कर्मणैव हि संसिद्धिः
**WARANGAL**

# DEPARTMENT OF
# ELECTRONICS AND COMMUNICATION
# ENGINEERING

**RULES AND REGULATIONS**

**SCHEME OF INSTRUCTION AND SYLLABI**

**of**

## B.Tech. Programs

# NATIONAL  INSTITUTE  OF  TECHNOLOGY
## WARANGAL 506 004

### SCHEME OF INSTRUCTION AND EVALUATION

## B.Tech.  ELECTRONICS AND COMMUNICATION ENGINEERING

### I - Year  I - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | MA101 | Mathematics - I | 4 | 0 | 0 | 4 | BSC |
| 2. | HS101 | English for Communication (or) | 3 | 0 | 2 | 4 | HSC |
|    | ME102 | Engineering Graphics | 2 | 0 | 3 | 4 | OEC |
| 3. | PH101 | Physics                      (or) | 4 | 0 | 0 | 4 | BSC |
|    | CY101 | Chemistry | 4 | 0 | 0 | 4 | BSC |
| 4. | EC101 | Basic Electronics Engg.     (or) | 3 | 0 | 0 | 3 | OEC |
|    | EE101 | Basic Electrical Engineering | 3 | 0 | 0 | 3 | OEC |
| 5. | CE102 | Environmental Studies       (or) | 3 | 0 | 0 | 3 | MDC |
|    | ME101 | Basic Mechanical Engg. | 3 | 0 | 0 | 3 | OEC |
| 6. | CS101 | Problem Solving and Computer Programming       (or) | 4 | 0 | 0 | 4 | OEC |
|    | CE101 | Engineering Mechanics | 4 | 0 | 0 | 4 | OEC |
| 7. | PH102 | Physics Laboratory          (or) | 0 | 0 | 3 | 2 | BSC |
|    | CY102 | Chemistry Laboratory | 0 | 0 | 3 | 2 | BSC |
| 8. | CS102 | Problem Solving and Computer Programming Laboratory     (or) | 0 | 0 | 3 | 2 | OEC |
|    | ME103 | Workshop Practice | 0 | 0 | 3 | 2 | OEC |
| 9. | EA151 | EAA: Games and Sports | 0 | 0 | 3 | 0 | MDC |
| Total | | | 21 | 0 | 11 | 26 | |
|       | | | 20 | 0 | 12 | 26 | |

## I - Year   II - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | MA151 | Mathematics - II | 4 | 0 | 0 | 4 | BSC |
| 2. | ME102 | Engineering Graphics           (or) | 2 | 0 | 3 | 4 | OEC |
|    | HS101 | English for Communication | 3 | 0 | 2 | 4 | HSC |
| 3. | CY101 | Chemistry                    (or) | 4 | 0 | 0 | 4 | BSC |
|    | PH101 | Physics | 4 | 0 | 0 | 4 | BSC |
| 4. | EE101 | Basic Electrical Engineering (or) | 3 | 0 | 0 | 3 | OEC |
|    | EC101 | Basic Electronics Engineering | 3 | 0 | 0 | 3 | OEC |
| 5. | ME101 | Basic Mechanical Engg.        (or) | 3 | 0 | 0 | 3 | OEC |
|    | CE102 | Environmental Studies | 3 | 0 | 0 | 3 | MDC |
| 6. | CE101 | Engineering Mechanics         (or) | 4 | 0 | 0 | 4 | OEC |
|    | CS101 | Problem Solving and Computer Programming | 4 | 0 | 0 | 4 | OEC |
| 7. | CY102 | Chemistry Laboratory          (or) | 0 | 0 | 3 | 2 | BSC |
|    | PH102 | Physics Laboratory | 0 | 0 | 3 | 2 | BSC |
| 8. | ME103 | Workshop Practice             (or) | 0 | 0 | 3 | 2 | OEC |
|    | CS102 | Problem Solving and Computer Programming Laboratory | 0 | 0 | 3 | 2 | OEC |
| 9. | EA151 | EAA: Games and Sports | 0 | 0 | 3 | 0 | MDC |
| **Total** | | | **20** | **0** | **12** | **26** | |
| | | | **21** | **0** | **11** | **26** | |

## II - Year   I - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | MA213 | Complex Variables and Special functions | 4 | 0 | 0 | 4 | BSC |
| 2. | EE236 | Network Analysis | 3 | 0 | 0 | 3 | OEC |
| 3. | EC201 | Electronic Devices and Circuits - I | 4 | 0 | 0 | 4 | PCC |
| 4. | EC202 | Networks and Transmission Lines | 3 | 0 | 0 | 3 | PCC |
| 5. | EC203 | Digital System Design - I | 4 | 0 | 0 | 4 | PCC |
| 6. | EC204 | Signals and Systems | 3 | 0 | 0 | 3 | PCC |
| 7. | EC205 | Electronic Devices and Circuits - I Laboratory | 0 | 0 | 3 | 2 | PCC |
| 8. | EC206 | Electronic Design Automation Laboratory | 0 | 0 | 3 | 2 | PCC |
| **Total** | | | **21** | **0** | **6** | **25** | |

## II - Year  II - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|---|---|---|---|---|---|---|---|
| 1. | CS235 | Data Structures | 3 | 0 | 0 | 3 | OEC |
| 2. | EC251 | Electronic Devices and Circuits - II | 4 | 0 | 0 | 4 | PCC |
| 3. | EC252 | Electromagnetic Fields and Waves | 3 | 0 | 0 | 3 | PCC |
| 4. | EC251 | Digital System Design - II | 4 | 0 | 0 | 4 | PCC |
| 5. | EC254 | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3 | PCC |
| 6. | EC255 | Electronic Devices and Circuits - II    Laboratory | 0 | 0 | 4 | 3 | PCC |
| 7. | EC256 | Digital System Design Laboratory | 0 | 0 | 3 | 2 | PCC |
| 8. | CS236 | Data Structures Laboratory | 0 | 0 | 3 | 2 | OEC |
| | | **Total** | **17** | **0** | **10** | **24** | |

## III - Year  I - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|---|---|---|---|---|---|---|---|
| 1. | SM335 | Engineering Economics and Accountancy | 3 | 0 | 0 | 3 | HSC |
| 2. | EC301 | Pulse Circuits | 4 | 0 | 0 | 4 | PCC |
| 3. | EC302 | Communication Theory | 3 | 0 | 0 | 3 | PCC |
| 4. | EC303 | Linear IC Application | 4 | 0 | 0 | 4 | PCC |
| 5. | EC304 | Antennas & Wave Propagation | 3 | 0 | 0 | 3 | PCC |
| 6. | EC305 | Computer Architecture and Organisation | 3 | 0 | 0 | 3 | PCC |
| 7. | EC306 | Pulse Circuits Laboratory | 0 | 0 | 3 | 2 | PCC |
| 8. | EC307 | IC Applications Laboratory | 0 | 0 | 3 | 2 | PCC |
| | | **Total** | **20** | **0** | **6** | **24** | |

## III - Year  II - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | EC351 | Digital Communications | 3 | 0 | 0 | 3 | PCC |
| 2. | EC352 | Digital Signal Processing | 3 | 0 | 0 | 3 | PCC |
| 3. | EC353 | Microprocessors and Microcontrollers | 4 | 0 | 0 | 4 | PCC |
| 4. | EC354 | Computer Networks | 3 | 0 | 2 | 4 | PCC |
| 5. | | Departmental Elective-I | 3 | 0 | 0 | 3 | DEC |
| 6. | | Open Elective-I | 3 | 0 | 0 | 3 | OEC |
| 7. | EC355 | Communication Systems Lab | 0 | 0 | 3 | 2 | PCC |
| 8. | EC356 | Microprocessors and Microcontrollers Laboratory | 0 | 0 | 3 | 2 | PCC |
| | | **Total** | **19** | **0** | **8** | **24** | |

## IV - Year  I - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | EC401 | Electronic Instrumentation | 3 | 0 | 0 | 3 | PCC |
| 2. | EC402 | Microwave Engineering | 3 | 0 | 0 | 3 | PCC |
| 3. | | Departmental Elective-II | 3 | 0 | 0 | 3 | DEC |
| 4. | | Open Elective - II | 3 | 0 | 0 | 3 | OEC |
| 5. | | Departmental Elective - III | 3 | 0 | 0 | 3 | DEC |
| 6. | | Departmental Elective - IV | 3 | 0 | 0 | 3 | DEC |
| 7. | | Departmental Elective - V | 3 | 0 | 0 | 3 | DEC |
| 8. | EC403 | Electronic Instrumentation and DSP Laboratory | 0 | 0 | 3 | 2 | PCC |
| 8. | EC449 | Project Work Part-A | 0 | 0 | 3 | 2 | PRC |
| | | **Total** | **21** | **0** | **6** | **26** | |

## IV - Year  II - Semester

| S. No. | Course No. | Course Title | L | T | P | Credits | Cat. Code |
|--------|-----------|--------------|---|---|---|---------|-----------|
| 1. | ME435 | Industrial Management | 3 | 0 | 0 | 3 | OEC |
| 2. | EC451 | Optical Fiber Communication | 3 | 0 | 0 | 3 | PCC |
| 3. | | Departmental Elective - VI | 3 | 0 | 0 | 3 | DEC |
| 4. | | Departmental Elective - VII | 3 | 0 | 0 | 3 | DEC |
| 5. | EC452 | Microwave and Optical Communication Laboratory | 0 | 0 | 3 | 2 | PCC |
| 6. | EC491 | Seminar | - | - | - | 1 | MDC |
| 7. | EC499 | Project Work  Part-B | 0 | 0 | 6 | 4 | PRC |
| | | **Total** | **12** | **0** | **12** | **19** | |

## Degree requirements for B.Tech.  Electronics and Communication Engineering

| S. No. | Category of Courses | | Credits offered | | Minimum Credits to be Earned |
|---|---|---|---|---|---|
| 1. | Basic Science Core Credits | BSC | ( $\geq 20$ | 24) | 24 |
| 2. | Other Engineering Core Credits | OEC | ( $\geq 28$ | 36) | 36 |
| 3. | Humanities & Social Science Core Credits | HSC | ( $\geq 07$ | 07 | 07 |
| 4. | Program Core Credits | PCC | ( $\geq 81$ | 89 | 89 |
| 5. | Departmental Elective Credits | DEC | ( $\geq 18$ | 21 | 18 |
| 6. | Open Course Credits | OEC | ( $\geq 6$ | 06 | 06 |
| 7. | Project Credits | PRC | ( $= 6$ | 06 | 06 |
| 8. | Mandatory Credits | MDC | ( $= 04$ | 04 | 04 |
| **Total** | | | **($\geq$ 170)** | **193** | **190** |

### LIST OF ELECTIVES

### III - Year  II - Semester

**Elective-I**

| | |
|---|---|
| EC361 | VLSI Design |
| EC362 | CMOS VLSI Design |
| EC363 | ASIC Design |

### IV - Year II - Semester

**Elective-II**

| | |
|---|---|
| EC411 | Modern Radio Communications |
| EC412 | Software Defined Radio |
| EC413 | Digital TV Engineering |

**Elective-III**

| | |
|---|---|
| EC414 | Image Processing |
| EC415 | Digital Switching and Multiplexing |
| EC416 | Distributed Computing |

**Elective-IV**

| | |
|---|---|
| EC417 | Satellite Communications |
| EC418 | Embedded Systems |
| EC419 | Networks Security |

**Elective-V**

| | |
|---|---|
| EC420 | Low Power VLSI |
| EC421 | Sensor Networks |
| EC422 | Real Time Operating Systems |

### IV - Year  II - Semester

**Elective-VI**

| | |
|---|---|
| EC461 | Cellular and Mobile Communications |
| EC462 | RADAR Engineering |
| EC463 | FPGA Design |

**Elective-VII**

| | |
|---|---|
| EC464 | System Engineering |
| EC465 | Advanced Digital Signal Processing |
| EC466 | PC Based Instrumentation |

# B. Tech.    ELECTRONICS AND COMMUNICATION ENGINEERING

## SYLLABUS

MA101                                **MATHEMATICS - I**                                (4-0-0)4

Rank, Normal form, Inverse of a matrix - solutions of systems of linear equations - Characteristic roots and vectors - Rolle's and Mean value theorems - Expansions - Indeterminate forms- Curve tracing - Partial Differentiation - maxima and minima of functions - solution of first order first degree differential equations - Homogeneous and non-homogeneous linear equations of arbitrary order.

*Reading:*

1.  R.K.Jain and S.R.K.Iyengar, *Advanced Engineering Mathematics,* Narosa Pub. House, 2008.
2.  Erwyn Kreyszig, *Advanced Engineering Mathematics,* 8th Edition, John Wiley and Sons, 2008.
3.  B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications, 2009.


HS101                          **ENGLISH FOR COMMUNICATION**                          (3-0-2) 4

Vocabulary Building - Effective Sentence Construction; Paragraphs- Note-making - Letter-writing - Reading Techniques - Technical Report writing - Book Review; English Sound System - Stress, Rhythm and Intonation - Group Discussions- Listening Comprehension.

*Reading:*

1.  Dept. of Humanities and Social Sciences, Anna University, *English for Engineers and Technologists,* Combined Edition, Vol. 1 and 2, Orient Blackswan, 2008.

2.  Ashraf, M Rizvi. *Effective Technical Communication.* Tata McGraw-Hill, 2006.

3.  Meenakshi Raman and Sangeetha Sharma. *Technical Communication: Principles and Practice 2nd Edition,* Oxford University Press, 2011.


ME102                              **ENGINEERING GRAPHICS**                              (2-0-3)4

Principles of orthographic projections, projections of points, lines, planes and solids, Section of solids, Isometric views, Auto-CAD.

*Reading:*

1.  Bhatt, N.D., *Elements of Engineering Drawing,* Charotar Publishers, 2005.

2.  Sham Tikoo., *Understanding AutoCAD 2002,* Tata McGraw Hill Book Company, New Delhi, 2001.

3.  Lakshminarayanan, V. and Vaishwanar, R.S., *Engineering Graphics including AutoCAD 2002,* Jain Brothers, New Delhi, 2005.

4.  Siddique, A.N., *Engineering Drawing with a Primer on Auto CAD,* Prentice Hall of India, New Delhi, 2004.


CY101                                    **CHEMISTRY**                                    (4-0-0)4

Electrochemistry: Reference electrodes - Ion selective electrodes-Chemically modified electrodes as sensors - Electrochemical energy systems-lithium batteries - Fuel cells Corrosion and its prevention: Molecular Interactions-Molecular orbital theory-self-assembly involving different types of interactions - Chemistry of Nano-materials-Synthesis and applications-Basic Principles of Organic Chemistry-Polymer Chemistry - Thermoplastic and Thermosetting resins - Conducting polymers-Chemical Spectroscopy- Photochemistry.

*Reading:*

1.  P. W. Atkins and Julio de Paula, *Atkins Physical Chemistry I Chemistry,* 7th Edition, Oxford University Press, New York, 2002.

2.  Shashi Chawla, *A Reading of Engineering Chemistry,* 3rd Edition, Dhanpat Rai & Co., New Delhi, 2007.

3.  S. Vairam, P. Kalyani and Suba Ramesh, *Engineering Chemistry,* 1st Edition, John Wiley & Sons, India, 2011.

PH101 **PHYSICS** (4-0-0)4

Interference - Interferometers- Applications; Diffraction- Multiple slits- resolving power- Applications; Polarization - Optical activity- photoelasticity; Lasers - Holography - Applications; Optical Fibers - Sensing; Functional materials - Nano materials; Matter waves, Schrodinger wave equation, Tunneling,  particle accelerators;  Acoustics- Ultrasonics - Applications.

*Reading:*

1.  Halliday, Resnic and Walker, *Fundamentals of Physics,* 9th Edition, John Wiley, 2011.
2.  Beiser.A, Shobhit Mahajan, *Concepts of Modern Physics,* 6th Edition, McGraw Hill, 2009.
3.  Ajoy Ghatak, *Optics,* 5th Edition, TMH, 2012.

EE101 **BASIC ELECTRICAL ENGINEERING** (3-0-0)3

DC Circuits - AC Circuits - Magnetic Circuits - Single Phase Transformers - DC Machines - Three Phase Induction Motor - Measuring Instruments.

*Reading:*

1.  Edward Hughes, *Electrical Technology,* 6th Edition, ELBS, 2001.
2.  Vincent Del Toro, *Electrical Engineering Fundamentals,* 2nd Edition, PHI, 2003.
3.  V N Mittle, *Basic Electrical Engineering,* TMH Edition, 2000.

EC101 **BASIC ELECTRONICS ENGINEERING** (3-0-0)3

Electronic Systems- Transistor and applications- Feedback in Electronic Systems- Integrated Circuits-Digital Circuits - Electronic Instrumentation Principles of Communication.

*Reading:*

1.  Salivahanan, *Electronic Devices and Circuits,* 2nd Edition, Tata McGraw hill, 2011.
2.  Neil Storey, *Electronics: A Systems Approach,* 4th Edition, Pearson Education, 2009.
3.  William David Cooper, *Electronic Instrumentation and Measurement Techniques*, 2nd edition, PHI, 1999.

CE102 **ENVIRONMENTAL STUDIES** (3-0-0) 3

Environmental studies and its importance, Environment and Society, Sustainable development, Global Concerns, Resources,  Ecosystems, Ecological pyramids, Biodiversity,  Environmental Pollution, Nuclear radiation hazards, Solid waste management, Disaster Management, Rain water harvesting, Environmental Acts and Legislation, Environment and human health

*Reading:*

1.  Garg, S.K and Garg, R., *Ecological and Environmental Studies,* Khanna Publishers, Delhi, 2006.
2.  Henry J.G. and Heinke G.W., *Environmental Science and Engineering,* 2nd Edition, Prentice Hall of India, New Delhi, 2004.
3.  Masters G.M., *Introduction to Environmental Engineering and Science,* 2nd Edition, Prentice Hall of India, New Delhi, 2004.

ME101 **BASIC MECHANICAL ENGINEERING** (3-0-0)3

Basic principles of thermodynamics, thermal power plant layout and different components, vapour compression refrigeration, fundamentals of heat transfer, I.C. engines and gas turbines, salient features of an automobile, transmission of power: belt and gear drives, manufacturing processes: casting, welding, Forming and machining.

*Reading:*

1.  Mathur, M.L.,  Mehta, F.S.,  and  Tiwari, R.P., *Elements of Mechanical Engineering*, Jain Brothers, New Delhi, 2011.
2.  Roy, K.P., and Hazra Chowdary, S.K., *Elements of Mechanical Engineering,* Media Promoters and Publishers Pvt. Ltd., 2002.
3.  Rudramoorthy, R., *Thermal Engineering,* Tata McGraw Hill Book Company, New Delhi, 2003.
4.  Hazra Chowdary, S.K. and Bose, *Workshop Technology*, Vol. I and II, Media Promoters and Publishers Pvt. Ltd., 2002.

CS101 **PROBLEM SOLVING AND COMPUTER PROGRAMMING** (4-0-0)4

Introduction to computers - Basics of C++ - Flow of Control- Conditional statements- Loops - Functions - parameter passing-Recursion- types of Variables - Single, Multi-Dimensional Arrays-Pointers and Dynamic Arrays -Multidimensional Dynamic Arrays - C Strings, Standard String Class - I/O Streams, Character I/O - File I/O - Structures and Classes.

*Reading:*

1. Walter Savitch, *Problem Solving with C++*, 6th Edition, Pearson, 2007
2. Cay Horstmann, Timothy Budd, *Big C++*, Wiley, Indian Edition, 2006

CE101 **ENGINEERING MECHANICS** (4-0-0)4

Force and Moment vectors - Degree of freedom - Equilibrium equations- D'Alembert's principle - Dynamic equilibrium of a body- force systems in space - Friction - Analysis of pin jointed plane frames- Centroid and Moment of Inertia- Kinematics and Kinetics of particles - Rectilinear and curvilinear motion- Principle of work and energy - Impulse and momentum- Simple stress strain- Hooke's law- Poisson's ratio - Analysis of axially loaded members.

*Reading:*

1. J.L. Meriam and L.G. Kraige, *Engineering Mechanics,* 7th Edition, John Wiley & Sons, 2012.
2. Timoshenko and Young, *Engineering Mechanics,* 3rd Edition, McGraw Hill Publishers, 2006.
3. Gere and Timoshenko, *Mechanics of Materials*, 2nd Edition, CBS Publishers, 2011.

PH102 **PHYSICS LABORATORY** (0-0-3)2

Newton's rings; $\lambda$ of He-Ne laser; Width of single slit; specific rotation of  sugar solution; RC circuit; LCR resonance circuit; Half Life of a Radioactive substance; Diffraction grating; Numerical aperture and bending losses;  Planck's constant;  Ultrasonic diffraction.

CY102 **CHEMISTRY LABORATORY** (0-0-3)2

Volumetric Analysis: Redox titrations - Complxometric titrations-Instrumental methods of analysis: pH-metry - Potentiometry-Conductometry- Colorimetry - Ion-exchange - Adsorption- Photochemical reduction-Study of rate of corrosion.

*Reading:*

1. A.I. Vogel, *Quantitative Inorganic Analysis,* 6th Edition, 2007.

CS102 **PSCP LABORATORY** (0-0-3)2

Familiarization - Editing - Conditional expressions - Series evaluation - Functions - Recursion - Arrays - Pointers - C-strings  - Strings - File I/O - Formatted Output - Structures, Classes.

ME103 **WORKSHOP PRACTICE** (0-0-3)2

Exposure is given to the student in the following Trades:  Fitting, Welding, Carpentry, Foundry, Power Tools, House Wiring and Machine Shop.

*Reading:*

1. Rajendra Singh, *Introduction to Basic Manufacturing Process and Workshop Technology,* New Age International(P)Ltd. Publishers, 2006.
2. Raghuwanshi, B.S.: *Workshop Technology, Vol.I and II,* Dhanpat Rai & Co. (P) Ltd., 2008.
3. P. Kannaiah and K.L. Narayana, *Engineering Practices Laboratory,* SciTech. Publications, Chennai, 2006.

MA151 **MATHEMATICS - II** (4-0-0)4

Laplace transform -  Inverse Laplace transform - Solution of ODE -  Evaluation of plane areas, volume and surface area of a solid of revolution and lengths - Convergence of Improper integrals - Double and triple integrals - Vector Differentiation - Gradient - Divergence and Curl - Line and surface integrals - Green's theorem, Gauss Divergence theorem, Stokes' theorem.

*Reading:*

1.  R.K.Jain and S.R.K.Iyengar, *Advanced Engineering Mathematics,* Narosa Pub. House, 2008.
2.  Erwyn Kreyszig, *Advanced Engineering Mathematics,* 8th Edition, John Wiley and Sons, 2008.
3.  B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications, 2009.

EC201       **ELECTRONIC DEVICES AND CIRCUITS - I**        (4-0-0) 4

Semiconductors: Review of semiconductor physics, volt-ampere characteristics of P-N junction diodes, Rectifiers, junction transistors, current profiles across the junctions, transistor biasing, Field Effect Transistors: JFET and its characteristics, biasing of FETs, ideal MOS capacitor, threshold voltage, control of threshold voltage, substrate bias effects, capacitance effects, short channel effects. MOSFET: enhancement, depletion modes. Small signal low frequency transistor amplifier circuits analysis.

*Reading:*

1.  Millman and Halkias, *Integrated Electronics,* 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2010.
2.  Ben G.Streetman, *Solid State Electronic Devices,*6th Edition, Prentice-Hall of India, 2006.
3.  Paul Gray and Meyer, *Analysis and Design of Analog Integrated Circuits,* 5th Edition, Wiley India, 2010.

EC202       **NETWORKS AND TRANSMISSION LINES**        (3-0-0)3

Networks: Image and iterative impedances, Lattice network and its parameters, Impedance matching networks, Networks designed for specified phase shift. Filter fundamentals and different types of filters, Composite filters, Resistance Equalizers, Bartlett's Bisection Theorem
Transmission line: Transmission  line equations, Distortion, Characteristics of LF lines, RF lines, lossless lines, reflection coefficient and VSWR, Quarter-wave, half-wave and 1/8 wave lines, Smith chart, Impedance matching with single and double stub, Introduction to strip line

*Reading:*

1.  Johnson - *Networks and  Transmission  Lines,*  McGraw Hill, 1950.
2.  Nathan Ida -  *Engineering Electromagnetics,* 2nd Edition, Springer 2005.
3.  John D. Ryder - *Networks Lines and Fields,* 2nd Edition, Pearson, 2009.

EC203       **DIGITAL SYSTEM DESIGN - I**        (4-0-0) 4

Introduction to Number Systems, Boolean Algebra, Combinational Switching Circuit Design, Sequential Switching Circuit Design, The Algorithmic state Machine approach, Logic families, Memory devices and organization, Implementation Options, Hardware Description Languages: VHDL and Verilog - Introduction.

*Reading:*

1.  Zvi Kohavi and Niraj K. Jha, *Switching and Finite Automata Theory,* 3rd edition, Cambridge University Press, 2010.
2.  Schilling, Herbert Taub and Donald, *Digital Integrated Electronics,* Tata McGraw-Hill, 2008.
3.  Jayaram Bhasker, *A VHDL Primer,* 3rd edition, Prentice-Hall India, 1998.

EC204       **SIGNALS AND SYSTEMS**        (3-0-0)3

Signals and systems, linear time invariant systems, Fourier series representation of periodic signals, continuous time Fourier transform, time and frequency characterization of signals and systems, Discrete time Fourier transform (DTFT), DTFT, DFT, and Z-transform.

*Reading:*

1.  Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, *Signals and Systems,* 2nd Edition, 2009.
2.  John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing, Principles, Algorithms, and Applications,* 4th Edition, PHI, 2007.
3.  Robert A. Gable, Richard A. Roberts, *Signals and Linear System,* John Wiley,1995.

EC205         **ELECTRONIC DEVICES AND CIRCUITS - I LABORATORY**       (0-0-3)2

Static V-I characteristics of PN junction diode and Zener diode, rectifiers: half wave, full wave and bridge rectifiers with and without filters, biasing circuits, FET characteristics and single stage BJT amplifier.

EC206         **ELECTRONIC DESIGN AUTOMATION LABORATORY**       (0-0-3)2

Introduction to spice, different types of analyses: bias point analysis, DC analysis, AC analysis, transient analysis, parametric analysis, Fourier analysis, noise analysis, simple RLC circuit simulation, design and simulation of different amplifier circuits and oscillator circuits, simulation of various digital subsystems using VHDL.

MA237         **COMPLEX VARIABLES AND SPECIAL FUNCTONS**       (4-0-0)4

Analytic functions - Conformal Mapping - linear fractional transformation - complex integration - Taylor's and Laurent's series expansions - evaluation of real integrals using residue theorem - Schwartz- Christoffel transformation - Bessel and Legendre Functions - Cubic Spline functions.

*Reading :*

1.  R.V. Churchill, *Complex Variables and Its Applications,* McGraw Hill, 1960.
2.  S.S. Sastry, *Introductory Methods of Numerical Analysis,* PHI, 2010.
3.  W.W. Bell, *Special Functions for Scientists and Engineers,* Dover Publications, 2004.
4.  Erwin Kreyszig: *Advanced Engineering Mathematics,* John Wiley and Sons, 8th Edition, 2008.

EE236         **NETWORK ANALYSIS**       (3-0-0)3

Circuit elements and relations, network graphs and analysis, time domain analysis, applications of laplace transforms in circuit theory, steady state analysis of circuits for sinusoidal excitations, resonance, network theorems and applications.

*Reading:*

1.  M.E. Van Valkenberg : *Network Analysis,* 3rd Edition, PHI, 2002
2.  Charles A Desoer and Ernest S Kuh: *Basic Circuit Theory*, McGraw Hill, 1969.
3.  M.L. Soni and J.C. Gupta : *A Course in Electrical Circuits Analysis,* Dhanpat Rai & Co.(P), 2001.
4.  G.K. Mithal and Ravi Mittal : *Network Analysis,* Khanna Khanna Pub, 1998.

EC251         **ELECTRONIC DEVICES AND CIRCUITS - II**       (4-0-0) 4

Multistage amplifiers: Analysis of multistage amplifiers, High frequency response of a CE stage, Analysis of difference amplifiers. Feedback amplifiers: Analysis and design of negative feedback amplifiers. Oscillators: Design and analysis of RC phase shift oscillator, Wein bridge oscillators, Hartley, Colpitts and Crystal oscillators. Power amplifiers, Design of heat sink, power output and cross over distortion. Tuned amplifier: Single tuned and double tuned interstage design. Class B and class C tuned power amplifiers.

*Reading:*

1.  J. Millman and Halkias, *Integrated Electronics*, 2nd Edition, TMH, 2010.
2.  J. Millman and A.Grabel, *Micro Electronics,* 2nd Edition, TMH, 2009.

EC252         **ELECTROMAGNETIC FIELDS AND WAVES**       (3-0-0)3

Static Electric field, Static Magnetic field, Comparison of curl and divergence, Inductance, Energy stored in Magnetic field, Maxwell's equations, Plane waves, Polarization of plane waves, Reflection and Transmission of Plane Waves, Guided waves, Wave guides.

*Reading:*

1.  W H Hayt, J A Buck, *Engineering Electromagnetics,* 7th Edition, McGraw Hill Companies, 2006.
2.  Nathan Ida, *Engineering Electromagnetics,* 2nd Edition, Springer, 2005.
3.  Matthew N O Sadiku, *Engineering Electromagnetics,* 4th Edition, Oxford University Press, 2007.

EC253                              **DIGITAL SYSTEM DESIGN - II**                          (4-0-0) 4

Digital system design process, EDA tools and design viewpoints, Hardware description languages: VHDL and Verilog   modelling concepts, Building blocks for digital systems, Design methodology- Synchronous systems. Implementation issues, Power Distribution and noise in digital systems, Timing and Signal conventions and circuits, Introduction to Programmable logic devices.

*Reading:*

1.   William Fletcher, *An Engineering Approach to Digital Design,* 1st Edition, Prentice-Hall India, 1997.

2.   William J Dally and John W Poulton, *Digital Systems Engineering,* Cambridge University Press, 2008.

3.   Jayaram Bhasker, *A VHDL Primer,* 3rd edition, Prentice-Hall India, 2009.

EC254                    **PROBABILITY THEORY AND STOCHASTIC PROCESSES**                (3-0-0)3

Probability, bayes theorem, random variable, random processes, spectral characteristics of random processes, linear systems with random inputs, power density spectrum of the response.

*Reading:*

1.   PZ Peebles JR, *Probability, Random Variables and Random Signal Principles*, MGH, 3rd Edition, 2003.

2.   A Papoulis., *Probability, Random Variables and Random Signal Principles,* MGH, 3rd Edition, 2003.

3.   Stark et al, *Probability, Random Variables and Random Signal Principles,* 3rd Edition Pearson, 2002.

EC255                **ELECTRONIC DEVICES AND CIRCUITS - II LABORATORY**              (0-0-4)3

Single stage BJT amplifier, CE, CB, CC amplifier, design of 2 stage  amplifiers, design of feedback amplifiers, design of RC phase shift oscillator and Wein bridge oscillator, differential amplifier.

EC256                        **DIGITAL SYSTEM DESIGN LABORATORY**                        (0-0-3) 2

Implementation of 32-bit ALU, 32-bit MIPS processor, 32-bit ARM processor using VHDL.

CS235                              **DATA STRUCTURES**                                  (3-0-0) 3

Ordered Lists - Stacks, Queues - Trees - Search Trees - BST, AVL - Hashing - Hash Tables - Priority Queues - Sorting Techniques - Graph Algorithms - Shortest Paths - Spanning Trees.
*Reading:*

1.   Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++,* Pearson, 2nd Edition, 2004.

2.   Alfred V Aho, John E Hopcroft, Jeffrey D Ullman, *Data Structures and Algorithms,* Addison Wesley, 1983.

CS236                        **DATA STRUCTURES LABORATORY**                            (0-0-3) 2

Implementation of ordered lists - Stacks -- Queues - conversion of expressions, evaluation, expression trees - Search Trees - BST - AVL Trees - Sorting algorithms - Graph traversals - Shortest paths - Spanning Trees.

EC301                              **PULSE CIRCUITS**                                  (4-0-0) 4

Linear and non-linear wave Shaping Circuits, Transistor as a switch, Switching times, Transistor multivibrator circuits: Analysis and design of Bistable, Monostable and Astable multivibrator circuits and Schmitt trigger circuit. Bootstrap and Miller sweep circuits, principle of current sweeps. Voltage and current controlled negative resistance switching circuits using Tunnel diode and UJT only, Triggered transistor blocking oscillators: Base timing and Emitter timing, Astable diode controlled and RC controlled.

*Reading:*

1.   Millman and Taub, *Pulse and Digital and Switching Waveforms,* TMH, 2011.

2.   L. Strauss, *Wave Generation and Shaping,* 3rd Edition, TMH, 1995.

3.   D.Bell, *Solid State Pulse Circuits,* 4th Edition, PHI, 2009.

EC302                            **COMMUNICATION THEORY**                              (3-0-0) 3

Communication channels, Transmission of Random Process through an LTI Filter, Noise types, Representation of Narrow Band noise In phase and Quadrature Components,  Noise Figure, Noise Bandwidth, Noise Temperature, Linear modulation schemes, noise in AM receivers, Angle modulation schemes, Noise in FM

receiver, Pulse analog and pulse digital modulation schemes, Noise performance, Source Coding Theorem, Information Capacity Theorem, Huffman Coding.

*Reading:*

1.  S.Haykin, *Communication Systems*, 4th Edition, John Wiley & Sons, Singapore, 2001.
2.  B.P. Lathi, *Modern Digital and Analog Communication Systems,* 3rd Edition, Oxford University Press, 1998.
3.  JG Proakis, *Communication Systems Engineering,* 2nd Edition, PHI, 2003.
4.  Ziemer and Tranter, *Principles of Communications,* 4th Edition, Houghton Mifflin, 1995.

EC303                                **LINEAR IC APPLICATIONS**                                (4-0-0)4

Operational Amplifiers, Linear Applications of OP. Amps, Non Linear Applications OP Amps, Design considerations and applications of 555 Timer IC, 566 VCO IC and 8038 function generator IC, Design considerations and applications of 723 voltage regulator IC, three terminal and Switching regulator ICs, Phase locked loop IC and its typical applications, Active filters, Analogue Multipliers and modulator circuits, ADC/DAC.

*Reading:*

1.  G.B. Clayton, *Operational Amplifiers,* 5th Edition, Newnes, 2003.
2.  Jerald Graeme, *Applications of Operational Amplifiers,* McGraw Hill, 1973.

EC304                            **ANTENNAS AND WAVE PROPAGATION**                            (3-0-0)3

Radiation, Antenna  theorems, Two element array, linear array, multiplication of patterns, effect of earth on vertical patterns, mutual impedance effects, Binomial arrays, Travelling wave radiators, Rhombic antennas, V.H.F. and U.H.F. antennas, Special Antennas, Antenna Measurements, Propagation of Radio waves.

*Reading:*

1.  E.C. Jordan and K.G. Balmain,  *Electromagnetic Waves and Radiating Systems,* 2nd Edition, PHI, 2007.
2.  J.D. Kraus, R.J. Marhefka and Ahmad S Khan, *Antennas and Wave Propagation*, 4th Edition, McGraw Hill, 2010.
3.  A. R Harish and M. Sachidananda, *Antennas and Wave Propagation,* Oxford University Press, KRAUS, Antennas - McGraw Hill, 2011.

EC305                        **COMPUTER ARCHITECTURE AND ORGANISATION**                        (3-0-0)3

Architecture and organization, CPU design, Instruction set design methodologies and Performance Metrics, Control unit design using microprogramming, Assembly language programming, Design of ALU and floating point processor, Memory and memory organization, m-level Memory hierarchy, Virtual Memory, Peripherals and Interfaces, input/output data transfer methods, Multiprocessor Architectures

*Reading:*

1.  William Stallings, *Computer Organization and Architecture*, 8th Edition, Prentice-Hall India, 2010.
2.  David A Patterson and John L. Hennesey, *Computer Organization and Design*, 4th Edition, Elsevier India, 2011.
3.  Andrew S Tanenbaum and James R Goodman, *Structured Computer Organization,* 5th Edition Prentice Hall India, 2009.

EC306                            **PULSE CIRCUITS LABORATORY**                            (0-0-3) 2

RC circuits, Clippers, Clampers, Bistable, Monostable and Astable multivibrators, Schmitt trigger, Bootstrap sweep circuits, Characteristics of UJT.

EC307                            **IC APPLICATIONS LABORATORY**                            (0-0-3) 2

OP Amp parameters and its applications, OP Amp  multivibrators - Astable, Monostable multivibrators, RC Active filters, 555 Timer IC  applications, 565 PLL  IC  applications, 723 Voltage regulator IC applications, 566 and 8038 ICs applications,  NAND  gate characteristics, Adders,  Subtractors, Code converters using gate ICs,  74138 Decoder IC, 746153 MUX  IC, 7483&86  4 bit binary addition/subtraction, 7474, 7476 FFICs, 7490,92,190,193 counters, 7495, 7498, 74195, 74198 shift registers.

SM335        **ENGINEERING ECONOMICS AND ACCOUNTANCY**        (3-0-0)3

Basic concepts of national income, inflation, economic policies, financial accounting, preparation of cost sheet, concepts of financial management and smart investment.

*Reading:*

1. Henry M.S., *Engineering Economics Principles,* McGraw Hill Publishers, 2011.

2. Jain and Narang, *Accounting,* Kalyani Publishers, 2011.

EC351        **DIGITAL COMMUNICATIONS**        (3-0-0)3

Basic signal processing operations in Digital communications, Detection of known signals in noise, Correlation receiver, Matched filter receiver, Estimation, Discrete PAM signals, Nyquist criterion for zero ISI, Adaptive equalizers, Baseband M-ary PAM, Digital modulation formats, M-ary modulation techniques, Linear block Codes, Cyclic Codes, Convolutional Codes and Trellis Codes.

*Reading:*

1. S.Haykin, *Digital Communications,* John Wiley & Sons, 2009.

2. B.Sklar, *Digital Communications*, 2nd Edition, Pearson Education, New Delhi, 2009.

3. John G.Proakis, *Digital Communications*, 3rd Edition, McGraw Hill, 1995.

EC352        **DIGITAL SIGNAL PROCESSING**        (3-0-0) 3

Discrete Fourier transforms (DFT), digital filter structures, design of digital filters, analysis of finite word length effects, multirate DSP, DSP processors.

*Reading:*

1. John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing, Principles, Algorithms, and Applications,* 4th Edition, PHI, 2007.

2. Sanjit K Mitra, *Digital Signal Processing: A Computer-Based Approach,* 3rd Edition, McGraw-Hill.

EC353        **MICROPROCESSORS AND MICROCONTROLLERS**        (4-0-0)4

Introduction to 8-bit, 16-bit and 32-bit microprocessors, 80X86 Architecture and programming concepts, Assembler directives, System hardware, Memory Interfacing, Peripheral Devices, Intel 8051 microcontroller, Interfacing with keyboards, LEDs, 7 segment displays, LCDs, Interfacing with ADCs and DACs, and stepper motors.

*Reading:*

1. Douglas V.Hall, *Microprocessor and Interfacing,* 2nd Edition, TMH, 2006

2. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D Mc Kinlay, *The 8051 Microcontroller and Embedded Systems Using Assembly and C,* 2nd Edition, Pearson Education, 2008.

3. Barry B.Brey, *Intel Micro Processors-(8086 to Pentium),* 8th Edition, Pearson Education, 2008.

EC354        **COMPUTER NETWORKS**        (3-0-2) 4

Introduction to Networks, Direct Link Networks, Local Area Networks, Packet Switching, Internetworking, The Internet Protocol (IPv6), End-to-End Protocols, Domain Naming and Hierarchies, Control Networks, Network Security, Applications.

*Reading:*

1. Tanenbaum, *Computer Networks,* 4th Edition, Prentice-Hall India, 2010.

2. Behrouz A Forouzan, *Data Communications and Networking,* 4th Edition, McGraw-Hill. 2004.

3. William Stallings, *Data and Computer Communications,* 8th Edition, PHI, 2007.

EC355        **COMMUNICATION SYSTEM LABORATORY**        (0-0-3)2

Amplitude modulation, Frequency modulation generation and detection, AM and FM transmitter and receiver, FDM, Analog Signal Sampling and Reconstruction, TDM, PCM, DM/ADM, PWM/PAM/PPM-Generation and detection, Data Conditioning and Reconditioning, QPSK/DQ, PSK generation and detection, CRC encoder and decoder, Simulation of Communications.

EC356 **MICROPROCESSORS AND MICROCONTROLLERS LABORATORY** (0-0-3) 2

Assembly language program on addition, multiplication, sorting, block move, Ram test, Rom test, Factorial of N-numbers.

Assembly language program to interface Hex Keypad Module, SSD module, ADC/DAC, real time clock, DC motor, Traffic light, Temperature transducer, LCD, Elevator, stepper motor, Dual DAC.


EC401 **ELECTRONIC INSTRUMENTATION** (3-0-0) 3

Static and dynamic characteristics of instruments, Different analyzers, Analog and Digital Multimeters, Digital frequency meter, Impedance Measurement instruments, Noise and Interference reduction techniques in measurement systems, study of different types of oscilloscope, Transducers, Introduction to Data Acquisition systems, GPIB.

*Reading:*

1. Oliver and Cage, *Electronic Measurements and Instrumentation,* 2nd Edition, McGraw Hill, 2010.
2. W.D.Cooper and Felbrick, *Electronic Instrumentation and Measurements Techniques,* 2nd Edition, PHI, 2009.
3. H S Kalsi, *Electronic Instrumentation,* 3rd Edition, McGraw Hill. 2011.


EC402 **MICROWAVE ENGINEERING** (3-0-0) 3

Introduction to and applications of microwaves, Microwave Tubes, Travelling Wave tube amplifier, backward wave oscillator, Cavity magnetron and crossed field amplifier, Microwave solid state devices, Introduction to MMICs, Microwave components, Microwave circuits, Scattering matrix and its properties, Power measurement, VSWR and impedance measurement, Reflectometers.

*Reading:*

1. S.Y. Liao - *Microwave Devices and Circuits*, 4th Edition, Prentice Hall of India, 2002
2. G.P. Srivastava and V.L. Gupta, *Microwave Devices and Circuit Design*, 1st Edition PHI, 2009.
3. R.E.Collin - *Foundations for Microwave Engineering,* 2nd Edition, McGraw Hill, 2011.


EC403 **ELECTRONIC INSTRUMENTATION AND DSP LABORATORY** (0-0-3)2

Measurement of angular displacement, speed, weight, temperature using various transducers, Study of DMM, digital storage oscilloscope, Generation of various waveforms using arbitrary waveform generator, experiments based on course EC352 using C, MATLAB and DSP kits.


EC451 **OPTICAL FIBER COMMUNICATION** (3-0-0) 3

Overview of Optical Communications, Optical Fibers, Signal Degradation, International standards, Review of Optical Sources, Review of Photo detectors, structures for InGaAs APDs, Temperature effect on avalanche gain, Optical receiver, Introduction to optical amplifiers (EDFA), Overview of WDM, Passive optical couplers, Isolators and Circulators.

*Reading:*

1. G.Keiser, *Optical Fiber Communications,* TMH, 4th Edition, 2008.
2. J. Gowar, *Optical Communication Systems,* PHI, 2nd Edition, 1993.


EC452 **MICROWAVE AND OPTICAL COMMUNICATION LABORATORY** (0-0-3)2

Mode characteristics of Reflex klystron oscillator, Gunn oscillator characteristics, impedance measurement, antenna pattern measurement, measurement of scattering parameters of reciprocal and non-reciprocal microwave components measurement of numerical aperture, length of the fiber, eye pattern, bit error rate, study of network analyzer.

ME435                                 **INDUSTRIAL MANAGEMENT**                     (3-0-0)3

Management theory and practice: functions of management; Hawthorne Experiments, leadership styles and motivational theories. Marketing management: Marketing management process, product life cycle and marketing strategies. Operations management: Productivity and work study, operations strategy, statistical process control, Taguchi's parametric design, Quality function deployment, Introduction to TQM and ISO 9000. inventory costs, ABC classification, EOQ, P and Q inventory systems. Project management: project planning and feasibility analysis, project scheduling methods.

*Reading:*

1. Koontz., H. et al., *Essentials of Management,* 7th Edition, McGraw Hill Book Company, New York, 2007.
2. Philip Kotler., *Marketing Management,* 13th Edition, Prentice Hall of India/Pearson, New Delhi, 2009.
3. Chase, Shankar, Jacobs and Aquilano, *Operations and Supply Management,* 12th Edition, Tata McGraw Hill, New Delhi, 2010.

## ELECTIVE COURSES

EC361                                  **VLSI DESIGN**                         (3-0-0)3

Review of micro electronics and introduction to MOS technology, Introduction to IC technology, MOS technology and VLSI, basic MOS transistor, fabrication of NMOS, CMOS and BiCMOS transistors, thermal aspects of processing MOS AND BICMOS, Basic Circuit Concepts, Scaling of MOS Circuits, Subsystem Design And Layout, Basic CMOS Analog IC Building Blocks, System Design And Design Methods, CMOS Testing.

*Reading:*

1. Douglas A. Pucknell and Kamran Eshraghian, *Basic VLSI Design,* 3rd Edition, Prentice Hall of India Pvt. Ltd., 1994.
2. Neil H.E.Weste and Kamran Eshraghian, *Principles of CMOS VLSI Design,* 2nd Edition, Addison Wesley Publishing company, 2000.

EC362                              **CMOS VLSI DESIGN**                     (3-0-0)3

MOS Transistor Theory, CMOS Processing Technology, Delay, Power, Interconnect, Robustness, Circuit Simulation, Combinational circuit Design, Sequential circuit Design, Data path subsystems, Array subsystems, Design Methodology and Tools, Testing, Debugging and Verification.

*Reading:*

1. Neil H. E. Weste, David Money Harris, *CMOS VLSI Design - A Circuits and Systems Perspective*, Addison-Wesley, 2011.
2. Jan M RABAEY, *Digital Integrated Circuits,* 2nd Edition, Pearson Education, 2003.

EC363                                 **ASIC DESIGN**                         (3-0-0) 3

Introduction to ASICs, CMOS Logic, ASIC Library design, Programmable ASIC Logic Cells, Programmable ASIC I/O Cells, Programmable ASIC Interconnects, ASIC Design Software, Low level Design Entry, Logic Synthesis and Simulation, ASIC Construction, Floor Planning and Placement, Routing.

*Reading:*

1. Michael John, Sebastian Smith: *Application Specific Integrated Circuits,* Addison Wesley Publishing Company 1997.
2. Elaine Rhodes: *ASIC Basics,* Lulu, 2005.

EC411                      **MODERN RADIO COMMUNICATIONS**               (3-0-0) 3

Elements of a Communication Systems, FM Modulators, FET Phase Modulator, Foster-Seeley FM Discriminator, Ratio Detector, AM Transmitter, FM Transmitter, SSB Transmitter, TRF Radio Receiver, Super heterodyne Receiver, Image Frequency, AGC, SSB Transceiver, Special Features in Communication Receiver, Digital Radio, Television Broadcasting, TV Channels, TV Scanning, Indian TV Standards, composite video Signal, Functional blocks and operational aspects of each block of TV transmitter and receiver, CCD cameras, color TV display systems, Digital TV technology, HDTV systems.

*Reading:*

1. Louis E Frenzil, *Communication Electronics: Principles and Applications,* 3rd Edition, MGH, 2001.
2. George Kennedy and Bernard Davis, *Electronic Communication Systems,* TMH, 4th Edition, 2000.
3. BernardGrob, *Basic Television and Video Systems,* 6th Edition, MGH, Singapore, 2000.

EC412       **SOFTWARE DEFINED RADIO**        (3-0-0)3

Software radio concepts, design principles, receiver front end topologies, noise and distortion in RF chain, digital generation of signals, common ADC and DAC architectures, object oriented software radios, Transmitter configuration, Digital compensation for analog I/O modulator errors, Direct digital synthesizers, recursive oscillator, CORDIC algorithm, pulse shaping and interpolation filters, resampling, DDS with tunable DSM, digital quad modulator, transmitter and receiver architectures, power amplifier, switches, components, technology and modeling, case studies in software radio design.

*Reading:*

1. Jouko Vanakka, *Digital Synthesizers and Transmitter for Software Radio*, Springer, 2005
2. A.A. Abidi et al, *ICs for Wireless Applications,* IEEE Press, 1999.

EC413       **DIGITAL TV ENGINEERING**        (3-0-0)3

Introduction, Digital Television Transmission standards, Performance objectives, Channel coding and modulation, Transmitters, Radio frequency systems, transmission lines, Transmitting antennas, radio wave propagation, Test and measurement.

*Reading:*

1. Modern Television Practice, *Principles, Technology and Servicing,* R.R. Gulati, 2nd Edition, New Age International Publishers, 2002.
2. Gerald W. Collins, *Fundamentals of Digital Television Transmission,* John Wiley, 2001.

EC414       **IMAGE PROCESSING**        (3-0-0)3

Digital Image Representation, Fundamental Steps in Image Processing, Arithmetic and Logic Operations, Edge Linking, Boundary Detection, Thresholding, Region Growing, Region Splitting, Chain Codes, Polygonal Approximations, Signatures, Skeleton, Boundary Descriptors, Shape Numbers, Fourier descriptors, Moments, Topological Descriptors, Image Analysis, Pattern and Pattern Classes, Minimum Distance Classifier, Baye's Classifier, Neural Network Training, Structural methods.

*Reading:*

1. RC Gonzalez and RE Woods, *Digital Image Processing,* Pearson Education, 2000.
2. B. Chanda, D. Dutta Majumder, *Digital Image Processing and Analysis,* PHI, 2000.
3. A.K. Jain, *Fundamentals of Digital Image Processing*, PHI, New Delhi, 2001.

EC415       **DIGITALSWITCHING AND MULTIPLEXING**        (3-0-0)3

Basics of multiplexing, frequency division multiplexing, wave division multiplexing, time division multiplexing, Basics of switching system, implementation complexity of the switches, blocking probability analysis of multistage switches, signaling principles, Traffic Analysis, Erlang-B formula, Erlang-C formula, M/G/1 model.

*Reading:*

1. Marion Cole, *Introduction to Telecommunications: Voice Data and the Internet*, 2nd Edition, Pearson Education, 2002.
2. John C Bellamy, *Digital Telephony,* 3rd Edition, Wiley India (P) Ltd., 2009.

EC416       **DISTRIBUTED COMPUTING**        (3-0-0) 3

A model of distributed computations, Logical and physical times and clock synchronization, Global state and snapshot recording algorithms, Message ordering and Group Communication, Termination Detection Algorithms, Distributed mutual exclusion algorithms, Deadlock detection in distributed systems, Distributed shared memory, Check pointing and rollback recovery, Consensus and agreement algorithms, Failure detectors.

*Reading:*

1. Ajay D. Kshemakalyani, Mukesh Singhal, *Distributed Computing,* Cambridge University Press, 2008
2. Andrew S. Tanenbaum, Maarten Van Steen, *Distributed Systems - Principles and Paradigms,* PHI, 2004.

EC417                                **SATELLITE COMMUNICATIONS**                          (3-0-0)3

Orbital mechanics, Satellite system, Satellite link design, multiple access, VSAT and LEO systems.

*Reading:*

1. Timothy Pratt Charles Bostian Jermey Allnutt, *Satellite Communi-cations,* 2nd Edition, John Wiley, 2003.
2. M.Ricchraia, *Satellite Communication Systems,* 2nd Edition, BS Publishers, 2002.
3. Tri T.Ha, *Digital Satellite Communications*, 2nd Edition, Tata McGraw-Hill, 2009.

EC418                                    **EMBEDDED SYSTEMS**                                  (3-0-0)3

Embedded Systems Overview, ARM, and Intel Atom Processor architecture and memory organization, Basic protocol concepts of RS232, USB, CAN, I2C, SPI, Firewire, IrDA, IEEE 802.11, Bluetooth, State Machine and concurrent Process Models, Program Design and Analysis, Hardware /software partitioning, compilers for DSP, multimedia, VLIW processors, Voltage scaling and Power management, Design flows and tools such as Ptolemey II and Spec C.

*Reading:*

1. Wayne Wolf, *Computers as Components,* 2nd Edition, Morgan Kaufmann Publisher, 2008
2. Peter Marwedel, *Embedded System Design,* 2nd Edition, Springer, 2010
3. Frank Vahid and Tony Givargis, *Embedded System Design*, 3rd Edition, Wiley, 2009
4. David E. Simon, *An Embedded Software Primer,* 1st Edition, Pearson, 2007.

EC419                                    **NETWORKS SECURITY**                                 (3-0-0) 3

Fundamentals of Network Security, Secure channels via encryption, Block ciphers and encryption modes, Message Authentication Codes, Stream Ciphers, Authentication mechanisms, The birthday paradox and applications, Kerberos, Public key cryptography, Public key infrastructure, RSA scheme, SSL scheme, IPSEC scheme, IPSEC, IKE scheme, Insertion, Evasion and Denial of Service, Malware, Spyware, Risk ware, and Spam, Cyber Crime and Cyber Criminals Privacy and Cyberspace Law.

*Reading:*

1. Kaufman, Perlman and Speciner, *Network Security: Private Communication in a Public World,* Prentice Hall, 2nd Edition, 2002.
2. William Stallings, *Network Security: Principles and Practice,* 3rd Edition, Pearson, 2003

EC420                                      **LOW POWER VLSI**                                   (3-0-0) 3

Low power CMOS VLSI design: Introduction, sources of power dissipation, designing for low power, physics of power dissipation in CMOS FET devices, Power estimation, synthesis for low power, Design and test of low-voltage CMOS circuits, Low power static RAM architectures, Low energy computing using energy recovery techniques. Software design for low power.

*Reading:*

1. Kaushik Roy, Sharat C Prasad, *Low Power CMOS VLSI Circuit Design,* Wiley Student Edition, 2009.
2. Jan M Rabaey, *Digital Integrated Circuits,* 2nd Edition, Pearson Education, 2003.

EC421                                      **SENSOR  NETWORKS**                                (3-0-0) 3

Introduction to sensor networks and its applications, unique constraints and challenges, deployment and configuration, localization, coverage and connectivity, radio characteristics, issues  and classification of MAC protocols, MAC protocols, scheduling sleep cycles, data gathering, tree construction algorithms and analysis, issues and classification of routing protocols, routing protocols, Deployment of sensor network, Sensor tasking and control, collaborative signal processing, Transport layer and security protocols, Sensor Network Platforms and Tools, Berkley Motes, Sensor network programming challenges and simulators.

*Reading:*

1. Holger Karl and Andreas Willig, *Protocols and Architectures for Wireless Sensor Networks,* WILEY, 2007
2. C. Siva Ram Murthy and B. S. Manoj, *Adhoc Wireless Networks: Architectures and Protocols,* Prentice Hall, 2004.
3. Feng Zhao and Leonidas J. Guibas, *Wireless Sensor Networks: An Information Processing Approach,* Elsevier, 2004.

EC422                      **REAL TIME OPERATING SYSTEM**                      (3-0-0)3

Introduction to Real Time (RT) system Architecture, RT Software Implementation, RT - system analysis, Board Support Package, RTOS Architecture, Interrupts, Tasks for Concurrency, Task synchronization, Inter task communication, Timers and system clock.

*Reading:*

1. Colin Walls, *Building a Real Time Operating System: RTOS from the Ground Up,* Elsevier Science, 2009.
2. Jesse Russel, Ronald Cohn, *Real Time Operating System,* Bookvika Publishing, 2012.

EC461                   **CELLULAR AND MOBILE COMMUNICATIONS**                   (3-0-0)3

A Basic Cellular System, Why Cellular Mobile Telephone Systems, Service Quality, Mobile Radio Transmission Medium, Mobile Fading, Delay Spread and Coherence Bandwidth, Operation of Cellular Systems, Hexagonal Shaped Cells, Analog and Digital Cellular Systems. Elements of Cellular Mobile Radio System Design, Ell Coverage for Signal and Traffic, Cell Site and Mobile Antennas, Co-channel Interference (CCI) Reduction, Frequency Management and Channel Assignment, Hands Offs and Cell Splitting, Digital Cellular Networks.

*Reading:*

1. William C Y Lee, *Mobile Cellular Telecommunications,* 2nd Edition, MGH, 2004
2. T.S.Rappaport, *Wireless Communications: Principles and Practice,* 2nd Edition, Pearson Education Asia, 2010.
3. R Steele, *Mobile Radio Communication,* 2nd Edition, John Wiley, 1999.

EC462                         **RADAR ENGINNERING**                         (3-0-0)3

Radar and Radar Equation, Doppler Effect, CW Radar, FM - CW radar, altimeter, Multiple Frequency Radar, Pulse Radar, Pulse Doppler Radar, Tracking Radar, RADAR System Design, Matched Filter, Detector Characteristics, Phased Arrays, Advantages and Limitations Navigational Aids.

*Reading:*

1. M.I. Skolnik, *Introduction Radar Systems,* McGraw Hill Book Co., Fourth Edition, 2001.
2. G.S.N. Raju, *Radar Engineering and Fundamentals and Navigational Aids,* I.K. International, 2008
3. Simon Kingsley and Shaun Quegan, *Understanding Radar Systems,* SciTech Publishing, 1999.

EC463                           **FPGA DESIGN**                           (3-0-0)3

Architecture vs organization, Design styles, Implementation styles, Design Examples using programmable logic devices, Design of Universal block. Design of memory, Floating point multiplier, Barrel shifter, Special purpose Processors - Xilinx Vertex and Spartan - II; Altera FLEX 10k and other architectures. Design of parameterized library cells, Implementation and Testing- Xilinx,Actel and Altera FPGA based systems. Design - Case study.

*Reading:*

1. John V.Old Field, Richrad C.Dorf, *Field Programmable Gate Arrays,* John Wiley1995.
2. Michel John Sebastian Smith: *Application Specific Integrated Circuits,* Pearson, 1997.

EC464                        **SYSTEMS ENGINEERING**                        (3-0-0)3

Foundations of system engineering, Concept Development Stage, Engineering Development stage, post-development stage, special topics.

*Reading:*

1. Alexander Kossiakoff, William N Sweet, *Systems Engineering Principles and Practice,* 2nd Edition, John Wiley & Son, 2011.

EC465       **ADVANCED DIGITAL SIGNAL PROCESSING**       (3-0-0) 3

Linear Prediction and Optimum linear filters, Power spectrum estimation, Adaptive Filter theory, Discrete cosine transforms (DCTs), Discrete sine transforms (DSTs), KL transforms, Hadamard transforms, Walsh transforms and Wave let transforms, Applications of DCTs and Wavelets.

*Reading:*

1. JG Proakis and DG Manolakis, *DSP - Principles, Algorithms and Applications,* 3rd Edition, PHI, 2001.
2. S.Haykin, *Adaptive Filter Theory,* 2nd Edition, Prentice Hall, 2001.
3. Janes V.Candy, *Signal Processing: The Model Based Approach,* McGraw Hill Book Company, 1987.

EC466       **PC BASED INSTRUMENTATION**       (3-0-0)3

Introduction, Hardware Overview, Operating System, Bus Standards, Study of Standard I/O Controller Cards, Additional Hardware, A Case Study.

*Reading:*

1. Dexter Arthur L., *The Microcomputer Bus Structures and Interface Design,* Marcel Dekker, 1986.
2. Friedhelm Schmidt: *The SCSI Bus and IDE Interfaces*, Addison Wesley Pub. Co., 1997.
3. Tom Shanley, Don Anderson: *PCI System Architecture*, 3rd Edition, Adison Wesley Pub. Co., 1999.

## OPEN ELECTIVES

CE390       **ENVIRONMENTAL IMPACT ASSESSMENT**       (3-0-0)3

Environment and its interaction with human activities Environmental imbalances, Concept of Environmental Impact Assessment (EIA), Environmental Impact Statement, EMP, Environmental Indicators Environmental issues of developmental projects, Environmental Issues in Industrial Development, Environmental impact of Highways, Mining and Energy development, Methodologies.

*Reading:*

1. Jain, R.K., Urban, L.V., Stracy, G.S., *Environmental Impact Analysis,* Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., *Environmental Impact Assessment,* McGraw Hill Pub. Co., New York, 1996.

EE390       **LINEAR CONTROL SYSTEMS**       (3-0-0)3

Introduction - control system, types, feedback and its effects-linearization Mathematical Modelling of Physical Systems. Block diagram Concept and use of Transfer function. Signal Flow Graphs- signal flow graph, Mason's gain formula. Time Domain Analysis of Control Systems - BIBO stability, absolute stability, Routh-Hurwitz Criterion. P, PI and PID controllers Root Locus Techniques - Root loci theory, Application to system stability studies. Frequency Domain Analysis of Control Systems - polar plots, Nyquist stability criterion, Bode plots, application of Bode plots.

*Reading:*

1. B.C. Kuo, *Automatic Control Systems*, 7th Edition, Prentice Hall of India, 2009.
2. I.J. Nagarath and M. Gopal: *Control Systems Engineering*, 2nd Edition, New Age Pub. Co. 2008.

ME390       **AUTOMOTIVE MECHANICS**       (3-0-0)3

Automotive Engine Types and Classification, Engine Construction, Transmission System, Steering System, Suspension System, Fuel Injection System, Carburettors, Ignition System, Cooling System, Lubrication System, Fuel Feed System, Engine Testing and Performance, Emission Control System, Automotive electrical and Electronic Equipment, Engine Service System.

*Reading:*

1. Crouse, W. H., *Automotive Mechanics,* TMH, 2006.
2. Heitner Joseph, *Automotive Mechanics: Principles And Practices,* 2nd Edition, CBS Publishers, 2002.
3. James E. Duffy, *Modern Automotive Technology,* Goodheart-Wilcox Publisher, 2009.

ME391            **ROBUST DESIGN**            (3-0-0)3

Fundamental of Experimentation, Simple comparative experiments, Experiments with single factor, ANOVA, Factorial and Fractional Factorial experiments, Orthogonal Arrays, Response Surface Methodology, and Taguchi's Parameter Design.

*Reading:*

1. Ross P.J., *Taguchi Techniques for Quality Engineering,* McGraw-Hill Book Company, New York, 2008.
2. Montgomery D.C., *Design and Analysis of Experiments,* 7th Edition, John Wiley & Sons, New York, 2008.

ME392            **ENTREPRENEURSHIP DEVELOPMENT**            (3-0-0)3

Entrepreneurship and Factors Affecting Entrepreneurial Growth. Role and qualities of entrepreneurs. Entrepreneurial development process and motivation, Small Enterprises, Sources of Finance; Identification of opportunities - Product planning and Development; Financial, Marketing and Project Management; Project Formulation - Techno-economic Feasibility, Business plan, Business Laws.

*Reading:*

1. G.G. Meredith, R.E. Nelson and P.A. Neek, *The Practice of Entrepreneurship*, ILO, 1982.
2. Desai, Vasant, *Management of Small Scale Enterprises,* Himalaya Publishing House, 2004.
3. *A Handbook for New Entrepreneurs* - Entrepreneurship Development Institute of India, Ahmedabad, 1989.

MM 390            **METALLURGY FOR NON-METALLURGISTS**            (3-0-0)3

Structure of Metals and Alloys, Mechanical Properties and strengthening mechanisms, discovering metals-overview of metals, modern alloy production, fabrication and finishing of metal products, testing and inspection of metals, quality, steel products and properties, cast irons, heat treatment, tool steels and high speed steels, stainless steels, nonferrous metals, corrosion, durability of metals and alloys, the materials selection process.

*Reading:*

1. M.F. Ashby: *Engineering Materials,* 4th Edition, Elsevier, 2005.
2. R Balasubramaniam (Adapted): *Callister's Materials Science and Engineering,* 7th Edition, Wiley India (P) Ltd, 2007.
3. Reza Abbaschian, Lara Abbaschian, R E Reed-Hill: *Physical Metallurgy Principles,* Affiliated East-West Press, 2009.
4. V Raghavan: *Elements of Materials Science and Engineering - A First Course,* 5th Edition, PHI Publications, 2006.

CH390            **NANOTECHNOLOGY AND APPLICATIONS**            (3-0-0)3

Introduction to nano sizes & properties, Quantum Mechanics, Chemical Kinetics at nanoscale, Nanomaterials: Fabrication, Nanomaterials: Characterization, Applications in electronics, Applications in chemical engineering, Nanobiology.

*Reading:*

1. Stuart M. Lindsay, *Introduction to Nanoscience,* Oxford University Press, 2009.
2. Sulabha K. Kulkarni, *Nanotechnology: Principles and Practices,* Capital Publishing Company, 2007.
3. Robert Kelsall, Ian Hamley, Mark Geoghegan, *Nanoscale Science and Technology,* John Wiley & Sons, 2005.

CH391            **INDUSTRIAL SAFETY AND HAZARDS**            (3-0-0)3

Introduction-Toxicology-Relative toxicity-Industrial hygiene-Source models-Toxic release and dispersion models-Design basis-Pasquill-Gifford model-Fires and Explosions-The fire triangle-Sprays and Mists-Designs to prevent fires and explosions-Introduction to reliefs-Relief systems-Relief sizing-Process Hazards-Identification-Risk Assessment-Fault trees-Accident investigations-Layered investigations-Investigation Summary-Case Studies - System designs.

*Reading:*

1. D. A. Crowl and J.F. Louvar, *Chemical Process Safety (Fundamentals with Applications),* Prentice Hall, 2011.

2. R.K. Sinnott, Coulson & Richardson's *Chemical Engineering,* Vol. 6, Elsevier India, 2006.

CS390                **OBJECT ORIENTED PROGRAMMING**          (3-0-0)3

Object Oriented Thinking - Messages and Methods - OO Design - Software Components - Design Paradigms - Inheritance - Mechanisms for software reuse - Polymorphism - AWT Class - Input output Streams - Design Patterns - Exception handling.

*Reading:*

1. Timothy Budd, *Understanding Object Oriented Programming with Java,* Pearson Education, 1999

2. Herbert Schildt, *Java 2 Complete Reference*, 5th Edition, TMH, 2010.

BT390                      **GREEN TECHNOLOGY**               (3-0-0)3

Biomass energy, sources, uses, science and engineering aspects of Biomass energy, biomass electricity, production, storage and uses of biomass fuels. Market Barriers of Biomass fuels, Biomass fuel Standardization. Biomass fuel Life Cycle, Sustainability of Biomass fuels, Economics of Biomass fuels, Consideration of Co-Products.

*Reading:*

1. Ayhan Demirbas, *Green Energy and Technology,* Biofuels, *Securing the Planet's Future Energy Needs,* 1st Edition, Springer, 2009.

2. Jay Cheng, *Biomass to Renewable Energy Processes,* 1st Edition, CRC Press; 2009.

3. Samir K. Khanal, Rao Y. Surampalli, Tian C. Zhang, Buddhi P. Lamsal, R. D. Tyagi, C. M. Kao, *Bioenergy and Biofuel from Biowastes and Biomass,* 1st Edition, American Society of Civil Engineers, 2010.

SM 390                 **MARKETING MANAGEMENT**            (3-0-0)3

Nature and Scope of Marketing; Major Market oriented strategic planning. Corporate Mission and Vision. Concepts of strategic business units. BCG matrix and GE model; SWOT Analysis. Analyzing needs and trends in Macro environment. Marketing Information systems. Consumer Behavior and STP concept. New Product development process, product Life cycle, product and Branding Strategy, products mix and line decisions Brand decisions - Building brand.Pricing - Strategies and programmes, Marketing Channels - Distribution channels, Channel Design and Management decisions. Retailing Wholesaling and Logistics, Electronic Channels. Marketing promotion.

*Reading:*

1. Philip Kottler, *Marketing Management,* PHI, 2011.

2. William Stanton and Etzel, *Marketing Management,* TMH, 2010.

3. Ramaswami and Namakumari, *Marketing Management,* McMillan Publication, 2010.

MA390        **NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS**       (3-0-0)3

Multistep methods - Linear and nonlinear BVP, Shooting methods - Finite difference methods for BVP - Classification of partial differential equations - Finite difference methods for Parabolic equations, Hyperbolic Equations, Laplace equation, Poisson equation.

*Reading :*

1. M.K. Jain, *Numerical Solution of Differential Equations,* Wiley Eastern, 1984.

2. G.D. Smith, *Numerical Solution of Partial Differential Equations,* Oxford Univ. Press, 2004.

3. M.K. Jain, S.R.K. Iyengar and R.K.Jain, *Computational Methods for Partial Differential Equations*, Wiley Eastern, 2005.

MA391            **FUZZY MATHEMATICS AND APPLICATIONS**         (3-0-0)3

Crisp set theory - Fuzzy set theory - Propositional Logic - Predicate Logic - Fuzzy Relations - Fuzzy Logic - Switching functions and Switching circuits - Applications of fuzzy mathematics.

*Reading:*

1. M. Ganesh, *Introduction to Fuzzy Sets and Fuzzy Logic*, PHI, 2001.
2. G.J. Klir and B.Yuan, *Fuzzy Sets and Fuzzy Logic-Theory and Applications,* PHI, 1997.
3. T.J. Ross, *Fuzzy Logic with Engineering Applications,* McGraw-Hill, 1995.

PH390                              **MEDICAL INSTRUMENTATION**                        (3-0-0)3

Human body - an overview - Cell - Body fluids. Origin of bio potentials- Electrical activity of Excitable cells. Electrocardio graph: heart and the circulatory system. Bio fluid mechanics- Pressures in the body. Blood pressure: direct measurement of blood pressure H2O manometers. Blood flow volume and oxygenation measurement: Blood flow dilution methods.

*Reading:*

1. Brown, B.H. et. al, *Medical Physics and Biomedical Engineering,* Institute of Physics Publishing, 1999.
2. John. G. Webster,  *Medical Instrumentation: Application and Design,* 2nd Edition, John Wiley & Sons, New York, 1995.

PH391                              **ADVANCED MATERIALS**                        (3-0-0)3

Nano Materials  - Nano biology; Biomaterials - ceramics, dental materials; Composites; Optical materials - solar cells, CCDs, lasers; Super conducting materials - SQUIDS; Smart materials; SAW Materials and Electrets.

*Reading:*

1. T. Pradeep, *Nano: The Essentials;* TaTa McGraw-Hill, 2008.
2. B.S. Murthy et al., *Textbook of Nano Science and Nanotechnology,* Universities Press, 2012.

CY390              **INSTRUMENTAL METHODS IN CHEMICAL ANALYSIS**              (3-0-0)3

UV-visible spectrometry, Fluorescence, Atomic spectroscopy, Atomic absorption, X-ray fluorescence methods, Separation techniques, chromatographic techniques, High performance liquid chromatography, Size, exclusion chromatography, Capillary electrophoresis, Thermo gravimetric analysis, Differential thermal analysis, DSC, Electroanalytical methods, Molecular absorption spectroscopy, Mass spectrometry.

*Reading:*

1. Mendham, Denny, Barnesand Thomas, Vogel: *Text book of Quantitative Chemical Analysis,* Pearson Education, 6th Edition, 2007.
2. Donald L. Pavia, Gary M Lanyman, *Introduction to Spectroscopy,* 3rd Edition, Thompson Pub., 2008.
3. Krishan K Chawla, *Composite Materials;* 2nd Edition, Springer 2006.

CY391              **CHEMICAL ASPECTS OF ENERGY SYSTEMS**              (3-0-0)3

Energy as the Key of Civilisation; Thermochemistry of Energy Sources and Kinteics of Energy Tapping; Conventional and Finite Energy Sources; Coal Based Energy Sources and Coal Carbonisation; Petroleum and Natural Gas; Biomass and Gobar Gas; Primary and Secondary Batteries, Reserve Batteries, Solid State and Molten Solvent Batteries, Lithium Ion Batteries;, Solar Energy Harnessing, Photogalvanic and Photovoltaic Energy Storage; Fuel Cells; Hydrogen as Future Fuel; Photochemical Water Cleavage; Green Energies.

*Reading:*

1. Tokio Ohta, *Energy Systems,* Elsevier Science, 2000.
2. R. Narayan and B. Viswanathan, *Chemical and Electrochemical Energy Systems,* Universities Press, 1998.

HS390                              **SOFT SKILLS**                        (3-0-0)3

Soft Skills - definition - scope and importance - workplace communi-cation, process and barriers- Interpersonal and Intra-personal communication skills- team building- emotional intelligence- developing self-esteem- time and stress management- group discussions, interviews, and presentation skills-résumé-writing -  campus to company- dressing and grooming- Entrepreneurial Skills Development- Project.

*Reading:*

1. Robert M. Sheffield, Montgomery and Moody, *Developing Soft Skills,* 4th Edition, Pearson, 2009.
2. K. Alex, Soft Skills: *Know Yourself and Know the World,* S. Chand, 2009.
3. Gopalaswamy Ramesh, Mahadevan Ramesh, *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success,* Pearson, 2010.

CE440                                    **BUILDING TECHNOLOGY**                              (3-0-0)3

Buildings - Grouping and circulation - lighting and ventilation - Termite proofing of buildings - Lightning protection of buildings - Fire protection of buildings - Vertical transportation - Prefabrication systems in residential buildings: Modular Coordination - Earthquake resistant structures - Air-conditioning and heating - Acoustics and Sound insulation - Plumbing services.

*Reading:*

1.   Varghese - *Building Construction* - PHI Learning Pvt. Ltd., 2008.
2.   Punmia B. C., Jain A. J., and Jain A.J., *Building, Construction*, Laxmi Publications, 2005.
3.   *National Building Code of India*, Bureau of Indian Standards, 2005.


ME440                              **ALTERNATIVE SOURCES OF ENERGY**                          (3-0-0)3

Non-conventional sources of energy, solar energy, basic sun-earth relationships, coordinates of the sun, solar radiation measurement and prediction,, solar thermal devices, photovoltaic power, fuel cells, wind energy, hydrogen energy, other forms of energy, nuclear, biomass, ocean and geothermal energy.

*Reading:*

1.   Sukhatme S.P. and J.K.Nayak, *Solar Energy - Principles of Thermal Collection and Storage,* Tata McGraw Hill, New Delhi, 2008.
2.   Khan B.H., *Non-Conventional Energy Resources,* Tata McGraw Hill, New Delhi, 2006.
3.   J.A. Duffie and W.A. Beckman, *Solar Energy - Thermal Processes,* John Wiley, 2001.


MM 440                          **MATERIALS FOR ENGINEERING APPLICATIONS**                    (3-0-0)3

Classification of materials and properties, metallurgical aspects of materials, Significance of microstructural features, effect of cooling and heating rates and ageing materials for mechanical load bearing applications, corrosion resistant materials, materials for electrical, electronic, civil, biomedical applications.

*Reading:*

1.   M.F. Ashby: *Engineering Materials,* 4th Edition, Elsevier, 2005.
2.   M.F. Ashby: *Materials Selection in Mechanical Design,* Butterworth Heinemann, 2005.
3.   ASM Publication Vol.20: *Materials Selection and Design,* ASM, 1997
4.   Pat L. Mangonon: *The Principles of Materials Selection and Design,* Prentice Hall International, Inc, 1999.


CH440                              **INDUSTRIAL POLLUTION CONTROL**                           (3-0-0)3

Introduction- Air pollution - Meteorological aspects of air pollution - Air pollution sampling and measurement- Air pollution control methods and equipment- Control of specific gaseous pollutants - Sources and classification of water pollutants - sampling Waste water and analysis- Waste water treatment - Solid waste management - Hazardous waste management.

*Reading:*

1.   Rao C.S., *Environmental Pollution Control Engineering,* Wiley Eastern Limited, India, 2006.
2.   Noel de Nevers, *Air Pollution and Control Engineering,* McGraw Hill, 2010.
3.   Glynn Henry J. and Gary W. Heinke, *Environmental Science and Engineering,* 2nd Edition, Prentice Hall of India, 2004.

CH441                                   **FUEL CELL TECHNOLOGY**                              (3-0-0)3

Overview of Fuel Cells, Fuels for Fuel Cells, Fuel Cell Process Design, Along the Electrode Models; Stack Design and Systems Integration.

*Reading:*

1.   Gregor Hoogers, *Fuel Cell Technology Hand Book*, CRC Press, 2003.
2.   Karl Kordesch and Gunter Simader, *Fuel Cells and Their Applications,* VCH Publishers, NY, 2001.


CS440                          **MANAGEMENT INFORMATION SYSTEMS**                             (3-0-0)3

Organization and Information Systems, Changing Environment and its impact on Business, Kinds of Information Systems, Computer Fundamentals, Telecommunication and Networks, System Analysis and Development

and Models, Manufacturing and Service Systems Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions, Enterprise Resources Planning (ERP), Choice of IT, Nature of IT decision, Security and Ethical Challenges.

*Reading:*

1. Kenneth J Laudon, Jane P. Laudon, *Management Information Systems,* 10th Edition, Pearson/PHI, 2007.
2. W. S. Jawadekar, *Management Information Systems,* 3rd Edition, TMH, 2004.

BT440                     **BIOSENSORS**                     (3-0-0)3

Introduction to Biosensors, Advantages and limitations, various components of biosensors, Types of Biosensors, Types of membranes used in biosensor constructions. Transducers in Biosensors: Various types of transducers; principles and applications of Biosensors.

*Reading:*

1. Donald G. Buerk, *Biosensors: Theory and Applications,* 1st Edition, CRC Press, 2009.
2. Jon Cooper, Tony Cass, *Biosensors: A Practical Approach*, 2nd Edition, Oxford University Press, 2004.
3. Bilitewski, U. Turner, A.P.F., *Biosensors for Environmental Monitoring,* 1st Edition, Harwood, 2006.

SM440               **HUMAN RESOURCE MANAGEMENT**            (3-0-0)3

Introduction, Job Analysis, Employee Involvement, and Flexible Work Schedules, Human resource Planning, Recruitment and Careers, Employee Selection, Training and Development, Appraising and Improving Performance, Managing Compensation, Industrial relations, Disputes, Grievances and Discipline, International Human Resources Management.

*Reading:*

1. Gary Dessler and Biju Varkkey, *Human Resource Management,* Pearson Edition, 2011.
2. Bohlander George W, Snell Scott A, Veena Vohra, *Human Resource Management,* Cengage Learning. 2010.
3. Aswathappa, *Human Resource Management,* TMH, 2011.

MA440              **OPTIMIZATION TECHNIQUES**             (3-0-0)3

Formulation of a LPP - Graphical Method - Simplex method - duality - dual simplex method - sensitivity analysis, transportation and assignment problems, traveling salesman problem - Lagrange multipliers and Kuhn-Tucker conditions - quadratic programming problem - Dynamic Programming - Integer Linear Programming.

*Reading:*

1. J.C. Pant, *Introduction to Optimization,* Jain Brothers, 2008.
2. S.S. Rao, *Optimization Theory and Applications,* Wiley Eastern, 2004.
3. K.V. Mittal, *Optimization Methods,* Wiley Eastern, 2003.
4. H.A. Taha, *Operations Research,* Pearson, 2007.

MA441               **OPERATIONS RESEARCH**             (3-0-0)3

Formulation of a LPP - Graphical solution - Simplex method - revised simplex method - duality theory - Transportation problems - Single server queuing models - deterministic inventory control models - stochastic inventory control models.

*Reading:*

1. Kanti Swarup, Man Mohan and P.K.Gupta, *Introduction to Operations Research,* S.Chand & Co., 2006.
2. J.C.Pant, *Introduction to Operations Research,* Jain Brothers, New Delhi, 2008.
3. N.S.Kambo : *Mathematical Programming Techniques,* East-West Pub., Delhi, 1991.

PH440             **NANO MATERIALS AND TECHNOLOGY**          (3-0-0)3

General properties of Nano materials - mechanical properties; Fullerenes and CNT's - Synthesis, physical properties; Investigation and manipulating materials in the Nanoscale - SAMs and clusters; Semi conducting Quantum Dots - Nanobiology- Nanosensors - Nanomedicines.

*Reading:*

1. T. Pradeep, *Nano: The Essentials;* TaTa McGraw-Hill, 2008.
2. W.R. Fahrner, *Nanotechnology and Nanoelectronics;* Springer, 2006.
3. B.S. Murthy et al., *Textbook of Nano Science and Nanotechnology,* Universities Press, 2012.
4. Rechard Booker and Earl Boysen, *Nanotechnology;* Willey, 2006.

PH441 **BIOMATERIALS AND TECHNOLOGY** (3-0-0)3

Overview of biomaterials; Structure and properties of biomaterials - surface properties of solids; Types of biomaterials - implant materials; Characterization of materials; Bio implantation materials - Materials in ophthalmology; Tissue response to implants.

*Reading:*

1. Joon park, R.S. Lakes, *Biomaterials - An Introduction*; 3rd Edition, Springer, 2007.
2. Sujatha V Bhat, *Biomaterials;* 2nd Edition, Narosa Publishing House, 2006.

CY440 **CORROSION SCIENCE** (3-0-0)3

Understanding Corrosion, types of corrosion, methods of corrosion monitoring, measurement of corrosion steel in reinforced cement concrete, corrosion rates of metals due to microbially induced corrosion,   methods of corrosion prevention and control.

*Reading:*

1. R. Winston Revie, Herbert H. Uhlig, *Corrosion and Corrosion Control,* 4th Edition, Wiley Interscience, 2007.
2. Mc Caffety, Edward, *Introduction to Corrosion Science,* 1st Edition, Springer, 2010.

CY441 **CHEMISTRY OF NANOMATERIALS** (3-0-0)3

Synthesis, characterization, properties and applications of the following Nanomaterials, Fullerenes, Carbon nanotubes, Core-Shell Nanoparticles, Nanoshells, Self- assembled monolayers, and Monolayer Protected Metal Nanoparticles, Nanocrystalline materials, Magnetic Nanoparticles and Important properties in relation to nanomagnetic materials, Thermoelectric materials, Non-linear optical materials, liquid crystals.

*Reading:*

1. T. Pradeep, *NANO: The Essentials,* MaGraw-Hill Edu., 2007.
2. Sulabha K. Kulakarni, *Nanotechnology (Principles, Properties and Applications),* Capital Pub. House, 2009.
3. C. N. R. Rao, *Nanomaterials Chemistry,* Achim Muller, K.Cheetham, Wiley-VCH, 2007.

HS440 **CORPORATE COMMUNICATION** (3-0-0)3

Importance of Communication in the Corporate World; Oral Communication: a) Oral Fluency and Communication Techniques, b) Seminar Skills and Presentation skills; Listening Skills; Writing for Career Purposes; Leadership Communication.

*Reading:*

1. Priyadarshi Patnaik, *Group Discussion and Interview Skills,* Cambridge University Press, 2011.
2. R.C. Sharma and Krishna Mohan, *Business Correspondence and Report Writing,* 3rd Edition, Tata McGraw-Hill, 2008
3. Patrick Hanks and Jim Corbett, *Business Listening Tasks,* Cambridge University Press, 1986.