Image Processing
Color Fundamentals, Color Models, Color Transformations, Smoothing and Sharpening. (06)

PART B

Wavelets and Multiresolution Processing
Background, Multiresolution expansions, Wavelet transform in one dimension, Wavelet Transforms in two dimensions, Wavelet Packets. (06)

Image Compression
Coding redundancy, Spatial and Temporal redundancy, Psychovisual Redundancy, Huffman Coding, Arithmetic coding, Transform coding, Predictive coding, Wavelet Coding, JPEG Compression. (06)

Morphological Image Processing
Erosion, Dilation, Opening & Closing, Morphological Algorithms: Boundary & Region Extraction, Convex Hull, Thinning, Thickening, Skeletons, Pruning. (05)

Image Segmentation & Representation
Point, Line and Edge Detection, Thresholding, Edge and boundary Linking, Hough transforms, Region Based Segmentation, Representation, Boundary Descriptors, Regional Descriptors. (06)
Practice Task:
(Based on MATLAB)
1. Intensity transformation
2. Histogram Processing.
3. Spatial Filtering.
5. Image Restoration.
6. Image Denoising
7. Color Image Processing
8. Wavelet Transform
9. Image Compression
10. Morphological Image Processing
11. Point, Line and Edge Detection
12. Image Segmentation
13. Image Representation and Description

Recommended Books:
1. Digital Image processing by R.C. Gonzalez and R.F. Woods (Pearson Education)
5. Digital Image Processing by W. K. Pratt
6. Digital Image Processing using MATLAB by Woods & Gonzalez (Pearson Education)

ECE-6203                   WIRELESS & MOBILE COMMUNICATION

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Mobile Communication:
Types of Mobile Communication Systems, Mobile radio systems around the world, Trends in cellular radio and personal communications. (03)

Cellular Design Fundamentals:
Frequency reuse, Channel alignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems, mechanism for capacity improvement-cell splitting, cell sectoring, and micro cell zone concept. (05)

Multiple access schemes : TDMA, FDMA, CDMA, WCDMA, OFDMA, Random Multiple access Scheme, Packet Radio Protocols, CSMA, Reservation Protocols, Capacity of Cellular systems. (09)
GSM Architecture & Protocols, GSM Burst structure, Carrier and Burst Synchronization, Design Consideration, Security Aspects, Power Control strategies. (06)

PART B

CDMA Digital Cellular Standards, Services and Security Aspects, Network Reference Model and Key Features, Advantages over TDMA, CDMA WLL System. (05)


Wireless Networks:
WiFi, WiMax, Bluetooth, Long Term Evolution (06)

Practice Task:-

1. Simulation and implementation of baseband digital signals
   (i) Types of baseband signals: unipolar, polar, bipolar, RZ, NRZ, etc.
   (ii) Distortion and noise, Eye diagram.

2. Simulation and implementation of modulated digital signals
   (i) PSK, ASK and FSK modulations.
   (ii) Demodulation with envelope detection and synchronous.
   (iii) PSK differential modulation.
   (iv) Quadrature modulations (QASK and QPSK).
   (v) QAM modulation.

3. Global System for Mobiles (GSM)
   (i) Cellular telephony. GSM Architecture.
   (iii) AT Commands
   (iv) Working of GSM mobile station.

4. Multiple Access
   (i) Time division multiple Access
   (ii) Frequency division multiple access

5. Spread Spectrum communication systems
   (i) Pseudo-noise coders
   (ii) Direct sequence spread spectrum communication systems
   (iii) Frequency hopped spread spectrum communication systems
   (iv) CDMA wireless computer communication systems
6. Channel Characteristics
   (i) Multipath channel propagation characteristics
   (ii) Bit-error rate measurement

7. Wireless Networks
   (i) Bluetooth wireless network.
   (ii) Wi-Fi
   (iii) Wi-Max

8. Educational field visit to a Mobile Switching Center (MSC)


Recommended Books:

1. Mobile and personal Communication Systems and services by Raj Pandya (PHI)
2. Wireless Communication by Rappaport (PHI)
3. Mobile Communication by Lee (TMH)
4. Wireless & Mobile System by Dharam Prakash Aggarwal, Qing-Anzeng (Thomson)

ECE-6204                   ADVANCED COMPUTER NETWORKS
Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A
Overview:

Data Link Layer:

Local/Personal Area Networks:
IEEE LAN standards: Ethernet (802.3), Gigabit Ethernet, Wireless LAN (802.11), Bluetooth, and Broadband Wireless (802.16). (05)

Wide Area Networks: X-25, Frame Relay, ATM. (04)

Network Layer:
Congestion control: Principles and policies congestion control in Virtual-circuit and Datagram subnets. Load shedding and Jitter control.
Quality of Service: Techniques for achieving good Quality of Service, Integrated Services, Differentiated Services, Label Switching and MPLS.  (08)

PART B

Internetworking and Internet Protocols:
Tunneling, Fragmentation. The IPv4 Protocol, IPv4 addresses, IPv6 Protocol, Mobile IP, OSPF, BGP, ARP, DHCP, Internet Control Protocols, Classless Inter-domain Routing (CIDR), Network Address Translation (NAT), Subnetting and Supernetworking. (08)

Transport Layer:
Transport layer protocol issues: Addressing, Connection Establishment, Connection Release, Flow control and Multiplexing. Internet Transport Protocols: TCP and UDP. (05)

Network Applications:
DNS, Electronic Mail, TELNET, FTP, SNMP, World-wide Web, Multi-media. (06)

Network Security:
Introduction to Network Security, Cryptography, Symmetric-key and Asymmetric Key Algorithms, Digital Signatures. (05)

Recommended Books:
3. Data Communications And Networks, 2nd Ed, Forouzan. Tata Mcgraw Hill.
8. Sheldon, Tom Encyclopedia Of Networking, Tmh

ECE-6205 NETWORK PROGRAMMING

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.
PART B

TCP/IP PROGRAMMING:
The TCP/IP reference model and protocol suite. IP address classes and Sub-netting. Concepts of sockets and port numbers. Port number and association. TCP header.

Interprocess Communication:
Remote procedure Call, Window Sockets, Named pipe, Mailslots, NetBIOS, and IPX/SPX. (08)

PART B

Windows programming:


Web Programming:
HTML, XML, Scripting. (05)

Practice Task: (To be covered under theory class)
1. Develop an SMTP client and a server.
2. Develop a POP client and a server
3. Develop a proxy server

Recommended Books:
1. SINHA, ALOK K. Network Programming in Windows NT, Addison-Wesley
2. STEVENS, R.W. TCP/IP Illustrated, Vol.1: The Protocols, Addison-Wesley
3. STEVENS, R.W. TCP/IP Illustrated, Vol.2
4. STEVENS, R.W. TCP/IP Illustrated, Vol.3
5. HTML in 24 Hours, SAMS.
ECE-6207  PLCs AND SCADA

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Introduction:
Fundamental Control Concepts, PLC System, CPU-Architecture, Programmers and Monitors, PLC Input and Output Modules-Analog and Digital, power Supply of PLCs, Internal Timers, Counters, and Flags. Criteria for Selection of PLC, PLC vs. PC. Memory requirements. (07)

SCADA:

PART B

Programming Procedures:
Different programming formats like ladder diagram, statement list, Boolean etc. Programming based on ladder diagrams using relay, timers counters sequencers, data transfer, comparison, arithmetic, logical instructions & software flags, Programming equipments like computer, hand-held programmer, on-board programming, Human machine interface, Program Scanning, Proximity Sensors and their connection to PLC, PLC as PID Controller. (19)

NETWORKING:
Networking of PLCs, Types of Networking, and Cell control by PLCs. (04)

Recommended Books:
1. Introduction to Programmable Logic Controllers by Gray Dunmig, Boston, Delmar
2. Manuals on PLCs by Siemens/Allen Bradley
3. Proggraming Logic Controllers by Hackworth and Hackworth Jt.
types, discussion on binomial & Dolph- Tschebysheff array), Super directivity (Efficiency &
directivity), design considerations. (05)

**Antenna Synthesis and continuous sources** (Line-source, Discretization of continuous sources),
Schelkunoff polynomial method, Fourier transform method, Taylor Line-source, Triangular,
cosine and cosine-squared amplitude distributions, continuous aperture. (05)

**Broad-band antennas** (Bi-conical, Sleeve Dipole, Cylindrical dipole, rhombic antenna, helical
antenna, Yagi-Uda array), Frequency Independent antenna (planar and conical spiral, log
periodic). (05)

**Different antenna**: (Field equivalence principle) Radiation equations, Directivity, Rectangular
and Circular aperture (Radiation from apertures and distribution), Horn antenna (E-plane, H-
plane, Corrugated, Di-electric loaded-field & directivity calculation). (07)

**PART B**

**Micro-strip antenna**, Basic characteristics, Rectangular and Circular patches, Transmission line
and cavity model, Feeding techniques and recent advancement (05)

**Antenna fabrication techniques** (Linear, Horn & Microstrip patch), Measurements (Impedance,
Gain, polarization and Radiation pattern). Matching techniques. Antenna ranges. (05)

**Smart Antenna** (Principle, Block diagram), Design considerations and recent development. (03)

**Review of radar** range equation (using all parameters), Radar Signal Integration, Range Accuracy
and Resolution, Signal detection and estimation, Clutter and noise suppression. (08)

**Simulation Software** based discussion of antenna and radar (Design and Calculation) (02)

**Recommended Books:**
1. C.A Balanis, Antenna Theory-Analysis, John Wiley
2. J.D.Karus- Antenna, McGraw Hill
4. M.I.Skolnik-Introduction to Radar System, Mcgraw Hill
5. B.Edde- Radar, Principles, Technology, Application-prentice Hall
CMOS processing technology: P-well, N-well, Twin Tub and silicon on Insulator processing, layout Design rules, CMOS Process enhancement.

**CMOS Circuit and Logic design:**
Sequential Circuit design: Sequencing methods, Max-Delay constraints, Min-delay constraints, time borrowing, and clock skew.
Data Path Subsystems: Adders, Sub tractors, Comparators, flip-flops, Shifter, counters, Multiplier

**PART B**
Design Methodology & Tools:
Design Methodology: Introduction, structured Design, Programmable logic, fully Custom design, CAD tools in VLSI Design Process.
Architecture Design: Introduction, HDLs, High level synthesis, Logic Synthesis.

**VLSI Simulation and Algorithm:**
Hierarchy of simulation tools, Switch level simulations, Layout synthesis, Placements and routing algorithms, spice simulation.

**Practice Task:**
Design & Simulation of combinational and sequential circuits using
1. Front End VLSI tools like Xilinx ISE, ISE simulator or Modelsim simulator.

**Recommended Books:**
1. CMOS VLSI design by Neil H.E. Weste, David Harris, Ayan Banerjee (Pearson Education)
2. Modern VLSI Design by Wayne Wolf (Pearson education)
3. FPGA-Based system design by Wayne Wolf (Pearson Education)
4. Introduction to VLSI Systems by Mead and Conway (Addison wisely)
5. VLSI Design by Puckneel.

**ECE- 6213 NANO ELECTRONICS**

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

**PART A**
Materials for Nano-Electronics:
Properties of Individual Nanoparticles:
Introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, preparation of quantum nanostructures, Introduction to carbon nano tubes, Fabrication, Structure, Electrical properties, vibrational properties, Mechanical properties.  (08)

Biological Materials:
Biological building blocks-polypeptide, nucleic acids- DNA, Biological nanostructure, Biological methods for Nano scale fabrication.  (08)

PART B

Tools:
TEM, Infrared and Raman Spectroscopy, Photoemission and X-RAY spectroscopy, Electron microscopy, SPMs, AFMs, Electrostatic force microscopy, Magnetic force microscopy.  (06)

Nano-scale Devices
Introduction, Nanoscale MOSFET-Planer and non-planer, Resonant-tunneling diodes, Single electron transistor, Quantum-dot Nano-electromechanical systems, Molecular/Bio molecular electron devices.  (15)

Recommended Books:
5. K.E. Drexler, Nano-Systems, Wiley (1922)

ECE- 6214 Multimedia communication

Max Marks/credit: 50/3
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART-A

Introduction to various multimedia Communication Techniques, Applications, Networks, Protocols and Standards, bandwidth and compression issues.

Multimedia Information Representation – Different types of multimedia information, Information representation.

Compression Techniques – Encoding and decoding techniques, Text compression techniques, Image compression techniques, Audio and Video Compression, Standards for Multimedia Compression, Huffman, Run length, Variable length, Lossy/ Lossless compression.
PART-B
Multimedia File Formats - Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/Video Standards, Challenges for encryption and decryption. HD TV, Mobile Phone Programming

Network Operating Systems - Overview of network operating systems (Windows NT/Unix/Linux), Mobile IP33N Operating System, Android Operating system. ATM Networks - Concepts, history, Architecture, Convergence and challenges

Reference Books:
THIRD SEMESTER

ECE-7101 NEURAL NETWORKS & FUZZY LOGIC

Max Marks/credit: 50/4

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Fundamentals of Neural Networks:
Introduction, Biological Neurons and Memory, Structure & Function of a single Neuron, Artificial Neural Networks (ANN). Typical Application of ANN - Classification, Clustering, Pattern Recognition, Function Approximation. Basic approach of the working of ANN – Training, Learning and Generalization. (10)

Supervised Learning:

PART B

Unsupervised Learning:
Winner-takes all Networks, Hamming Networks. Adaptive Resonance Theory, Kohonen’s Self-organizing Maps. (09)

Neurodynamical models:
Stability of Equilibrium states, Hopfield Network, Brain-state-in-a-Box network, Bidirectional associative memories. (06)

Fuzzy Logic:
Basic concepts of Fuzzy Logic, Fuzzy Vs. Crisp set Linguistic variables, membership functions, operations of fuzzy sets, Crisp relations, Fuzzy relations, Approximate reasoning, fuzzy IF-THEN rules, variable inference, techniques, defuzzification techniques, Fuzzy rule based systems. Applications of fuzzy logic. (10)

Practice Task: (To be covered under theory class)
1. Design and train NN for AND or gate using perceptron
2. Design and train perceptron to classify odd and even numbers
3. Design and train NN for alphabet recognition using back propagation
4. Design and train Hopfield network for recognizing patterns such as ‘+’ and ‘–’
5. Design and train NN for EXOR classification using back propagation

Recommended Books:
1. Satish Kumar – Neural Network : A classroom approach
2. Jacek M.Zurada- Artificial Neural Networks
3. Simon Haykin- Artifical Neural Network
4. Rajasekaran & Pai – Neural networks, Fuzzy logic and genetic algorithms
ECE-7102                      RF AND MICROWAVES

Max Marks/credit: 50/4

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Review of boundary conditions: Wave-guides and Cavity resonates (rectangular, circular & cylindrical) passive Circuits (design principles), impedance transformers, filters, hybrids, isolates. Detail discussion on S-matrix. (10)

High frequency semi-conductor devices: Intel valley Scattering, Gunn diodes, IMPATT diodes, Step recovery diodes. Lumped elements: Equivalence circuits of Capacitors and Inductors, Design of lumped element resonators and circuits, Basic blocks in RF system and their VLSI implementation, Design of mixer, Basic topologies VCO and phase noise, Various RF Synthesizer architecture and frequency dividers, Design issues in integrated RF filters. Thin & Thick film technologies. (13)

PART B

Design aspects: Transmission lines for microwave circuits, Strip lines, Micro-strip lines, Slot line & Coupled lines. Characteristics impedance, Lumped parameters etc. Design considerations and implementation using simulation tools, Design of power dividers, combiners, and directional couplers (08)

Microwave measurements: SWR, Return loss, impedance, Scattering parameters, attenuation and familiarization with equipments such as vector network analyzer, Spectrum analyzer, power meters and their block diagrams discussion. Fabrication techniques in microwave. (10)


Recommended Books:
1. B.Bhat & S.koul , Stripline- Loke Transmission lines for MICS, John Wiley
3. Y.Konishi, Microwave integrated Circuit, Marcel Dekker
4. S.Y.Liao, Microwave Circuit Analysis and Amplifier Design, PHI
5. B.Razavi, RF Micro-Elements,PH.
ECE-7103 SIMULATION & MODELLING
Max Marks/credit: 50/4
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Modelling:
State and events, abstraction, Modelling approaches, Graphical Analogue, Scaled, Model characteristics. (08)

System Simulation:
Technique of simulation, montecarlo method, Comparison and simulation with analytical method, numerical computation techniques. (10)

Probability Concepts in Simulation:
Stochastic variables, Discrete and continuous probability functions, Numerical evaluation, Random number generators, discrete distribution generation. (06)

PART B

Arrival pattern and Service Times:
Arrival patterns: poisson, Exponential distribution, Coefficient of variations, Service times, Queuing, Solution of queuing, Solution of Queuing problems. (04)

Discrete System Simulation:
Discrete events, Representation of time, Arrival patterns, Gathering statistics, Measuring utilization and occupancy. (05)

Analysis of Simulation Output:
Nature of the problems, Estimation methods, Simulation run statistics, Time series analysis, Discrete and continuous random variables, Probability mass function, Distribution functions, Reliability, Discrete and continuous Markov Chains. (10)

Statistical Interference:
Regression, correlation and analysis of variance. Simulation kernels, Strong predicted events, Event cancellation. (05)

Practice Task (To be covered under Theory)
Simulation using package software such as IE3D, FDTD, VHDL, SDL, EDL & other Communication Software.

Recommended Books:
1. Geoffrey Gordon System Simulation, Prentice Hall of India
2. Kishor S. Trivedi, Probability and statistics with Reliability, Queuing and computer Science Applications, Prentice Hall of India(EEE)
3. Narsing Deo, System Simulation with Digital Computer, Prentice Hall of India

MTE-7201 HUMAN RESOURCE DEVELOPMENT AND TRAINING METHODS

Max Marks/credit: 50/4

Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART A

Introduction to Human Resource Development
Evolution Pre-industrial and Information age.
Mission and Purpose, Components of HRD, HRD problems and issues related to Indian Industry and technical education, HRD in the context of new industrial policy.

(05)

Stages of HRD
Initial or Induction Training for job-related /professional development Training for horizontal and vertically mobility of employees.

(05)

Training & Training Strategies
Training: Concepts, Assumptions- prevailing and alternative, phase in training, modalities of training, drawbacks in existing systems of training benefits of training, Six goals content and process orientation.

(05)

Training Methods
Off-the –job Training Methods-Coaching, Counseling, mentoring, reflective practices, subjects groups, observing classes of seniors/experts etc.
Characteristics, merits and demerits of training methods

(08)

PART B

Developing Group and Climate
Social process: Three facets, Indicators of group development, the training Climate: personal and interpersonal dimensions

(07)

Evaluation of Training
Concept, purposes, types and issues in evaluation
Steps in designing evaluation of training.

(07)

Systematic approach to Design of Training Programme:
Concept of system, benefits of systematic approach to design of training programme, steps in systematic approach – need analysis, task analysis, entry behavior analysis, resource and
constraints analysis, analysis of goals and objectives, Synthesis of criterion tests, Synthesis of contents, Synthesis of training methods and media, implementation of training methods and media, implementation of training, assessment of trainees’ performance, evaluation of training, improvement in training. (09)

**Recommended Books:**


**MTE 7202 **

**RESEARCH METHODOLOGY**

Max Marks/credit: 50/4

**Note for paper setter:** Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part

**PART-A**

**Introduction to Educational Research**
Concept, types – basic, applied and action, Need for educational research (3)

**Reviewing Literature**
Need, Sources – Primary and Secondary, Purposes of Review, Scope of Review, steps in conducting review. (3)

**Identifying and Defining Research Problem**
Locating, analyzing stating and evaluating problem. Generating different types of hypotheses and evaluating them. (5)

**Methods of Research**
Descriptive research design - survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research (5)

**Sampling Techniques**
Concept of population and sample’ sampling techniques - simple random sampling, stratified random sampling, systematic sampling and cluster sampling, snow ball sampling, purposive sampling, quota sampling techniques. Determining size of sample. (6)

**PART-B**
Design and Development of Measuring Instruments, Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test. (6)

Procedure Of Data Collection
Aspects of data collection, coding data for analysis (3)

Statistical Methods of Analysis
Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve.
Inferential statistics: t-test, Chi-square tests, correlation (rank difference and product moment), ANOVA (one way), Selecting appropriate methods. (7)

Procedure for Writing a Research Proposal
Purpose, types and components of research proposal. (3)

Procedure for Writing a Research Report
Audiences and types of research reports, Format of research report and journal articles. (2)

Strategies for Evaluating, Research disseminating and utilizing research – An Overview (2)

Practice Tasks
• Define a research problem in polytechnic education/industry after studying problem situation and literature.
• Given the purpose, objectives of research, write hypotheses.
• Select research designs for the given research objectives.
• Identify the measuring instruments for the given research objectives/hypotheses.
• Identify the appropriate statistical methods of analysis for the given research proposal.
• Critically analyse the given research reports on various aspects such as hypothesis, design, measuring tools, statistical analysis, interpretation etc. to identify the gaps or weaknesses in the study.

Recommended Books:

3. CPSC: Developing Skills in Technician Education Research Modules 1 to 11 Singapore, Colombo Plan Staff College for Technician Education

ECE 7105 SATELLITE COMMUNICATIONS

Max Marks/credit: 50/4
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

Unit-I: Communication Satellite: Orbit and Description

Unit-II: Satellite Sub-Systems
Attitude and Orbit Control system, TT&C subsystem, Attitude Control subsystem, Power systems, Communication subsystems, Satellite Antenna Equipment.

Satellite Link
Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use).

Unit-III: Propagation effects
Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.

Unit-IV: GPS Principles
History of Navigation, GPS Constellation, Principle of operation, GPS Orbits, Orbital mechanics and Satellite position determination, Time reference, Various DOPs, signal structure, Code and carrier phase measurements, position estimation with pseudorange measurements. GPS applications

REFERENCES:

ECE-7108 CRYPTOGRAPHY & NETWORK SECURITY

Max Marks/credit: 50/4
Note for paper setter: Total of Eight questions may be set covering the whole syllabus taking four from Part A & four from Part B. Candidates will be required to attempt any five questions taking at least two from each Part.

PART - A
Introduction:
cryptography. (02)

**Symmetric Key Cryptography:**
Substitution and Transposition techniques. Block cipher principles. Data Encryption Standard (DES), Triple DES. Block cipher modes of operation. Stream cipher structure and RC4 algorithm. Confidentiality using symmetric key encryption. Symmetric key distribution. (08)

**Asymmetric Key Cryptography:**

**Message Authentication:**
Authentication requirements and functions. Message Authentication Code. Hash functions. Hash and MAC algorithms: MD5, Secure Hash Algorithm (SHA) and HMAC. (04)

**Digital Signatures and Authentication:**

**PART - B**

**Email Security:**
Pretty Good Privacy (PGP) operation. S/MIME specifications and functionality. (04)

**IP Security:**
Architecture, Authentication Header, Encapsulating Payload, Security Associations, Key Management. (04)

**Web Security:**

**Intrusion Defence Mechanisms:**
Intrusion Detection techniques. (03)

**Malicious Software:**
Viruses and related threats. Virus countermeasures. Distributed Denial of Service Attacks. (03)

**Firewalls:**
Design Principles, Characteristics, Types of Firewalls, Firewall Configuration. Trusted System. (04)

**Recommended Books:**