FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

B. TECH.
(ELECTRONIC COMMUNICATION SYSTEMS ENGINEERING)
(Under Credit Based Continuous Evaluation Grading System)

(SEMESTER: III – VIII)

Session: 2015–16

GURU NANAK DEV UNIVERSITY AMRITSAR

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

Semester – III

Course Code	Course Name	L	T	P
MTL–201	Mathematics – III	3	1	0
ECL–211	Digital Electronics	3	1	0
ECL–212	Analysis and Synthesis of Networks	3	1	0
ECL–214	Analog Integrated Circuits	3	1	0
CSL–297	Programming Languages	3	1	0
ESL–220	Environmental Studies(Compulsory)	3*	0	0
Practicals				
ECP–211	Lab. Digital Electronics	0	0	1
ECP–212	Lab. Analysis and Synthesis of Networks	0	0	1
ECP–214	Lab. Analog Integrated Circuits	0	0	1
ECP–215	Lab. PSPICE	0	0	2
ECE–216	Summer Training**	–	S/US	–
	Sub Total:	**15**	**5**	**5**
	Total:	**25**		

*Credits will not be included in SGPA.

** The Student should undergo summer training at the end of 2nd Sem. He / She should clear it satisfactorily.

S–Satisfactory
US–Unsatisfactory

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

MTL201 **MATHEMATICS–III**

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UNIT–I

Probability: Classical and axiomatic approach to the theory of probability, additive and multiplicative law of probability, conditional probability and bayes theorem.

Random Variables: Random Variables, probability mass function, probability density function, cumulative distribution function, function of random variable. Two and higher dimensional random variables, joint distribution, marginal and conditional distributions, Stochastic independence.

UNIT–II

Expectation: Mathematical expectations and moments, moment generating function and its properties.

Probability Distributions: Binomial, Poisson, Uniform, Exponential, Gamma, Normal distribution, t–distribution, chi–square distribution, F–distribution.

UNIT–III

Uniform Pseudo random number generation and random variable generation, Generating random variate from standard statistical distribution (discrete and continuous distribution), Monte–Carlo integration.

Books Recommended:

1. Hogg, RV, Mckean, JW and Craig, AT: Introduction to Mathematical Statistics.
2. Gupta, SC and Kapoor, K: Fundamentals of Mathematical Statistics, Sultan Chand & Co.
3. Rubinstein, R.Y.: Simulation and the Monte Carlo Method, John Wiley.
4. Probability and Statistics with Reliability by KS Trivedi, Prentice Hall.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL – 211 DIGITAL ELECTRONICS

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PART – I

1. **Number System and Binary Code**:
Introduction, Binary, Octal and hexadecimal number system. Signed and unsigned number, binary operations–Addition, Subtraction. Multiplication and division. Subtractions using 1's and 2's compliment; ASCII code. Excess 3 codes and Gray code. (4)

2. **Minimization of logic function**:–
OR, AND, NOT, NOR, NAND, Ex–OR gates, Basic theorem of Boolean Algebra sum of products and product of sums canonical form. Minimization using theorems, minimization using K–map and Q–M method. Incompletely Specified functions. (6)

PART – II

3. **Combinational Logic Circuits:–**
Introduction, Combinational circuit design, multiplexer, de–multiplexer, encoders, decoders, adders, subtracters and code converters, parity checker, BCD display drive, magnitude comparators. (5)

4. **Sequential Circuits**:–
Introduction, flip flop, SR. JK, D,T. Edge triggered and clocked flip–flop, Registers. Types of Registers, circuit diagram, timing wave form and operations, counter, counter design with state equation state diagram.

PART – III

5. **D/A and A/D Converters:–**
Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test. D/A accuracy and resolution, parallel A/D converter Counter type A/D converter, Successive approximation A/D converter, Single and dual slope A./D converter, A/D accuracy and resolution, Voltage to Frequency conversion, Voltage to time conversion. (8)

6. **Semiconductor Memories**:–
Introduction, Memory organization, Classification and characteristics of memories. Sequential memories, ROMs, RAM memories, Content addressable memories, programmable logic arrays, charged–coupled device memory. (5)

7. Logic Families:
RTL, DCTL, DTL, TTL, ECL and its various types, Comparison of logic families. (4)

Recommended Books:

1.	Digital Principle and Applications:	Mulvino and Lelach	(TAIII)
2.	Modern Digital electronics :	R.P. Jain	(PIII)
3.	Digital Electronics Principles :	Malvino	(TIIM)
4.	Modern Digital Systems Design :	Cheung & Bredeson	(WPC)
5.	An Engg. Approach to Digital Design :	Fletcher	(PRI)

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP – 211 LAB DIGITAL ELECTRONICS

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1. (a) Verification of the truth tables of TTL gates, e.g., 7400, 7402, 7404, 7408, 7432, 7486.
   (b) Design, fabrication and testing of low frequency TTL clocks using NAND gates.
2. (a) Verification of the truth table of the Multiplexer 74150.
   (b) Verification of the truth table of the De–Multiplexer 74154.
3. Design and verification of the truth tables of half adder and full adder circuits using gates 7483.
4. Study and verification of the operations of at ALU 74181 with regards to addition/ subtraction/ comparison.
5. Design fabrication and testing of differentiator and integrator circuits using OP AMP.
6. Design fabrication and testing of clipper & clamper circuits using OP AMP.
7. Design fabrication and testing of
   (a) Monostable multivibrator of t_r = 0.1 msec (approx) using 74121/123.Testing for both positive and negative edge triggering, variation in pulse with and retriggering.
   (b) Free running multivibrator at 1 KHz and 1 hz using 555 with 50% dully cycle Verify the timing from theoretical calculations.
8. Design fabricate and test a switch debouncer using 7400.
9. (a) Design and test of an S.R. flip–flop using NOR/Nand gates.
   (b) Verify the truth table of a J–K flip flop (7476).
   (c) Verify the truth table of a D flip–flop (7474) and study its operation in the toggle and asynchronous modes.
10. Operate the counters 7490, 7493 and 74192. Verify the frequency division at each stage. With a low frequency clock (say 1 hz display the count on LEDs).
11. (a) Verify the truth table of decoder driver 7447 and 07448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
    (b) Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs.

B.Tech. (Electronics Communication Systems Engineering) 3rd Semester
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ECL – 212: ANALYSIS AND SYNTHESIS OF NETWORKS

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PART – I

1. Circuit Concepts: Circuit elements, independent and dependent sources, signals and wave forms, periodic and singularity functions

2. Mesh & Nodal Analysis: Loop currents and loop equations, node voltages and node equations, mesh and supermesh analysis, nodal and supernodal analysis, duality, graphical method of determining the dual of N/Ws.

3. Network Theorems: Superposition, Thevenin, Norton, Maximum power Transfer, Tellegen, Reciprocity theorem, Millman theorem for DC and AC sources.

PART – II

4. Signal Waveforms: input signals, step, ramp, impulse and doublet function with Laplace transform, sampling property of impulse function, shifting functions.

5. Time and Frequency Domain Analysis: Representation of basic circuits in terms of generalized frequency, transient & steady response, DC and sinusoidal response of RL, RC and RLC circuits, time domain behaviours from poles and zeros, applications of Laplace transform in electrical circuits.

6. Filters Synthesis: Classification of filters, characteristic impedance and propagation constant of pure reactive network, ladder network, T–section, Pi–section, design of constant–K, m–derived filters, terminating half section, composite filters.

PART – III

7. Network Synthesis: Two port parameters, Z parameters, Y parameters**,** ABCD parameters, h parameters, effect of location of poles and zeros on stability, driving and transfer functions, Hurwitz polynomial, positive real function, network synthesis techniques for 2–terminal network by Foster and Causer's forms.

8. State Variable Analysis: Introduction, state equations, choice of state variables, order of complexity of a N/W, writing state equations using N/W graphs, advantages of state variable analysis.

Books Recommended:

1. Circuit and Network Analysis & Synthesis by R. Sudhakar, Tata McGraw-Hill Education.
2. Circuit Theory : Analysis and Synthesis by A. Chakrabarti, Dhanpat Rai Publications.
3. Network and Systems by D.R.Choudhury, New Age International Publishers.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
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ECP – 212 LAB ANALYSIS AND SYNTHESIS OF NETWORKS

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Experiments Covering

Implementation and proof of

Superposition Theorem

Thevenin's Theorem

Norton's Theorem

Maximum Power Transfer Theorem

And Reciprocity Theorem.

Study of transfer characteristics of

Low Pass Filters

High Pass Filters

Band Pass Filters

Band Stop Filters

Design and implementation of

Constant–k

m–dirived and

composite filters

B.Tech. (Electronics Communication Systems Engineering) 3rd Semester
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ECL–214: ANALOG INTEGRATED CIRCUITS

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PART – I

Differential and cascode Amplifiers: Introduction, Differential Amp with circuit configurations- Dual Input Balanced output, Dual Input unbalanced output, Single Input Balanced output, Single Input Unbalanced Output, Swamping Resistors, Constant Current Bias, Current Mirror, Cascaded Differential Amplifier, level Translator circuits, Cascode or CE–CB configuration, common wave signals.

Introduction to Op–Amp: Operational Amplifier, Block diagram, analysis and its schematic symbol, interpretation of data sheets and characteristics, practical op–amp, all important electrical parameters and their values, Op-amp applications in open loop configuration

PART – II

Concept of Feedback, Op–Amp with Negative Feedback: Introduction and Block diagram representation of feedback configurations, Voltage Series feedback amplifier, Voltage Shunt feedback and derivation of important electrical parameters

Operational Amplifier Applications: D.C. and A.C. Amplifiers, peaking amplifier, scaling and averaging amplifier, signal conditioner, V to I and I to V converter, log and antilog amplifier, differential amplifier, Instrumentation and Isolation amplifier, Integrator, Differentiator, active filters, Butterworth type, Design of Audio Frequency filters, LP, HP, BP, and all pass filters, Analog multiplier and its applications, Sample and Hold circuits, A to D and D to A converters, introduction to data acquisition systems.

PART – III

Concept of positive feedback, Introduction to Oscillators, RC phase shift and Wien bridge Oscillators, Schmitt Trigger, voltage to frequency & frequency to voltage convertors, Precision rectifiers, Clippers and clampers, Peak detectors,

The 555 Timer: Introduction and block diagram 555 timer as Monostable Multibrator, Astable Multivibrator and Bistable Multivibrator and timer applications, Phased Locked Loops and Voltage Regulators, Operating principles & applications of PLL, Fixed voltage regulators, Adjustable voltage regulators, switching regulators

Books:

1. Op–Amps & Linear Integrated Circuits: Ramakant A. Gayakward, Pearson Education.
2. Operational Amplifiers with Linear Integrated Circuits: Fourth Edition, William D. Stanley.
3. Micro Electronics : Millman & Grabal, Tata Mc-Graw Hill.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–214 LAB ANALOG INTEGRATED CIRCUITS

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List of Experiments:

1. To use discrete components to build and understand the amplifier circuit similar to those used in linear. ECE and calculate gain of each stage and total gain.

2. To examine the design and operating characteristics of an Op–amp inverting summer.

3. To use the Op–Amp as schmitt trigger and study its response.

4. To examine the effects of bias currents on Op–Amp operation.

5. To use the CF–Amp as summing amplifier.

6. To study the effect of different noise source upon co–Amp output noise level.

7. To study the operation of a voltage/current boosted amplifier.

8. Design a series regulators with an error amplifier to provide an output voltage of 5 volt at a lead current of 4.5 Amp. Use a 741 pp. Amp, and specify the Zener voltage necessary transistor gain and the maximum power dissipation of the transistor.

9. Design a wein bridge oscillator using 741 with and without adaptive feedback.

10. To investigate the operation of a VCO–type digital voltmeter.

11. Design a delay circuit using 555.

12. To examine the operation of a PLL and to determine the free running frequency, the capture range, and the lock in range of PLL.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

CSL–297 PROGRAMMING LANGUAGES

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Purpose:
The purpose of this course is to enable students to understand the concepts of data structure and the commonly used algorithms.

Instructional Objectives:
The students undergoing this course should be able to
• Understand and explain fundamentals of data structures
• Develop approach towards analyzing and evaluating commonly used algorithms
• Write the algorithm in pseudo code similar to programming language C
• Understand basic concepts of object oriented programming.
• Solve problems using C++

Contents:

PART – I

Advance features of C Programming:
Standard C Data types, Storage Classes, Standard C libraries, Unions, Macro's, Advance preprocessor statements, Dynamic memory allocation.

Data Structures:
Preliminaries – Various Data structures, common operations on data structures.
Arrays– insertion, deletion, traversal, searching– Linear search and binary search, sorting– insertion sort, selection sort, and merging.

PART – II

Stacks– Introduction, implementation of stack using arrays, Polish notation, Quick sort.
Queues– Introduction, implementation of queue using arrays, deques.
Linked List– representation of linked list in memory, operations on linked list– creation, traversal,
search, insertion and deletion.
Trees – terminology, binary tree, binary search tree – traversal, search, insertion and deletion.

PART – III

Object Oriented Programming:
Basic concepts of object oriented programming, difference between C and C++, Classes, Objects, operator overloading, Inheritance, polymorphism, Input and output functions.

Recommended Books:
1. Theory and Problems of Data Structures by Seymour Lipschutz, Schaum's Outline Series, McGraw–Hill Book Company.
2. Data Structures Using C by Yedidyah Langsam, Tenenbaum, Prentice Hall of India.
3. Programming in C++ by Balagurusamy, Tata McGraw– Hill.
4. The Waite group's Object Oriented Programming in C++ by Robert Lafore.
5. Programming in C++ by Mark Keegon.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
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ESL 220: ENVIRONMENTAL STUDIES (COMPULSORY)

Credit 3–0–0

1. **The Multidisciplinary Nature of Environmental Studies:** Definition, scope & its importance, Need for public awareness.

2. **Natural Resources:** Natural resources and associated problems.

   a) **Forest Resources:** Use of over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
   b) **Water Resources:** Use and over–utilization of surface and ground water, floods, drought, conflicts over water, dams–benefits and problems.
   c) **Mineral Resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
   d) **Food Resources:** World food problems, change caused by agriculture and overgrazing, effects or modern agriculture, fertilizer–pesticide problem, salinity, case studies.
   e) **Energy Resources:** Growing of energy needs, renewable and non–renewable energy resources, use of alternate energy sources, case studies.
   f) **Land Recourses:** Land as a resource, land degradation, soil erosion and desertification.
   g) Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.

3. **Ecosystem:**

   Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

   Introduction, types, characteristic features, structure and function of the following ecosystems:

   a. Forest ecosystem

   b. Grassland ecosystem

   c. Desert ecosystem

   d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its Conservation:

Definition: Genetic, species and ecosystem diversity, Biogeographical classification of India.

Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option values.

Biodiversity of global, National and local levels, India as mega–diversity nation "Hot–spots of biodiversity.

Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts

Endangered and endemic species of India.

Conservation of Biodiversity: In situ and Ex–situ conservation of biodiversity.

5. Environmental Pollution:

Definition, Causes, effects and control measures of:

a) Air Pollution
b) Water Pollution
c) Soil Pollution
d) Marine Pollution
e) Noise Pollution
f) Thermal Pollution
g) Nuclear Hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies Disaster Management: Floods, Earthquake, Cyclone and Landslides

6. Social Issues and Environment:

* From unsustainable to sustainable development
* Urban problems related to energy
* Water conservation, rain water harvesting, watershed management
* Resettlement and rehabilitation of people; its problems and concerns. Case studies
* Environmental ethics: Issues and possible solutions.
* Climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holocause. Case studies.
* Wasteland reclamation
* Consumerism and waste products
* Environmental Protection Act
* Air (prevention and Control of Pollution) Act
* Water (prevention and Control of Pollution) Act
* Wildlife Protection Act
* Forest Conservation Act
* Issues involved in enforcement o£. environmental legislation
* Public awareness

7. Human Population and The Environment:

* Population growth, variation among nations
* Population explosion–Family welfare programme
* Environment and human health
* Human rights
* Value education
* HIV / AIDS
* Women and child welfare
* Role of information technology in environment :and human health
* Case studies

*** Road Safety Rules & Regulations:** Use of Safety Devices while Driving, Do's and Don'ts while Driving, Role of Citizens or Public Participation, Responsibilities of Public under Motor Vehicle Act, 1988, General Traffic Signs

*** Accident & First Aid:** First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance

8. Field Work: Visit to a local area to document environmental assets–river / forest / grassland / hill / mountain. Visit to a local polluted site–Urban / Rural / Industrial / Agricultural. Study of common plants, insects, birds. Study of simple ecosystems–pond, river, hill slopes, etc. (Field work equal to 5 lecture hours)

References:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Bharucha, E. 2004. The Biodiversity of India, Mapin Publishing Pvt. Ltd. Ahmedabad.
4. Brunner, R. C. 1989. Hazardous Waste Incineration, McGraw Hill Inc. New York.
5. Clark, R. S. 2000. Marine Pollution, Clanderson Press Oxford.
6. Cunningham, W. P., Cooper, T. H., Gorhani, E. & Hepworth, M. T. 2001. Environmental Encyclopedia, Jaico Publications House, Mumbai.
7. De, A. K. 1989. Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment, New Delhi.
9. Hawkins, R. E. 2000. Encyclopedia of Indian Natural History, Bombay Natural History Society.

10. Heywood, V. H & Waston, R. T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
11. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
12. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
13. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
14. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
15. Odum, E. P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA.
16. Rajagopalan, R. 2005. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
17. Sharma, B. K. 2001. Environmental Chemistry. Geol Publishing House, Meerut.
18. Sharma, J. P. 2004. Comprehensive Environmental Studies, Laxmi Publications (P) Ltd, New Delhi.
19. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
20. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.
21. Survey of the Environment. 2005. The Hindu.
22. Tiwari, S. C. 2003. Concepts of Modern Ecology, Bishen Singh Mahendra Pal Singh, Dehra Dun.
23. Townsend, C., Harper, J. and Michael, B. 2001. Essentials of Ecology, Blackwell Science.
24. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar.

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP– 215 **LAB PSPICE**

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1. Introduction to pspice, MATLAB and SIMULINK.
2. Verification of network theorem
3. Resonant Circuits: R–L–C series and parallel circuits
4. Amplifiers: Using BJT and OP–amps
5. Oscillators circuits: Using BJT and OP–amps
6. Frequency Response of CE Amplifier
7. Design and Verification of Class–A Power Amplifier
8. Frequency response of Integrated circuits
9. Stability of feedback amplifiers

B.Tech. (Electronic Communication Systems Engineering) 3rd Semester
(Under Credit Based Continuous Evaluation Grading System)

ECE–216 **SUMMER TRAINING**

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Students would showcase their projects and jobs performed in machine shops during their summer training and appear for the viva voce examination for the same.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

Semester – IV

Course Code	Course Title	L	T	P
	Interdisciplinary Course – I	4	0	0
ECL–231	Guided Wave Propagation	3	1	0
ECL–232	Theory of Communication Signal & Systems	3	1	0
ECL–234	Fiber Optics Communications	3	1	0
	Elective – III	3	1	0
Practicals				
ECP–234	Lab. Fiber Optics Communications	0	0	1
ECP–236*	Electronic Circuits Simulation & Implementation	0	0	2
	Lab Elective – III	0	0	1
	Sub Total:	**16**	**4**	**4**
	Grand Total:	**24**		

**Note: The students are expected to design at least five application Electronic Circuits.*

List of Elective – III

ECL–261	Linear control System	3	1	0
ECL–262	Electrical & Electronic Measurements	3	1	0

List of Lab Elective – III

ECP–261	Lab Linear control System	0	0	1
ECP–262	Lab Electrical & Electronic Measurements	0	0	1

NOTE: The students of B.Tech. (ECSE) 4th Semester are required to undergo Industrial Training four to six weeks after their major examination of 4th Semester in any Industry/ Institute of repute. The viva voce will be held along with the viva voce of 5th semester.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

Interdisciplinary Course – I

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4	0	0

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL– 231 GUIDED WAVE PROPAGATION

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PART – I

Introduction:
Review of Electrostatics and Magnetostatics.

Maxwell's Equation:
Maxwell's equations in differential and integral forms concept of displacement current. Boundary conditions.

Electromagnetic Waves:
Wave equation and its solution in different media, plane wave, sinusoidal time variations, polarization, Reflection of waves by perfect dielectrics and by perfect insulators. Surface impedance , Pointing theorem and pointing vector.

PART – II

Guided Wave Propagation:
Waves between parallel planes, TE and TM waves and their characteristics. TEM wave, velocities of waves Rectangular and circular wave guides. TE and TM waves in rectangular wave guides. Impossibility of TEM wave in wave guides. Wave impedances and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectric slab wave guides, Velocities of propagation, Attenuation in parallel plane guides, wave impedance

PART – III

Transmission Lines:
Circuit representation of parallel plane transmission lines. Parallel plane transmission, plane with losses. Low loss RF and UHF transmission lines. Distortion less condition. Transmission line charts. Impedance matching.

References:

1. Electromagnetic Kraus TMH, 2006.

2. Electro Magnetic Wave and Jordon and Balmain PHI, 2007.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
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ECL–232 THEORY OF COMMUNICATION SIGNAL AND SYSTEMS

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PART – I

1. Signals, Systems and Analysis:
Classification of signals and systems, signal representation using Fourier series, complex exponential Fourier series, representation of periodic signals, a periodic signal representation Fourier transform, Fourier transform of periodic power signals, power spectral density, system response impulse, step. Time domain response analysis, frequency, Domain analysis.

PART – II

2. Signal Transmission Through Linear Networks:
Convolution theorem, its graphical interpretation. Convolution function with a unit impulse function. The sampling theorem low pass and band pass network, matched filter, input output relations with random inputs, envelope detector.

3. Introduction to Thermal Noise, shot noise partial noise, low frequency or flicker, Gaussion Noise, burst noise, avalanche noise, bipolar transistor noise, F.E.T. noise, noise factor, noise temperature, noise equivalent band width, noise figure. Experimental determination of noise figure.

PART – III

4. Random Signal Theory:
Introduction to probabilities, Definition, probability of Random events, joint and conditional probability, probability, probability mass function statistical averages. Probability density functions and statistical averages. Examples of P.D. function, Random processes.

References:
1. Comm. System B.P. Lathi Wiley Eastern, 4th Reprint, 2006.
2. Comm. System Haykins Wiley Eastern, 2005.
3. Intro. to Modern Comm. Theory P.D. Sharma New Chand Brothers, Roorkee.
4. An Intro. to The Information Theory Rera F.H. McGraw Hill, 2007.
5. Modern & Digital B.P. Lathi, 4th Edition, 2008 Comm. Systems Oxford University Press.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
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ECL–234 FIBER OPTICS COMMUNICATIONS

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PART – I

Introduction:
Evolution of optical fiber communication, basic elements of fiber optic communications, optical Transmission Windows, comparison with other modes of guided communication.

Signal Degradation in Optical Fibers:
Attenuation, absorption, scattering losses and bending losses in optical fibers. Signal distortion in optical wave guide due to material dispersion and wave guide dispersion.

PART – II

Ray Theory & Mode Theory of Optical Wave Propagation:
Wave equation in step index fiber, model equation, modes in step index fiber, power flow in step index fiber, modes in graded index fiber, Ray Theory explanation of optical wave propagation, Basic fiber parameters such as Numerical aperture acceptance angle & V–number.

Optical Sources & Detectors: Light emitting diode, laser diode, modes and threshold conditions, resonant frequency, laser diode structure, single mode laser, modulation of laser diode light source linearity, reliability considerations, Optical Detectors: Pin and APD, their working principle. Noise in Optical receiver.

PART – III

Fiber Materials and Fabrication
Fiber materials–Doping of fiber material, Glass fibers, plastic clad glass fibers, plastic fibers, fiber fabrication, drawing and coating.

Optical Fiber Sensors:
Physical phenomena for optical fiber sensor, temperature sensor, pressure sensor, liquid level sensor.

References:

1. Keiser – Optical Fiber Communication, McGraw Hill, 4th Edition, 2008.
2. Myanbaev and Scheiner– Fiber Optics Communication Technology, Pearson Education Asia, 2006.
3. Chai Yeh – Hand Book of Fiber Optics, Academic Press.
4. Ghatak & Thyagarajan–Optical Electronics, Cambridge University Press, 2007.
5. John Gower– Prentice Hall of India Pvt. Ltd., Optical Communication System, 2007.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
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ECP–234 LAB FIBER OPTICS COMMUNICATIONS

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0	**0**	**1**

1. To study temperature characteristics of Optical Fiber.
2. To study pressure characteristics of Optical Fiber.
3. To measure numerical aperture of different types of Optical Fiber.
4. To study different losses of Optical Fiber.
5. To determine beat length of Optical Fiber
6. To determine laser beam parameters.
7. To study diffraction experiments using Laser.
8. To study characteristics of Optical Coupler.
9. To study LED and Detector characteristics using integrating sphere.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–261 LINEAR CONTROL SYSTEM

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PART – I

1. **Introductory Concepts**: Plant, Systems Servomechanism, regulating systems, disturbances, open loop control system, closed loop control systems, linear and non–linear systems, time variant & invariant, continuous and sampled data control systems, block diagrams, some illustrative examples.
2. **Modelling :** Formulation of equation of linear electrical, mechanical, thermal pneumatic and hydraulic system, electrical, mechanical analogies. Use of Laplace transform, transfer function, concepts of state variable modelling. Block diagram representation signal flow graphs and associated algebra, characteristics equation, transfer function of discrete data system, state equation of linear discrete data system, z–transform solution of discrete state equations.
3. **Time Domain Analysis:** Typical test– input signals, transient response of the first and second order systems. Time domain specifications, dominant closed loop poles of higher order systems. Steady state error and co–efficients. Pole–zero location and stability. Routh – Hurwitz criterion, stability of discrete data systems, steady state error analysis of discrete data systems.

PART – II

4. **Root Locus Techniques:–** The extreme points of the root loci for positive gain. Asymptotes to the locii breakaway points, intersection with imaginary exits, location of roots with given gain & sketch of the root locus plot, root loci of discrete data control system.
5. **Frequency Domain Analysis**: Closed loop frequency response, Bode plots , stability and loop transfer function. Frequency response specification relative stability, relation between time and frequency response for second order systems. M and N–circles, Lag magnitude versus Phases angle plot nyquist criterion, frequency domain analysis of discrete data systems.

PART – III

6. **Compensation:** Necessity of compensation series and parallel compensations, compensating network, application of lag and lead compensation.
7. **Control components:** Error detectors – potentiometers and synchronous, servo motor A.C and D.C. techno–generators, magnetic amplifiers.

Books Recommended:

1. Modern Control Engineering by K. Ogata, Prentice Hall, New Delhi, 1974.
2. Control System Components by J.F. Gibson, McGraw Hill, 1963.
3. Automatic Control System by B.C. Kuo, Prentice Hall 3rd Ed., 1978.
4. Control System Engineering by I.J. Nagrath & Gopal, Wiley Eastern Ltd., New Delhi., 1975.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–261 LAB LINEAR CONTROL SYSTEM

L	T	P
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1. To study input–output characteristics of a potentiometer and to use two potentiometers as an error deflector.
2. To study transmitter–receiver characteristics of a synchro set and to use the set as control component.
3. To study the operation of a D–C positional servo system and to investigate the effect of damping and supply voltage on its response.
4. To study the operation of an n.c. position servo–system and to obtain effects of supply voltage and system parameter on its transient response.
5. To design different compensating network for the given cut off frequencies and to plot frequency response of these networks.
6. To use operational amplifiers as multiplier, summer, inverter and integrator.
7. To simulate a servo–system and obtain its characteristics with the use of controllers.
8. To study control action of light control device.
9. To study details of magnetic amplifier and to obtain input–output characterization of this amplifier.
10. To study details of a two winding a–c servo meter and to obtain its T–N characteristics.
11. To study PID – Controller and to obtain the effect of proportional, integral and derivative control action.
12. To study details of an analogue computer and solve a given second order different equation using it.
13. To generate a sine–wave using a given Analog computer with specified amplifier and frequency.
14. To study a stepper motor and control its direction speed and number of steps with the help of a microprocessor.
15. To obtain dynamic characteristics of a given solar cell array and to obtain the point of operation for maximum power transfer to the load.
16. To obtain T.F. of a field controlled d.c. servo meter and to show its pole–zero configuration.
17. To obtain T.F. of an armature controlled d.c. servo meter and to obtain its pole–zero configuration.
18. To design, fabricate and to obtain characteristics of a high pass type filter.
19. To design, fabricate and to obtain the characteristics of a low pass Type filter.
20. To design, fabricate and to obtain the characteristics of a band pass–T Type filter.
21. To design, fabricate and to obtain the characteristics of a composite low pass filter.
22. To design, fabricate and to obtain the characteristics of a composite high pass filter.
23. To design, fabricate and to obtain the characteristics of composite hand pass filter.
24. Some experiments are to be performed using software tools such as MATLAB & SIMULINK.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–262 ELECTRICAL AND ELECTRONIC MEASUREMENTS

L T P
3 1 0

PART – I

Electronic Instruments:
Electronic voltmeter, VTVM Transistor voltmeter, Electronic Multimeter, CRO's study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope measurement of inductance, capacitance effective resistance at high frequency, Q meters, LCD meter.

Instruments for Generation and Analysis of Waveforms:
Signal generators function generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, and spectrum analysis.

PART – II

Transducers:
Principles of operation, qualitative treatment of strain gauge, LVDT, thermocouple piezoelectric crystal and photoelectric transducers.

Data Acquisition System:
Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorder, digital tape recorders.

PART – III

Display Devices:
Electronic indicating instruments, seven segment display, fourteen segmental display, Nixie tube.

Telemetry:
Introduction, method of data transmission, types of telemetry systems and applications.

Computer Controlled Test System:

References:
1. A.K. Sawhney – Electrical and Electronic Measurements and Instrumentation, PHI, 2007.
2. B. Stout – Basic Electrical Measurements, PHI, 2007.
3. D. Cooper – Electronic Instrumentation and Measurement Techniques, PHI, 2006.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–262 LAB ELECTRICAL & ELECTRONIC MEASUREMENTS

L	T	P
0	0	1

LIST OF EXPERIMENTS:

1. Measurement of inductance by Maxwell's Bridge.
2. Measurement of small resistance by the Kelvin's Bridge.
3. Measurement capacitance of the Schering Bridge.
4. Measurement of frequency by main bridge.
5. Drawing of the B–H loop of a toroidal specimen by using a flux meter.
6. Calibration adjustment of single phase energy meter.
7. Measurement of displacement with the help of potentiometer.
8. Determination of frequency & phase angle using CRO's.
9. Measurement of medium resistances with the help of Wheatstone bridge.
10. Measurement of leakage factor with flux meter.
11. To use low pass RC circuit As An Integrator for Square Pulses. To verify the time constant and observe its effect on the output wave form so as to chose its optimum value. Also to calculate the time constant graphically.
12. To observe the response of an R.L.C. circuit to A.C. input. Determine the phase shift between the applied voltage and current making use of lissajous figures. Compare the result with theoretical one calculated from the circuit parameters.
13. To verify voltage current relationship in a linear circuit with non sinusoidal A.C. supply.
14. To find the Q. of a coil by a series resonance method and verify it by using Q. meter.
15. To convert a four terminal network to a three terminal network i.e. equivalent T network.

B.Tech. (Electronic Communication Systems Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–236: ELECTRONIC CIRCUITS SIMULATION & IMPLEMENTATION

L	T	P
0	0	2

Students are required to design simple electronic circuits (Digital, Analog or mixed) as directed by the class teacher. Students should be made aware of the requirement and function of all the components used in the circuit from circuit designing point of view. An introduction about the different designing techniques used nowadays should also be given to the students of this subject.

B.Tech. (Electronics Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading Systems)

Semester – V

Course Code	Course Title	L	T	P
	Interdisciplinary Course – III	4	0	0
ECL331	Analog Communication Systems	3	1	0
ECL332	Microprocessor and Its Interfacing	3	1	0
ECL333	Basic of Radiating Systems	3	1	0
MGL301	Entrepreneurship Skills for Engineers	3	0	0
	Elective – IV	3	1	0
Practicals				
ECP331	Lab Analog Communication Systems	0	0	1
ECP332	Lab Microprocessor and its Interfacing	0	0	1
	Lab Elective – IV	0	0	1
ECP315	Industrial Training**	–	S/U S	–
	Sub Total:	**19**	**4**	**3**
	Grand Total:	**26**		

****** The result will be satisfactory or unsatisfactory.

List of Elective – IV

ECL–351	Wave Generation and Shaping	3	1	0
ECL–352	Industrial Electronics	3	1	0
ECL-353	Instrumentation and Industrial Automation	3	1	0

List of Lab Elective – IV

ECP–351	Lab Wave Generation and Shaping	0	0	1
ECP–352	Lab Industrial Electronics	0	0	1
ECP353	Lab. Instrumentation and Industrial Automation	0	0	1

B.Tech. (Electronics Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading Systems)

ECL331: ANALOG COMMUNICATION SYSTEMS

L T P
3 1 0

PART – I

1. Base Band Signals and Systems: Introduction, Definition of Communication, Communication system, Block Diagram, Need for Wireless Communication, Introduction to Modulation, Need of Modulation, Types of various Signals, Basic Transmission Signals

2. Analog Modulation Techniques: Introduction, Theory of Amplitude Modulation, AM Power Calculation AM Current Calculations, AM Modulation with a Complex wave, Theory of Frequency Modulation: Mathematical analysis of FM Spectra of FM Signals, Narrow band FM, Wide band FM, Theory of Phase Modulation, Phase Modulation obtained from Frequency Modulation, Comparison of AM and FM, Comparison of PM and FM

3. AM Transmission and Reception:

AM Transmission: Introduction, Basic Principle of AM Generation, Low Level and High Level Modulation, Square Law Diode Modulation, Suppressed Carrier AM Generation (Balanced Modulator): Ring Modulator, Product Modulator/Balanced Modulator, Introduction to Single Side Band (SSB) Transmission System

PART – II

AM Reception: Introduction, AM Receiver Parameters, Tuned Radio Frequency (TRF) Receiver, Super heterodyne Receiver, Basic Elements of AM Super-heterodyne Receiver, RF Amplifiers, Neutralization of RF Amplifiers, Image Frequency Rejection, Frequency Conversion, Mixers and types of mixer, Tracking and Alignment, IF Amplifier, AM Detector: Square law Detector, Envelope or Diode Detectors, AM Detector with AGC, AM Receiver Using a phase locked loop (PLL), Double hetero-dyne Receiver, Introduction to Single Side Band (SSB) Reception System.

4. FM Transmission and Reception

FM Transmission

FM Allocation Standards, Generation of FM by Direct Method: Varactor Diode Modulation, Reactance Modulation; Indirect Generation of FM: The Armstrong Method, FM Stereo Transmitter.

B.Tech. (Electronics Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading Systems)

PART – III

FM Receptions

Introduction to FM Receiver, Direct Methods of Frequency Demodulation, Travis Detector/Frequency Discrimination (Balanced Slope Detector), Foster Seeley or Phase: Discrimination, Radio Detector, Indirect Method of FM Demodulation, FM Detector Using PI Zero Crossing, Pre-emphasis and de-emphasis, Limiters, FM Stereo Receiver

5. Pulse Modulation Transmission and Reception

Introduction, Pulse Amplitude Modulation (PAM), Natural PAM, Flat-top PAM, Modulation and demodulation of PAM Signals, Pulse Width Modulation and Demodulation (PWM), Pulse Position Modulation and Demodulation (PPM)

Books Recommended:

1. Communication Systems by J.Dass Wiley Eastern, 2007.
2. Digital and Analog Communication Systems by K Sham Shanmugam (John Wiely & Sons), 2007.
3. Electronic Communication Systems by Wayne Tomasi Pearson Education Fifth Edition, 2007.
4. Modern Digital and Analog Communication Systems by B.P. Lathi, Zhi Ding (oxford University press), Fourth Edition, 2010.
5. Electronic Communication Systems by Bernard Davis, S.R.M. Prasanna, Goerge Kennedy, Tata McGraw- Hill Education, Fifth Edition, 2012.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP 331 LAB ANALOG COMMUNICATION SYSTEMS

L	**T**	**P**
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List of Experiments:

1. To study the amplitude modulation and demodulation experimental boards.
2. To study the frequency modulation & demodulation experiment boards.
3. To Study the function of a super–heterodyne receiver.
4. To study the operation of a phased lock loop.
5. To study the operation of a single sideband transmission system.
6. To study the operation of balance modulator.
7. To study the vestigial sideband transmission system.
8. To study the PAM, PWM, PPM techniques.
9. Some experiments related to signals & systems are to be performed using MATLAB.
10. Some experiments related to analog modulation & demodulation are to be performed using MATLAB.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–332 MICROPROCESSOR AND ITS INTERFACING

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PART – I

Introduction to Microprocessors:
Need for Flexible Logic and Evolution of Microprocessors, Applications, Generic Architecture of a Microprocessor.

INTEL 8085 Microprocessor:
Pin Functions, Architecture, Addressing Modes, Instruction Set, Timing Diagrams, Interrupts, Programming Examples.

Basic Input/Output Techniques:
Serial I/O, Parallel I/O, Programmed I/O, Interrupt Driven I/O, Direct Memory Access.

PART – II

INTEL 8086 Microprocessor:
Pin Functions, Architecture, Characteristics and Basic Features of Family, Segmented Memory, Addressing Modes, Instruction Set, Data Transfer Instructions, Arithmetic, Logical, Shift & Rotate Instructions, Flag Control Instructions, Transfer of Control Instructions, Processor Control Instructions, Programming Examples, Interrupt Structures.

INTEL 8086 System Configuration:
Clock Generator (8284), Bus Controller (8288), MIN/MAX Modes of 8086 and System Configurations.

PART – III

Peripheral Controllers:
USART (8251), Programmable Peripheral Interface (8255), Programmable Interrupt Controller (8259),Programmable Keyboard and Display Interface. Co–processors 8087.

Advanced Microprocessors: Main features, comparison of 80186, 80286, 80386, 80486 and Pentium processors.

BOOKS:

1. Microprocessor Architecture Programming and application with 8085 : R.S.Gaonkar, PRI
2. Microprocessor and Interfacing : D.V.Hall TMH
3. The 8088 and 8086 Microprocessors : W. A. Triebel, Avtar Singh, Pearson Edu Asia
4. An Introduction to the INTEL Family of Microprocessor. : J. L. Antonakos, Pearson Edu Asia

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP – 332 LAB MICROPROCESSOR AND ITS INTERFACING

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List of Experiments:

1. Simple programs for sorting a list of number in ascending and descending order.
2. Sorting a list without destroying the original list.
3. Code conversion – Binary to Gray/Gray to Binary.
4. Program for addition of BCD numbers.
5. Program for multiplication of 8 bit numbers using Booth's algorithm.
6. Interface an LED array and 7–segment display through 8255 and display a specified bit pattern/character sequence at an interval of 2 seconds.
7. Generate the given waveform using a DAC after interfacing it with a microprocessor kit, Use any PPI port.
8. Interface an ADC chip with microprocessor kit and verify its operation with d.c. and low frequency inputs. Use of PPI port and sample and holds is required.
9. Interface an external 8253 to the micro processor kit at the address given.
   Hence,
   i) Generate a pulse train of specified duty cycle at the given output line, operate as a N counter
   ii) Count a train of pulses for a given duration.
10. Interface the given microprocessor kit to a personal computer through R.S.–232C. The band rate is specified. Verify data transfer in both directions (P–PC and PC–P).
11. Interface a given printer to the micro processor kit using on board 8255.
12. Interface an external keyboard to a microprocessor kit through on board 8255.
13. Write a program to demonstrate rolling display from left–to–right using 8279. Do not use any built in routines, instead program the 8279.
14. Use the SOD line to generate a square wave of the specified duty cycle at a given frequency.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–333 BASIC OF RADIATING SYSTEMS

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PART – I

1. **Radiation:**
   Physical concept of radiation, retarded potential radiation from a hertizian, mono pole and a half wave dipole, field in the vicinity and antenna, for field approximation.

2. **Antenna Parameters:**
   Radiation pattern, directivity, gain; radiation resistance effective aperture, terminal impedance, noise temperature, reciprocal properties, elementary ideas about self and mutual impedance.

PART – II

3. **Aperture Antennas:**
   Radiation through an aperture in a conduction screen, solo horn and reflector antennas.

4. **Antenna Arrays:**
   Arrays of point sources, array factor, directivity and beam width, ordinary and fire array super directive and fire array pattern multiplication, non uniform excitation, electronic scanning.

PART – III

5. **Wave Propagation:**
   Basic idea of ground wave surface wave and space wave propagation, tropospheric propagation and duct propagation. Structure of ionosphere, reflection and infraction of waves by ionosphere, regular and irregular variations of the ionosphere qualitative discussion of propagation through ionosphere, vertical height, maximum usable frequency, skip distance, propagation characteristics of medium, high frequencies and microwaves.
6. Concept of Electromagnetic interference, EMC, advantages of EMC.

Books Recommended:

1. Antenna, Krous, J.D., McGraw Hill.
2. Electromagnetic and Radiating System, Jordan E.C.P., H.I.
3. Antennas Theory and Design, C.A. Balanis Row and Harper.
4. Antenna Theory and Practice, R. Chatterjee, Wiley Eastern.
5. Antennas and Radio Wave Propagation, Collins, R.E. McGraw Hill.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

MGL301 ENTREPRENEURSHIP SKILLS FOR ENGINEERS

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PART–I

- Entrepreneurship: Concepts, Traits, types, characteristics, nature and functions.
- Classification and types of Entrepreneurs.
- Social Responsibility of an Entrepreneur.
- Role of Entrepreneurship in Economics Development.

First Terminal Test: 1 hour

PART–II

- Entrepreneurship motivation.
- Developing Creativity and Understanding Innovation.
- Entrepreneurial Decision Process.
- Setting Up a Small Business Enterprise

Second Terminal Test: 1 Hour

PART–III

- Brief introduction to concept of Marketing and conduction market survey.
- Plant location and plant layout decisions
- Managing relations with staff, customers and suppliers
- Identifying various sources of finance

Suggested Readings:

- Hisrich, Robert D and Peters, Michael P, Entrepreneurship, Delhi, Tata McGraw Hill, 2002.
- Holt, David H, Entrepreneurship: New Venture Creation, Delhi, Prentice Hall of India, 2001.
- Cliffton, Davis S and Syflie, David E, “Project feasibility analysis”, 1977 John Wiley, New York.
- Chandra, Prasana, Projects: Preparation, Appraisal, Budgeting and Implementation, New Delhi, Tata McGraw Hill.
- Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himala Publishing House, Mumbai.
- Parsad L.M., Principles and Practice of Management, Sultan Chanda & Sons, New Delhi.
- M Charatimath, Poornima, Entrepreneurship Development & Small Business Enterprises, Pearson Education, Delhi.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

INTERDISCIPLINARY COURSE – III

L	T	P
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B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL – 351 WAVE GENERATION AND SHAPING

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PART – I

1. Wave Generation:

Multivibrators: Monostable, bistable, astable, smith trigger ,Time base generators and their general features, UJT, millers sweep circuits, Bootstrap sweep circuit. Blocking oscillators and their applications.

PART – II

2. Wave Shaping:

Linear Wave shaping: Response of RC, RL, RLC circuits to step, pulse, ramp and exponential wave forms, Integrators & differentiators circuits, Attenuators and Pulse transformers.

Non–Linear Wave Shaping: Clipping circuits; diode clipper, op–amp clipper, transistors clipper and compensation. Clamping circuits; diode clamping circuit, clamping operation synchronized clamping, transistors as a switch, Clamping circuit theorem.

PART – III

3. Oscillators:

Nyquist conditions for oscillation, Barkhausen Criteria, Tuned collector, Tuned base, Hartley, Collpits, Crystal oscillators, RC Phase shift, Wein bridge oscillators.

Recommended Books:

1. Pulse Digital and Switching Wave Forms by Millman Taub McGraw Hill, 2008.

2. Wave Generation and Shaping by Strauss McGraw Hill, 2007.

3. Microelectronics by Millman and Grabel McGraw Hill, 2007.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–351 LAB. WAVE GENERATION AND SHAPING

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LIST OF EXPERIMENTS

1. To construct the astable multivibrator circuit and determine its performance
2. To construct the monostable multivibrator circuit and determine its performance characteristics
3. To construct habitable multivibrator circuit and determine its performance characteristics
4. To construct the Schmitt trigger circuit and determine its performance
5. To study the performance characteristics of phase shift oscillator and to determine the frequency of oscillation
6. To study the performance characteristics of Hartley /colpitts oscillator and to determine the frequency of oscillation
7. To study the performance characteristic of high pass RC circuit
8. To study the performance characteristic of low pass RC circuit
9. To study the performance characteristic of clipper circuit
10. To study the performance characteristic of clamper circuit
11. To study the performance characteristic of voltage time base generator circuit

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–352 INDUSTRIAL ELECTRONICS

L T P
3 1 0

PART – I

1. **Characteristics of selected devices**
   Fast Recovery diodes, Schottky diode, SCR, gate trigger and communication circuits, series and parallel connection of SCRs, Diac, Triac, UJT, Power MOSFETS.

2. **Controlled Rectifier**
   Half wave and full wave with resistive and R–L–E and resistive, Inductive loads, Free–wheeling diode, three phase rectifier. Bridge rectifiers–half controlled and fully controlled.

PART – II

3. Inverter, Chopper and Cycle Converters
Voltage driven, current driven, bridge, parallel, SCR version, control of output voltage–PWM scheme, harmonic reduction.

4. Induction Heating, effect of frequencies and power requirements, Dielectric heating and applications.

PART – III

5. Switched Mode Power Suppliers
Basic principle, step up and step–down circuits, integrated circuits for switched mode regulators.

6. Motor Control
D.C. and A.C. motor control, reversible drives, closed loop control, commutator less d.c. motor control.

References:

- *Power Electronics – P.C. Sen, Tata McGraw Hill Publishing Co. Ltd., 2007.*
- *Power Electronics and Control– S.K. Dutta, Prentice Hall of India Pvt. Ltd., 2006.*
- *Industrial Electronics SN Biswas Dhanpat Rai & Sons, 2005*.
- *Thyristor Engineering, MS Berde, Khanna Publication, 2005*.
- *Power Electronics, PS Bimbra, Khanna Publication, 2004*.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–352 LAB INDUSTRIAL ELECTRONICS

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List of Experiments:

1. To draw the characteristics of various thyristor families.
2. To determine frequency of a relaxation oscillator for various values of C.
3. To obtain the average current of an SCR as a function of resistance.
4. To vary the frequency of an inverter circuit.
5. To vary the firing angle of an SCR using a phase shift circuit and a peaking transformer.
6. To control the firing angle of thyristor by varying
   i) dc bias alone
   ii) dc bias with superimposed ac.
7. To vary the speed of a dc motor with the help of an SCR.
8. To determine the ripple factor of a full wave rectifier using SCR for various firing angles.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–353 INSTRUMENTATION AND INDUSTRIAL AUTOMATION

L	T	P
3	1	0

Part-I

Transducers - Introduction, generalized measurement system, performance characteristics. Classification, basic working principle of resistive, capacitive, inductive, piezoelectric transducers. Measurement of displacement, velocity, acceleration and force. Measurement of pressure, flow, temperature, liquid level and humidity.

Part-II

Introduction to Programmable Logic Controllers (PLCs) - PLC evolution, advantages, block diagram, principle of operation. List of various PLCs available,

PLC programming- Introduction to Logic Ladder Design. Symbols used and simple instructions. Equivalent Ladder Diagram of AND, OR, NOT, XOR, NAND and NOR Gate. Equivalent ladder diagram to demonstrate De Morgan theorem. Programming examples.

Part- III

Data Acquisition Systems (DAS) : Computers in process control, Data loggers, DAS, Alarms, Direct Digital Control (DDC), Supervisory digital control (SCADA), Introduction & Brief History, SCADA Hardware & Software.

Applications of PLC's and SCADA in Industrial Automation.

B.Tech. (Electronic Communication Systems Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–353 LAB INSTRUMENTATION AND INDUSTRIAL AUTOMATION

L	T	P
0	0	1

Experiments related to PLC programming & experiments using SCADA software to be performed by the students in addition to the basic experiments based on transducers.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

Semester – VI

Course Code	Course Title	L	T	P
	Interdisciplinary Course – IV	4	0	0
ECL341	Microwave Devices & Measurements	3	1	0
ECL342	Advance Communication Systems	3	1	0
	Elective – V	3	0	0
	Elective – VI	3	0	0
ENL351	Communication Skill for Engineers	2	1	0
Practicals				
ECP341	Lab Microwave Devices & Measurements	0	0	1
ECP342	Lab Advance Communication Systems	0	0	1
ECP324	Project	0	0	4
	Sub Total:	**18**	**3**	**6**
	Grand Total:	**27**		

List of Elective – V

ECL–361	Digital Communication	3	0	0
ECL–362	Bio–medical Electronics	3	0	0
ECL–363	VLSI Technology and Design	3	0	0
ECL–364	Virtual Instrumentation	3	0	0
ECL–369	Computer Network	3	0	0

List of Elective – VI

ECL–365	Microcontrollers	3	0	0
ECL–366	Microwave Solid state Devices	3	0	0
ECL–367	Software Engineering	3	0	0
ECL–368	Operating System	3	0	0

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–341 MICROWAVE DEVICES & MEASUREMENTS

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PART – I

Microwave Tubes:
UHF limitations in conventional tubes, Analysis and operation of multi–cavity and reflex, Klystron, Admittance diagram of Klystron;
Analysis and operation of a traveling Wave Magnetron, Performance charts of Magnetron tubes, Principle of operation of Traveling Wave Tube.

PART – II

Microwave Semiconductor Devices:
Classification of Microwave Devices, Tunnel diode, Point Contact diode, Gunn diode, two valley structures, mode of operation, circuit realization, IMPATT diode, Read Diode, circuit realization, PIN diode, basic principle of operation, equivalent circuit, application as switch, modulator and phase shifter; Microwave Bi–polar and Field Effect Transistors characteristics and performance.
Microwave Circuits:
Voltage and current definitions, uniqueness of definitions, Impedance representation of one port, two port and n port junctions; Scattering matrix and its properties, Tee's and directional coupler; Transmission matrix representations.

PART – III

Microwave Measurements and Components
Measurement of VSWR & Reflection coefficient, impedance using slotted line, Measurement of Power, use of SMITH CHART, Theory and use of attenuators, Directional Couplers Magic TEE, Probes and Loops. Microwave circulators and Isolators, bends and twists, Resonant cavities, Rat–Race circuits, wave guide, corners, Impedance Matching, Single, Double and Triple stub Tuners, Quarter wave Transformer.

Suggested Text Books & References:

1. Fundamentals of Microwave Engg. – R.E. Collin, McGraw Hill, 2006.

2. Microwave Devices and Circuits – S.Y. Liao, Prentice Hall of India, 2004.

3. Microwave Circuits – R.N. Ghose, McGraw Hill, 2007.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP – 341 LAB MICROWAVE DEVICES & MEASUREMENTS

L T P
0 0 1

1. Study of microwave components and instruments.
2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.
3. Measurement of Klystron characteristics.
4. Measurement of VSWR and standing wave ratio.
5. Measurement of Dielectric constants.
6. Measurement of Directivity and coupling coefficient of a directional coupler.
7. Measurement of Q of a cavity.
8. Calculation of the attenuation constant of an attenuator.
9. Determination of the radiation characteristics and gain of an antenna.
10. Determination of the Phase–shift of a phase shifter.
11. Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuit stub.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL – 342 ADVANCE COMMUNICATION SYSTEMS

L T P
3 1 0

PART – I

1. **Digital Modulation Transmission and Reception:**
   Introduction, Comparison of Analog and Digital Signals; Advantages and disadvantages of Digital Communications, Elements of Digital Communication Systems. Pulse Code Modulation (PCM); Quantization Noise, Companding Sampling Theorem, PCM bandwidth, Differential PCM, Delta Modulation (DM), Continuously Variable Slope Delta Modulator (CVSDM) or Adaptive Delta Modulation.

2. **Digital Carrier Modulation Transmission and Reception:**
   Introduction, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), coherent, non–coherent FSK detection, Continuous–Phase Frequency–Shift Keying (CP–FSK). Binary Phase Shift Keying (BPSK) ; Bandwidth consideration, transmitter and receiver. Quaternary Phase–Shift Keying (QPSK) ; Bandwidth consideration, transmitter and receiver, Offset QPSK. 8–PSK ; Transmitter and Receiver. Quadrature Amplitude Modulation (QAM) ; 8–QAM transmitter and receiver. Differential Phase Shift Keying (DPSK).

PART – II

3. **Spread Spectrum Communication Systems:**
   Introduction, Principles of Spread Spectrum; Direct sequence Pseudo–noise (DSPN) Spread Spectrum, Frequency hopping Spread Spectrum. Spread spectrum Modulation Systems ; Generation of Pseudo–Noise Sequences ; Maximal Length Sequences. Gold Sequences, Correlation properties, Code Division Multiple Access (CDMA) : Principles of operation, Near–Far Interference in Direct Sequence CDMA systems. Adaptive power control in CDMA Spread–Spectrum Systems.

4. **Cellular and Mobile Communication Systems:**
   Evolution of Cellular phones ; cell phone generations. Cellular system Concepts ; cellular system topology, Frequency reuse, cell repeat patterns, cell splitting, sectorization, co–channel interference, Adjacent channel interference, Roaming and Handoffs. GSM Standard for cellular systems ; GSM architecture, Features of GSM, security features, Call processing in GSM. Introduction to new data services like High Speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), Digital Enhanced Cordless Telecommunications (DECT) and Enhanced Data Rate for Global Evolution (EDGE).

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

PART – III

5. **Space Communications:**

History of Satellites, Kepler's Laws, Satellite Elevation Categories, Satellite Orbital Patterns, Geosynchronous satellites; station keeping, satellite attitude control, satellite spacing and frequency allocation, satellite foot prints, Satellite system link models and equations.

References:

1. Advanced Electronic Communication Systems 6th by Wayne Tomasi Pearson Education.
2. Wireless Communications Principles and Practices by Rappaport PHI.
3. Mobile Communication by J.Schiller Pearson Education.
4. Wireless Digital Communications Modulation and Spread Spectrum by Dr. Kamilo PHI.
5. Communication Systems (Analog and Digital) by Sanjay Sharma (KATSONS), 2006.
6. Satellite Communication by DC Aggarwal Dhanpat Rai Publication, 2006.
7. Wireless Communication by Mark Ciampa, Cengage Learning India Edition, 2008.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP – 342 LAB ADVANCE COMMUNICATION SYSTEMS

L T P
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1. IF amplifier using Transistors
2. Amplitude Modulator using transistors and demodulation by envelope detection.
3. IC based Balanced Modulator and Demodulator
4. Frequency Modulators using 8038 and 566.
5. Capture range & Lock range measurement of a PLL.
6. Frequency demodulation using PLL.
7. IC based sample and hold.
8. Delta Modulator using D–Flip Flop
9. IF Amplifier using IC 3028.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

INTERDISCIPLINARY COURSE – IV

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B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–361 DIGITAL COMMUNICATION

L T P
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PART – I

1. Data Transmission:
Time Division Multiplexing; TDM–PCM systems–baseband signal receiver, error probability, Optimum filter, Coherent reception, correlation, Binary ASK,BSK and PSK systems – Coherent and noncoherent, comparison of Digital transmission schemes–band–width and power requirements,

PART – II

2. M–Ary signaling–coherent PSK, differential PSK and wideband FSK Schemes. QPSK scheme. Introduction to data compression techniques.

3. **Data Reception:**
Optimum detection–Matched Filter receiver using maximum SNR criterion. Practical Matched Filter–Detection of signals in digital communication–Parameter estimation.

PART – III

4. **Error Correcting Codes:**
Introduction, Galois fields, vector spaces and matrices, block codes, binary cyclic codes, multiple error correcting codes.

Recommended Books:

	Name of Book	Author	Publisher
1.	Digital and Analog Communication Systems	Sam K. Ahunmugam	John Wiley
2.	Principle of Digital Communication Systems	J. Das	John Wiley
3.	Communication Systems	Taub.Schilling	T.M.H.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–362 BIO–MEDICAL ELECTRONICS

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PART – I

1. **Transducers**
   Resistive, capacitive, inductive, photo–electric, piezo–electric, thermo electric, mechano–electronic transducers – the pick circuits for each of the transducers.

2. **Electrodes**
   Half–cell potential electrode impedence, equivalent circuits, micro electrode and micro pipette – their equivalent circuits, – polarisable and non–polarisable electrodes.

PART – II

3. **Non–Electrical Parameters**
   Flow meters, respiration gas volume and rate measurements, pressure measurements and force measurements, temperature measurements.

4. **Bio–Chemical Measurements**
   PH, PHCO3, electrophoresis photoelectric calorimeter, spectro–photometer.

PART – III

5. **X–Rays**
   Soft and hard X–rays general black diagram of X–ray generator for diagnosis, radiography, angiography, fluoroscopy , CAT.

6. **Isotopes**
   Properties, GM Counter, Scintillation counter, Scanners.

7. **Ultrasonics**
   Principles–modes of displays–application of ultrasonic's for diagnosis.

Books Recommended

	Name of Book	**Author**	**Publisher**
1.	Bio–Physical Measurement and Measurement Concepts	Peter Strong	Tetronic Inc.
2.	Principles of Applied Bio–Medical Instrumentation	Geddes and John Wiley	L.E. Baker
3.	Engineering and Practice of Medicine	Segal and Kilpatric	William and William Co.
4.	X–Ray Techniques for Students	M.O. Chesney	Blazewell

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–363 VLSI TECHNOLOGY AND DESIGN

L T P
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PART – I

IC Fabrication: Unit process for integrated circuit fabrication, crystal growth, substrate preparation, oxidation, diffusion, photolithography, ion – implantation, epitaxial for Si, chemical vapor deposition techniques and metallization.

PART – II

CMOS: MOS transistor theory (enhancement and depletion). NMOS and CMOS technology, the pass transistor, inverter design in NMOS and CMOS technology.

PART – III

CMOS Design and Realization: E/D logic gates in NMOS and CMOS technology, impurity introduction, layer deposition, etching, design rules, general design methodologies, Stick diagrams, polycell and gate away approach, examples of cell design.

Books Recommended:

1. A.B. Glasser, Ges Sharpe – Integrated Circuit Engineering (Addison Wesley).
2. S.K. Gandhi – VLSI Fabrication Principles (John Wiley).
3. N. Wasle, K. Eshranghian – Principles of CMOS VLSI Design (Addison Wesley).
4. C. Mead, L. Conway – Introduction to VSL VLSI Systems (Addison Wesley).
5. V.L.S.I Technology SZE. S.M. (McGraw Hill Pb.).

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–364 VIRTUAL INSTRUMENTATION

L T P
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PART – I

Review of Virtual Instrumentation: Historic perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Programming Techniques: VIS & Sub VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local & global variables, string 7 file input.

PART – II

Data Acquisition basics: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and hardware Installation.

Common Instrument Interfaces: Current loop, RS 232C/RS 485, GPIB, System basics, Interface basics, USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, motion control.

Use of Analysis Tools: Fourier transform, Power spectrum, Correlation methods, windowing & filtering.

PART – III

Application of VI: Application in Process Control Projects, Major equipments– Oscilloscope, Digital Multimeter, 120 MHz Pentium computers, Lab view Software, Study of Data acquisition & control using Lab view, Virtual Instrumentation for an Innovative Thermal Conductivity Apparatus to measure the Thermal Conductivity Apparatus– to measure the conductivity of non Newtonian fluids while they are subjected to sharing force.

Recommended Text Books:

1. Gary Johnson, Labview Graphical Programming Second Edition, Mc GrawHill, New York, 1997.
2. Lisa K.Wells & Jeffrey Travis, Labview for Everyone, Prentice Hall, New Jersey, 1997.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL – 369 COMPUTER NETWORK

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PART – I

1. **Introduction to Computer Network:** Network – needs & goals, classification: broadcast, point to point, topologies: physical & logical, types: LAN, MAN, WAN & Enterprise.
2. **Computer Model :**Centralized, Distributed. Network configurations : client/ server & peer to peer.
   Security Concepts : Access rights, permissions, authentication, shares, groups & users and user accounts.
3. **The OSI Reference Model:** Layer & peer communications, need for protocols, network architecture, design issues for the layer, functions of different layers.
4. **Layer Interfaces and Services:** Entities, service access points, connection oriented and connectionless services, reliable and unreliable services, layer service primitives, Overview of IEEE 802.3n standards.

PART – II

5. **Physical Layer :** The transmission Media : Coaxial cable, twisted pair, optical fiber and wireless. Media for various types of LAN & MAN standards.
6. **Data Link Layer:** Design Issues: service provided, framing, error control & flow control. Protocols: HDLC, LAP, SLIP, PPP, MAC sub layer protocols, ALOHA, CSMA/CD protocols. IEEE standard 802.3 (CSMA/CD), 802.5 (token ring), 802.6, IEEE standard 802.2 Bridges: their need, basic operation and different types.
7. **Network Layer:** Design issues: Service provided, subnet design approaches. Network routing algorithms: their properties, types, congestion control. Internet working : routers, gateways.
8. **Transport Layer:** Transport layer – TCP/IP, quality of service, transport protocol design issues.

PART – III

9. **Session Layer:** Remote procedure calls.
10. **Presentation Layer:** Data compression, encryption.
11. **Application Layer:** NFS, X.400. Virtual terminals.
12. **Services:** Brief overview of X.25 protocol, frame delay, ISDN, ATM.
13. **Networking Operating System:** Basic concepts of network operating system. Important features and architecture of Window NT operating system, Window NT file system, important features of Novell Netware and UNIX.
14. **Network Management:** Network management, maintenance and troubleshooting of networks, network security.

Books Recommended:

1. Computer Network by A. Tannenbaum.
2. Computer Networks and Distributed Processing by James Martin.
3. Communication & Network for IBM PC & Compatibler by Jordon LP.
4. Data Communication & Networking by Behrouz A. Forouzan TMH, 2006.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–365 MICRO CONTROLLERS

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PART – I

Introduction: 8051 Microcontroller; Comparison of Microprocessor and Microcontroller, Microcontroller and embedded processors, overview of 8085 families.
8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program, Data types and Directives, 8051 flag bits and PSW register, Register banks and stack.
Jump loop and call instructions, I/O Port programming: Addressing modes and accessing memory using various addressing modes, Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming.

PART – II

Timer/Counter Programming in 8051.
Serial Communication: 8051 connection to RS 232, 8051 serial communication programming.

PART – III

Real World Interfacing: LCD, ADC and sensors, stepper motor, keyboard, DAC and external memory.
Introduction to an embedded system and its design: Introduction to ES & its applications, design parameters of an ES and its significance (with respect to all parameters), present trends in ES, Embedded System design life cycle, product specifications and hardware, software partitioning, Co–design.
Introduction to latest microcontrollers such as ARM processors and its applications.

Recommended Text Books:

1. The 8051 Microcontroller and Embedded Systems by Ali Mazidi
2. An Embedded Software Primer, David E.Simon, Pearson Education.
3. Embedded System Design by Frank Vahid and Tony Givargus.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–366 MICROWAVE SOLID STATE DEVICES

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PART – I

Microwave Transistors:

Microwave BIT, HBT, JFET, MESEFT, HEMT, MOSFET, NMOS, PMCS,

CMOS, MEMORIES, OCD.

PART – II

Tunnel Diode

Parametric Devices

Manley Power relations parametric up converters and Down converters.

Transferred Electron Devices

GUNN diode, LSA diode Inp. Diodes CD Te diodes.

PART – III

Avalanche Transit Time Device

Read diode, IMPATT Diode, TRAPATT Diode, BARITT Diode.

References:

- Fundamental of Microwave Engineering, RE Collin, McGraw Hill.
- Microwave Semiconductor Devices & their Circuits Application, HA Watson, McGraw Hill.
- Microwave Devices & Circuits, SYLiao, Prentice Hall.
- Microwave Circuits, RN Chose, McGraw Hill.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–367 SOFTWARE ENGINEERING

L T P
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PART – I

I. **Introduction:** Problems encountered during software development and their causes, Software life cycle.
II. **Software Planning:** Software Planning: Objectives and Scope, Costing Estimation and Scheduling.
III. **Software Requirement Analysis:** Fault finding techniques, information flow, information structure, data base requirements, requirement analysis tools.

PART – II

IV. **Software Design Process:** System design tools and techniques, Top down technique, structural programming; Data oriented design, design documentation and review.
V. **User Interface Design:** Design issues, Features of a modern GUI; Menus, scrolling, windows, icons, panels, error messages, etc.

PART – III

VI. **Software Testing and Reliability:** Purpose of testing, unit testing, component testing, integration testing, system testing, testing tools, debugging and reliability.
VII. **Software Maintenance:** Maintainability, documentation to facilitate maintenance; Regression testing, Reverse engineering.

Suggested Text Book & References:

1. Software Engineering – A Practitioners Approach – R.S. Pressman, MCGraw Hill 1992.
2. Software Testing Techniques – Boris Beizer, Van Nostrand Reinhold, 1990.
3. An Integrated Approach to Software Engineering, Pankaj.
4. System Analysis and Design Methods – Wlutten, Bentley and Barlow; Galgotia Publications, 1996.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–368 OPERATING SYSTEM

L T P
3 0 0

PART – I

Introduction: Operating System, Role as resource manager, Operating system strategies, Factors in operating system design, Views of an operating system.
Process Management I: The system view of processes, Process descriptor, Process state diagram, Resource abstraction, Process hierarchy, Process scheduling strategies, Process synchronization.

PART – II

Process Management II: Dead handling, Coordinating processes, Semaphores.
Memory Management: Factors in memory design, Memory hierarchies, Memory manager strategy, Memory allocation strategies, Paging, Demand paging and Segmentation techniques.

PART – III

Device Management: Device management approaches, Device allocation considerations, Role of I/O traffic controller, I/O scheduler and device handler.
Information Management: File System, Its layered structure and general model, Allocation methods, Free Space management.

References:

1. Gary Nutt : *Operating System, Modern Perspective*, Addison Wesley.
2. A. Silberschatz, P. Galvin : *Operating System Concepts*, Addison Wesley.
3. A.S. Tanenbaum : *Modern Operating System*, Prentice hall.
4. Madnick and Donovan : *Operating System*, McGraw Hill.
5. M. Mileenkovic : *Operating Systems*, McGraw Hill.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ENL351 COMMUNICATION SKILLS FOR ENGINEERS

L T P
2 1 0

PART–I

Basic Grammar:
Use of Articles, Prepositions, Degrees of Comparison, Verbs: Kinds and uses, Tenses: Kinds and uses, Subject: Verb Agreement, Active and Passive Voice, Phrases, clauses and sentences, kinds of sentences, Reported speech.

Basic Composition:
Paragraph writing, Essay writing, Business correspondence, Official reports, Note making. Preparing and delivering presentations Resume writing.

PART–II

Basic Phonetics:
The Production of Speech, The Sounds of English, Phonetic Transcription, Syllable and stress, Intonation.

PART–III

Basic Conversation:
English in use, English for routine communicative functions, English in common interactive situations, Speech practice, Group discussion. Preparing for interview, conferences and seminars.

Books Recommended:

1. Written and Spoken Communication in English by Universities Press (India) Private Limited, Hyderabad.
2. Oxford Guide to Effective Writing and Speaking.

Note: For sections 3 and 4, the students will practice in the language lab.

B.Tech. (Electronics Communication Systems Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–324 **PROJECT**

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Students either individually or in a group have to undertake a project of their interest or related to their degree of specialization in the beginning of 6th Semester.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

Semester – VII

Course Code	Course Title	L	T	P
ECL431	Neural Network and Fuzzy Logic Design	3	1	0
ECL432	Signal Processing	3	1	0
	Elective – VII	3	1	0
	Elective – VIII	4	0	0
	Elective – IX	4	0	0
Practicals:				
ECP432	Lab Signal Processing	0	0	1
ECP413	Seminar	0	0	2
	Sub Total:	**17**	**3**	**3**
	Grand Total:	**23**		

List of Elective – VII

ECL–451	Optical communication	3	1	0
ECL–452	Wireless Communication	3	1	0

List of Elective – VIII

ECL–453	Computer Architecture and Organization	4	0	0
ECL–454	Image Processing	4	0	0

List of Elective – IX

ECL–455	Cellular and Mobile Communication	4	0	0
ECL–456	Bio–sensors and MEMS	4	0	0
ECL–457	Digital System Design (Verilog VHDL)	4	0	0
ECL–458	Radar System Engineering	4	0	0
ECL–459	Fundamental of Nano Electronics	4	0	0
ECL-460	Wireless Sensor Network	4	0	0

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–431 NEURAL NETWORK & FUZZY LOGIC DESIGN

L T P
3 1 0

PART – I

1. Fundamentals of Neural Networks, History, Basic concepts of Neural networks, Model of and Artificial neuron, Basic neural network architectures characteristics of Neural networks, Introduction to various learning methods.
2. Back propagation network– architecture, the perception model, model for multilayer perception, back propagation learning and applications.

PART – II

3. Basic Hop field model, Kehonen feature maps.
4. Associative memory, Auto correlators, heterocorrelators, Wang et al's multiple training encoding strategy, BAM, Associative memory for Real– coded pattern pairs and applications.

PART – III

5. Fuzzy set theory– Introduction, crisp sets, and fuzzy sets, crisp and fuzzy relations.
6. Fuzzy Systems: Crisp logic, Predicate logic, fuzzy logic, fuzzy rule based system, Defuzzilication methods and applications.

Books:

- Neural Networks, Fuzzy Logic and Genetic Algorithm by S. Rajesekaran, G.A. Vijayalakshmi Pai, PHI.
- Neural Networks & Fuzzy Logic by Bart Kosko.
- Neural Computing Theory & Practice by P.D. Wasserman (ANZA PUB).

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–432: SIGNAL PROCESSING

L T P
3 1 0

PART – I

1. **Introduction:** Limitations of analog signal processing, Basic elements of DSP system, Advantages and disadvantages of DSP over Analog processing and applications of DSP.
2. **Discrete Time Signals and Systems:** Elementary discrete time signals, manipulation of discrete time signals, linear convolution, correlation and autocorrelation, Concepts of stability, causality, linearity, difference equations.
2. **Z–transform:** Introduction, direct Z transform and Region of convergence, properties of Z transform, evaluation of inverse Z– transforms by different methods, one sided Z-transform.

PART – II

3. **Discrete and Fast Fourier Transform:** Introduction, Discrete Time Fourier Transform, Magnitude and Phase Spectra, Discrete Fourier Transform, computing inverse DFT by using a direct IDFT, Fast Fourier Transform using decimation in time and decimation frequency algorithms.
4. **Finite Impulse Response (FIR) filters:** Introduction, magnitude and phase response of digital filters, frequency response of linear phase FIR filters, Design methods for FIR filter, design of optimal linear phase transformation.
5. **Infinite Impulse Response (IIR) Filters:** Introduction, IIR filters design by derivatives, impulse invariant, bilinear transformation & Matched Z-Transformation method, Frequency transformation.

PART – III

6. **Finite Precision Effects:** Fixed point and Floating point representations, Effects of coefficient unitization, Effect of round off noise in digital filters, Limit cycles.
7. **DSP processor architecture fundamentals:** Study of ADSP and TMS series of processor architectures.

Books Recommended:

1. "Digital Signal Processing Principles, Algorithms and Application" John G Proakis,Dimtris G Manolakis 4th 2009.
2. "Discrete-Time Signal Processing" Alan V Oppenheim, Ronald W Schafer, John R Back 2nd 2008, Prentice Hall.
3. "Digital Signal Processing" S. Salivahan, A Vallavaraj, Gnanpiya 1st 2008, Tata McGraw Hill.
4. "Digital Signal Processing-A computer based approach" S. K. Mitra 1st 2006, Tata McGraw Hill
5. Jervis, Pearson Education India.
6. "Introduction to Digital Signal Processing" Johny R.Johnson

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–432 **LAB SIGNAL PROCESSING**

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Design the implementation of various types of digital filters on DSP 2100 – TM

320 C 10 & TM 320 C 25.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–451 OPTICAL COMMUNICATION

L T P
3 1 0

PART – I

1. **INTRODUCTION:**
   Evolution of fiber optic systems, Elements of optical fiber transmission links, Brief review of basic concepts and transmission characteristics of optical fibers.
2. **POWER LAUNCHING AND COUPLING:**
   Source of fiber power launching– source output pattern, power coupling calculations, equilibrium numerical aperture, LED coupling to single mode fiber, Lensing schemes for coupling improvement. Fiber to Fiber joints, Fiber splicing, Optical fiber connectors and couplers.

PART – II

3. **PHOTO DETECTOR:**
   p–i–n photo detector, avalanche photo detector, photo detector noise, detector response time, photo diode materials.
4. **POINT TO POINT OPTICAL LINK DESIGN:**
   System considerations, Link power budget, Rise time budget, Line coding– NRZ, RZ, Optical Manchester and block codes.

PART – III

5. **WDM FIBER OPTIC NETWORKS:**
   Overview, Time division and wave length division multiplexing in fiber optic networks, Add/ drop problem. Repeaters and amplifiers, Transmitter and receiver requirements in WDM networks. Semiconductor optical amplifiers and Erbium doped fiber amplifiers (EDFAs).
6. **PASSIVE COMPONENTS, SWITCHES AND FUNCTIONAL MODULES OF FIBER OPTIC NETWORKS:**
   Couplers/ Splitters, WDM multiplexers and demultiplexers, Filters: Fixed and tunable. Isolators, Circulators and attenuators, optical switches: Single and multistage switches. Basic principle of wavelength converters. Functional modules of Fiber optic networks like Add/ Drop multiplexers and optical cross connects with and without wavelength conversions.

Books Recommended:

1. *Fiber Optic Communication Technology, Djafar K. Mynbaev, Lowell L. Scheiner Pearson Education Asia.*
2. *Keiser–Optical Fiber Communications, McGraw Hill.*
3. *John M. Senior–Optical Fiber Communications: Principles and Practices, PHI.*
4. *Chai Yeh–Hand Books of Fiber Optics.*
5. *Govind P. Agrawal: Fiber Optic Communication Systems, John Willey Sons Inc. USA.*
6. *Bishnu P. Pal: Guided Wave Optical Components & Devices Elsevier Academic Press.*

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–451 LAB OPTICAL COMMUNICATION

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NOTE: At least eight experiments are to be performed.

List of Experiments:

1. Evaluation of power budget of an optical link upto 5 km. length in a step of 1 km. using laser and LED source.
2. Evaluation of Rise Time budget of an Optical link upto 5 km. length in a step of 1 km. using laser and LED source.
3. Investigation of Q– factor & BER as a function of optical link length for laser & LED sources.
4. Investigation of Q– factor & BER as a function of increasing bit rate in a given optical point to point link for LED & LASER sources.
5. Measurement of insertion loss and back reflection/ return loss for coupler, WDM, isolator circulator, DWDM MUX/ DEMUX and optical Add Drop Multiplexers (OADM).
6. Determination of isolation/ extinction ratios for appropriate output ports of an isolator, circulator, DWDM MUX/DEMUX and OADM.
7. Investigation of temperature tuning of Bragg grating.
8. Investigation of two channel WDM system.
9. Measurement of system cross–talk/ channel isolation in WDM system.
10. Examination of temperature effects on system crosstalk/channel isolation.
11. Investigation of temperature/ cross talk effects on eye diagram/ BER is WDM systems.
12. Examination of Four Wave mixing (FWM) effect in long haul fiber optic DWDM systems to study the effect of channel separations & allocation on FWM.
13. Examination of stimulated Raman Scattering (SRS) effect in long haul fiber optic DWDM systems & to study the effect of Optical power and Channel separation on SRS.
14. Examination of the effect of dispersion on FWM in a DWDM fiber optic system.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–452 WIRELESS COMMUNICATION

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PART – I

Introduction: Mobile radio System around the world, Examples of Wireless Communication system, Paging System, Cordless Telephone Systems, Cellular Telephone System, Comparison of common Wireless Communication System.

Digital Communication Through Fading Multipath Channels: Fading channel and their characteristics, Channel modelling, Digital signalling over a frequency non selective slowly fading channel, Frequency selective slowly fading channel, Calculation of error probabilities, Tapped Delay line model , The RAKE demodulator, Performance, Concept of Diversity branches and signal paths, Combining methods, Selective diversity combining, Pre–detection and post detection combining, Switched combining , Maximal radio combining, Equal Gain combining.

PART – II

Multiple Access Techniques for Wireless Communication: Introduction, Frequency division, Multiple Access (FDMA) , Time division multiple Access(TDMA), Spread Spectrum Multiple Access, Space division Multiple Access, Packet radio Protocols, Pure ALOHA, Slotted ALOHA, Capacity of Cellular System.

Wireless Networking: Introduction, Difference between wireless & Fixed Telephone Networks, Development of Wireless Networks, Traffic Routing In Wireless network, Wireless data Services, Common channel Signaling, Broadband ISDN &ATM, Signaling System No. 7(SS–7),Personal communication Services/Networks, Protocols for Network Access, Network Databases.

PART – III

Wireless Systems and Standards: AMPS and ETACS, United States digital cellular (IS–54 & IS 136), Global System for Mobile (GSM); Services, Features, system architecture and channel types, Frame structure for GSM, Speech processing in GSM, CDMA digital standards (IS 95); Frequency and channel specifications, Forward CDMA Channel, Reverse CDMA channel, CT2 standard for cordless Telephones, Personal Access Communication System, Pacific Digital Cellular , Personal Handyphone System, PCS and ISM bands, Wireless Cable Television.

Wireless Local Area Networks(WLAN): Components and working of WLAN, transmission media for WLAN, Modulation Techniques for WLAN (DSSS, FHSS), IEEE 802.11 standards and protocols for WLAN (MACA, MACAW), Mobile Network and Transport Layer, Mobile IP, Mobile TCP, traffic routing in wireless networks, wireless ATM, Wireless Local Loop (WLL), WLL Architecture, WLL Technologies and frequency spectrum.

Future Trends: Bluetooth technology, 4G Mobile techniques, wi–Fi Technology.

Recommended Text Books:

1. Theodore S. Rappaport, “Wireless Communications, Principles, and Practice”, Third Indian Reprint Pearson Education Asia, 2003.
2. Raj Pandya, “Mobile and Personal Communication Systems and Services”, Prentice Hall of India, 2001.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–452 LAB WIRELESS COMMUNICATION

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1. Study of GSM & CDMA System.
2. Study of Wi–Fi.
3. Study of soft & hard hand off protocols.
4. To Study and evaluate various parameter of GSM using MATLAB programmes.
5. Other related experiment with cellular communications.
6. Case Study of GSM/CDMA cellular networks.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–453 COMPUTER ARCHITECTURE & ORGANIZATION

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PART–I

1. **Introduction to Computer Architecture:** Basic Comp. Organization: System Buses, Instruction cycles, Instruction format, Instruction types, Addressing Modes.
2. **CPU Organization:** Design specification of a simple & CPU, Instruction fetching, decoding & executing. Design of a simple ALU.

PART–II

3. **Control Unit:** Design Methods, Hardwired Control & Micro programmed Control approach.
4. **Memory Organization:** Memory subsystem organization & interfacing, Types of memories, cache memory, interleaved, associative, virtual memory.

PART–III

5. **I/O Subsystem:** I/O subsystem organization & interfacing, DMA & Interrupts, I/O Processors.
6. **Parallel Processing:** Trends in parallel processing parallel processing mechanism, Flynn & Taxonomy, Seriel vs Parallel processing, Parallelism vs Pipeline. Array Processor, Multi processor systems. Loosely coupled Multiprocessor & tightly coupled Multi processor.

Books:

1. Comp. Architecture & Organization by John P. Hynes,Mc Graw Hill International.
2. Computer System Architecture by Morin Mano, PHI.
3. Computer Architecture & Parallel Processing, Faye A. Briggs, McGraw Hill International.
4. Computer System Organization & Architecture, John D. Carpinelli, Addison Wesley.
5. Computer Architecture & Organization by B. Govinderajalu (TMH), 2007.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–454 **IMAGE PROCESSING**

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PART – I

1. **Introduction to Electronic Image Processing:** Historical background, visual perception, image formation, sampling & Quantization & application of image Processing.
2. **Transforms used in Electronic Image Processing:** Review of 1–D & 2–D Fourier Transforms, Discrete Fourier Transforms & other image transforms.
3. **Image Enhancement by Point operation:** An overview of point processing, constants & non–linear operations between image and histogram techniques.

PART – II

4. **Spatial Filtering & Fourier frequency Method**: Noise in image, Spatial & Special Frequency Filtering, image restoration.
5. **Non–linear image processing techniques**: Non–linear Spatial/Mean/Adaptive & Homo–morphic filters.

PART – III

6. **Color Image Processing:** Color models, examples of color image processing, Pseudo–coloring & color displays.
7. **Image segmentation & Representation:** Image Thresh–holding, Edge/Line & point direction, Region based segmentation & Image representation.
8. **Introduction to Morphological filters & Image Compression.**

Recommended Text Books:

1. Digital Image Processing by Rafael C.Gonzale & Richard E.Woods, Pearson Education Asia (2nd Edition 2002).
2. Fundamentals of Digital Image Processing by A.K. Jain, 1989, Prentice Hall, Englewood Cliffs, N.J.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–455 CELLULAR & MOBILE COMMUNICATION

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PART – I

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface – specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features. 3G Systems: UMTS & CDMA 2000 standards and specifications.

PART – II

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co–channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co–channel interference, real time co–channel interference, co–channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co–channel interference – different types.

Cell Coverage for Signal & Traffic: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

PART – III

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non–fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls: Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Optional Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Text Books:

1. Mobile Cellular Telecommunications; 2nd Ed., William, C Y Lee McGraw Hill.
2. Wireless and Digital Communications; Dr. Kamilo Feher (PHI).
3. T.S. Rappaport, “Wireless Communication, Principles & Practice”, PHI, 2001.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–456 Bio–sensors and MEMS

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PART–I

Overview of Biosensors and their Electrochemistry: Molecular reorganization: enzymes, Antibodies and DNA, Modification of bio recognition molecules for Selectivity and sensitivity Fundamentals of surfaces and interfaces.

Bioinstrumentation and Bioelectronics Devices: Principles of potentiometry and potentiometric biosensors, principles of amperometry and amperometric biosensors, Optical Biosensors based on Fiber optics.

PART–II

MEMS Technology: Introduction to MEMS, MEMS design and fabrication technology: Lithography, Etching, MEMS material, Metals, Semiconductors, Ceramics and Organic Materials, bulk micromachining, Surface micromachining.
RF MEMS: Introduction to static and dynamics Beam Analysis, Electromagnetic modeling concept, MEMS Switches & Micro relays, Inductor &Capacitors, MEMS phase shifter, Antenna, Applications.

PART–III

BioMEMS: Bio/Nano Technology, Biomass, Mendalian genetics, Genomics and proteomics, biosensor arrays; electronic nose and electronic tongue, DNA Transistor, Applications.

References:

1. Richard P. Buck,William E. Hatfield (1990)– "Bio–sensors Technology" Marcel Dekker.
2. Vijay K Varadan, K J .Vinoy and K A Jose (2004) "RF MEMS and Applications" Wiley–Vch UK.
3. Baltes H, Brand (2004) "Enabling Technology for MEMS and Nano Devices" Wiley–Vch.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–457 DIGITAL SYSTEM DESIGN (Verilog VHDL)

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PART–I

INTRODUCTION
Introduction to Computer aided design tools for digital systems. Hardware description languages; introduction to VHDL, data objects, classes and data types, Operators, Overloading, Logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioural, data flow and structural models.

VHDL STATEMENTS:
Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements.
Subprograms: Application of Functions and Procedures, Structural Modelling, component declaration, structural layout and generics.

PART–II

COMBINATION CIRCUIT DESIGN:
VHDL Models and Simulation of combinational circuits such as Multiplexers, De–multiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

SEQUENTIAL CIRCUITS DESIGN:
VHDL Models and Simulation of Sequential circuits, Shift Registers, Counters etc.

PART–III

DESIGN OF MICROCOMPUTER:
Architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL.

DESIGN WITH CPLDs AND FPGAs:
Programmable logic devices: ROM, PLAs, PALs, CPLDs and FPGA. Design implementation using CPLDs and FPGAs.

Reference Books:

1. IEEE Standard VHDL Language Reference Manual (1993).
2. Digital Design and Modelling with VHDL and Synthesis: KC Chang; IEEE Computer Society Press.
3. "A VHDL Primmer": Bhasker; Prentice Hall 1995.
4. "Digital System Design using VHDL". Charles.H.Roth; PWS (1998).
5. "VHDL – Analysis & Modelling of Digital Systems": Navabi Z; McGraw Hill.
6. VHDL – IV Edition: Perry TMH (2002).
7. "Introduction to Digital Systems": Ercegovac. Lang & Moreno; John Wiley (1999).
8. Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH (2000).
9. Modern Digital Electronics – III Edition: R.P.Jain; TMH (2003).ECP 412.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL – 458 **RADAR SYSTEM ENGINEERING**

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PART – I

1. Introduction
   Radar equation, block diagram, operation and application.
2. Radar Equation
   Various parameters of radar equation.
3. CW and FM CW Radar
   Doppler effect. CW radar. FM CW radar. Multiple frequency CW Radar.
4. MTI And Pulse Doppler Radar
   MTI radar, Delay lines, cancellers, Pulse doppler radar, Non coherent MTI radar, AMTI radar.

PART – II

5. Tracking Radar
   Sequential loping, conical scan, Monopulse, Tracking in range and doppler, Acquisition.
6. Radar Transmitters, Antennas and Receivers
   Hard tube and pulse modulators. Types of Radar antennas, Duplexers, Displays.
7. Electronic Scanning Radar
   Principle of phased array for electronic scanning, Advantages and capabilities of electronic scanning, block diagram of a electronic scanning system and its operation.

PART – III

8. Navigational Aids
   Loaran, Radio range Aircraft, Landing Systems – instruments landing system and Ground controlled approach, Radio Direction Finding, Satellite based navigation system.
9. Electronic Warfare
   Electron Reconnaissance (ER), Electronic Counter Measures (ECM), Electronic Counter –Counter Measures (ECCM) – different techniques. .

Recommended Books:

	Name of Book	**Author**	**Publisher**
1.	Introduction to Radar System	M.I. Skolnik	McGraw Hill
2.	Electronic and Radio Engg.	F.E. Terman	– do –
3.	Radar Engg. Hand Book	M.I. Skolnik	– do –
4.	Radar Systems and Radio Aids to Navigation.	Sen & Bhattacharya	– do –

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL–459 FUNDAMENTAL OF NANO ELECTRONICS

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PART – I

1) **Introduction to The Practice and Discipline of Nanotechnology**
   - **a.** The nanoscale dimension and paradigm,
   - **b.** Definitions, history and current practice
   - **c.** Overview of current industry applications
   - **d.** Nanoscale science and engineering principles
2) **Physical Basis and Principles of Nanotechnology**
   - **a.** Overview of chemistry fundamentals for nanotechnology
   - **b.** Engineering principles for nanotechnology materials and applications
   - **c.** Self–assembly and overview of Complex Adaptive Systems (CAS)
3) **Semiconductors**
   - **a.** Moore's Law, history 1950–2025
   - **b.** Materials requirements for silicon
   - **c.** Quantum effects – desired or not
   - **d.** Beyond Moore
   - **e.** Nanofabrication techniques in semiconductors

PART – II

4) **Quantum Computing**
   - **a.** Basic physics and Moore's Law
   - **b.** Quantum devices – e.g. quantum dots
5) **Future Requirements for Development in Nanotechnology**
   - **a.** Electron Transport at nano–meter scale
   - **b.** Molecular manufacturing
   - **c.** Self–assembly and 'bottom–up' manufacturing
   - **d.** Organic molecules and supramolecular chemistry
   - **e.** Current practice – applications in nano–bio
   - **f.** Drexler–Smalley debate – realistic projections

PART – III

6) **Carbon Nanotube Technologies (CNT)**
   - **a.** From graphite to buckyballs to CNT
   - **b.** Carbon nanotube applications and MWNT
   - **c.** Fabricating carbon nanotubes and nano–wall structures
   - **d.** Key applications of CNT and MWNT

7) **Nanomaterials in Consumer Market**
   - **a.** Electronics, photonics, nano–opto, NEMS
   - **b.** Thin Film applications
   - **c.** Computing technologies – present and future
   - **d.** Nano medicine

8) **Challenges to Nanotechnology**
   - **a.** Skilled and educated workforce
   - **b.** Public and private investment in R&D
   - **c.** Materials risks, e.g., carbon fullerene and CNT waste

Books:

1. Nanotechnology: A Gentle Introduction to Nxt Big Idea: Mark Ratner. Daniel Ratner,Prentice Hall.
2. Nano Technology De Mystified– A Self Teaching Guide: Linda Williams , Dr. Wade Adams, McGraw Professional.
3. Fundamentals of Nanotechnology :Gabor L. Hornyak, John J. Moore, H.F. Tibbals, Joydeep Dutta, Taylor and Francis.
4. Nano Technology: Fundamentals And Applications : Manasi Karkare, I. K. International Pvt Ltd.
5. Fundamentals of Nanotechnology: Hanson.
6. Nano Technology: Lynn E. Foster, Pearson India.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECL-460 WIRELESS SENSORS NETWORK

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Introduction to Wireless Sensor Networks
Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness Advantages of sensor networks, Sensor network applications.

Part II

Topology Control
Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF), GEAR, Connectivity driven, SPAN, ASCENT.

WSN Sensors
Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols & Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address & Name Management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing.

Part III

WSN Platforms & Tools
Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Reference Books:
1. Holger Karl & Andreas Willig, "Protocols & Architectures for Wireless Sensor Networks", John Wiley, 2005.

2. Feng Zhao & Leonidas J. Guibas, —Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

3. Waltenegus Dargie and Christian Poellabauer, —Fundamentals of Wireless Sensor Networks – Theory and Practice‖ , John Wiley and Sons, first edition, 2010.

4. Holger Karl and Andreas Willig, —Protocols and Architectures for Wireless Sensor Networks‖ , John Wiley and Sons, 2007.

B.Tech. (Electronic Communication Systems Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECP–413 **SEMINAR**

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Students are required to give a seminar/presentation along with report on latest topics related to their degree of specialization.

B.Tech. (Electronic Communication Systems Engineering) 8th Semester
(Under Credit Based Continuous Evaluation Grading System)

Semester – VIII

Course Code	**Course Title**	**L**	**T**	**P**
ECE421	Industrial Training	–	–	20

B.Tech. (Electronic Communication Systems Engineering) 8th Semester
(Under Credit Based Continuous Evaluation Grading System)

ECE–421 **INDUSTRIAL TRAINING**

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Students are required to undergo an industrial training of minimum 20 weeks duration and at the end he/ she should give a presentation along with report.