Course Name: NETWORK AND SYSTEMS
Course Code: EE 211/EE 211H Credits: 4 L T P : 4-0-0
Pre Req: ---

Lecture wise break up **Number of Lectures**

1. **SIGNALS AND TRANSFORMS [06]**

Basic continuous time signals, Laplace transform of basic signals and functions, initial and final value theorems, inverse Laplace transform, convolution theorem, Fourier integral and Fourier transform, transform of common functions and periodic wave forms, applications of Laplace and Fourier transforms to network analysis.

2. RESISTIVE CIRCUITS [08]

Sources and Loads, review of KCL and KVL, Duality, Circuits with controlled sources, Linear elements and circuits, proportionality principle, superposition theorem, Thevenin, Norton, reciprocity, Millman and Tellegen's theorems, source conversions.

3. ANALYSIS METHODS [06]

Node analysis, mesh analysis, analysis with controlled sources, delta-wye transformations, network topology concepts, AC circuit analysis, series and parallel resonance,

4. GRAPH THEORY [05]

Graph of a network, definitions, tree, co tree, link, basic loop and basic cut set, incidence matrix, cut set matrix, tie set matrix duality, loop and nodal methods of analysis

3. THREE PHASE CIRCUITS [05]

Balanced and unbalanced three phase wye and delta loads, symmetrical components, three phase power measurements.

4. MAGNETIC COUPLING AND MUTUAL INDUCTANCE [03]

Analysis of circuits with mutual inductance, dot convention.

5. NETWORK FUNCTIONS [04]

Transform impedances, Network functions, concepts of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

6. TWO PORT NETWORKS [06]

Characterization of two port networks, Z, Y, ABCD and h-parameters, inter-relationships between the parameters, interconnection of two port networks, ladder and lattice networks, T and π representations.

7. FILTERS [05]

Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, high pass, band pass filters, introduction to active filters

BOOKS:

1 Circuits – Engineering Concepts and Analysis of Linear Electric Circuits by A. Bruce Carlson, Thomson Brooks/Cole.

2 Network and Systems by D. Roy Choudhary, Wiley Eastern Ltd.

REFERENCES:

1. Network Analysis & Synthesis by FF Kuo, Wiley International
2. Circuit Analysis: A Systems Approach by Russell M. Mersereau et.al, Pearson Education Inc., 2006.

Honors: Students opting for Honors course will have to over reach academic performance through learning of advanced topics and evaluation in terms of assignments working on related field problems and additional questions for honors students in the examinations.

Course Name: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
Course Code: EE 212/EE 212H Credits: 4 L T P :4 0 0
Pre Req: ---
Design Points: 2

Lecture wise break up **Number of Lecturers**

1. INTRODUCTION (06)

Functional elements of an instrument, static and dynamic characteristics, errors in measurement, statistical evaluation of measurement data, standard and calibration. Measurement of error, Accuracy and Precision, significant figures, types of error, Statistical analysis of data, probability of errors, limiting errors. Unit and Measurement: Fundamental and derived units, systems of units electric and magnetic units, international system of units, conversion of units.

2. ANALOG INSTRUMENTS (08)

Electro-mechanical instruments – moving, coil, moving iron, electrodynamics, rectifier, electrostatic instruments, current voltage and power measurements, induction type energy meter, q meter, frequency meter, power factor meter.

3. SENSOR AS TRANSDUCERS (07)

Classification of transducers - selection of transducers resistive, capacitive and inductive transducers- piezo electric transducers - optical and digital transducers - pH electrodes -transducers for measurement of displacement, temperature, level, flows, pressure, velocity and acceleration.

4. BRIDGE MEASUREMENT (06)

Wheatstone bridge, Kelvin bridge, a.c. bridge and their application for the measurement of self inductance and mutual inductance, Wagner Ground connection, measurement of capacitance, Measurement of low and high resistance.

5. ELECTRONIC INSTRUMENTS (07)

Principle and analog and digital ammeters and volt-meters-single and three phase watt meters and energy meter- magnetic measurements -instruments transformers.

6. SIGNAL GENERATORS AND ANALYSERS (07)

Sweep frequency generator, frequency synthesized signal generator signal generator and function generator, wave analyzer harmonic distortion and spectrum analyzer.

7. STORAGE AND DISPLAY DEVICES (07)

Magnetic disc and tape recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD and Dot matrix displays.

BOOKS:

1. Doebeling, E.O.: Measurement Systems- Application and Design, McGraw Hill Publishing Company, 1990
2. A.K. Sawhney, A course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai & Co., (Pvt) Ltd., 2000.

REFERENCES

1. Stout MoB., Basic Electrical Measurement, Prentice Hall of India, 1986.
2. Dalley, J.W., Riley, W.F. and Meconnel, K.G., Instrumentation for Engineering Measurement, John Wiley & Sons, 1999.
3. Moorthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India, 1995.
4. Mooris. A.S., Principle of Measurement and Instrumentation, Prentice Hall of India, 1999.

Honors: Students opting for Honors course will have to over reach academic performance through learning of advanced topics and evaluation in terms of assignments working on related field problems and additional questions for honors students in the examinations.

Course Name: **ELECTRICAL MACHINES-I**
Course Code: **EE 214/EE 214H** **Credits: 4** **L T P: 4 -0- 0**
Pre Req: **---**
Design Points: **2**

Lecture wise breakup **No. of lectures**

1 PRINCIPLES OF ELECTRO-MECHANICAL ENERGY CONVERSION (07)

Review of magnetic circuits, magnetic materials and their properties, flow of energy in electromagnetic devices, singly excited systems, determination of mechanical force, mechanical energy, torque equation, doubly excited systems, energy stored in magnetic field, electromagnetic torque, generation emf in machines, torque in machines with cylindrical air gap.

2 TRANSFORMERS (13)

Construction, ideal transformer, no-load and on-load operation, real transformer and equivalent circuit, transformer losses, testing of transformer and determination of its parameters, the per unit system, efficiency and voltage regulation, autotransformer, parallel operation, three phase transformers construction and connections applications.

3 DC MACHINES (14)

Construction, emf and torque equations, circuit model, armature reaction and commutation, methods of excitation, characteristics of generators and motors, starting and speed control of dc motors, starters, losses, efficiency and testing of dc machines.

4 THREE-PHASE INDUCTION MOTORS (14)

Construction, torque production, slip, equivalent circuit, power and torque expressions, torque-slip characteristics, testing, circle diagram, calculations of performance, starting and speed control techniques, cogging and crawling.

BOOKS:

1. Electrical Machines by I. J. Nagrath and D. P. Kothari, Tata McGraw Hill
2. Electric Machinery by A.E. Fitzgerald, Charles Kingsley, Jr. and Stephen D. Umans, Tata McGraw-Hill.

REFERENCES:

1. Electrical Machinery by P. S. Bimbhra, Khanna Publishers
2. Electrical Machinery by M. G. Say, C.B.S. Publisher

Honors: Students opting for Honors course will have to over reach academic performance through learning of advanced topics and evaluation in terms of assignments working on related field problems and additional questions for honors students in the examinations.

Course Name: PHYSICS - II

Course Code: PY 201 **Credits: 4** **L T P: 4 0 0**

Pre-requisite: PY 101

Lecture-wise breakup **(No. of Lectures)**

1. QUANTUM MECHANICS & ATOMS

Quantum theory of light, X-rays – production, spectrum & diffraction (Bragg's law), photoelectric effect, Compton effect, pair production, photons & gravity, black holes, de-Broglie hypothesis, particle diffraction, uncertainty principle and applications **(7)**

Postulates of quantum mechanics, Schrodinger theory, time-dependent and time-independent Schrodinger equation, wave function, Born interpretation and normalization, expectation values **(3)**

Particle in a box (infinite potential well), finite potential step and barrier problems, tunneling, linear harmonic oscillator (one-dimensional) **(4)**

Hydrogen atom, radiative transitions and selection rules, electron spin, Stern-Gerlach experiment, Spin-orbit coupling, exclusion principle, symmetric and antisymmetric wavefunctions **(6)**

ADDITIONAL TOPICS FOR HONOURS STUDENTS: α-decay, Zeeman effect, Correspondence Principle, Angular Momentum in Quantum Mechanics

2. NUCLEAR PHYSICS

Natural radioactivity, successive radioactive transformations, radioactive equilibrium, radioactive series, radiometric dating **(3)**

Nuclear force and its characteristics, Elementary description of shell model, explanation of magic numbers, liquid drop model and semi-empirical binding energy formula **(3)**

Nuclear fission, fission products, mass and energy distribution of fission products, neutron emission and energy distribution of neutrons emitted in fission, theory of fission process, nuclear reactors – classification, neutron cycle in thermal reactors and four-

factor formula for neutron reproduction, nuclear fusion – controlled thermonuclear reactions. **(5)**

ADDITIONAL TOPICS FOR HONOURS STUDENTS: Artificial radioactivity and its applications, β-decay (energy spectrum & discovery of neutrino), Fusion Reactions in stars

3. STATISTICAL PHYSICS

Maxwell-Boltzmann statistics, molecular energies in an ideal gas, Bose-Einstein and Fermi-Dirac statistics, black body radiation, Rayleigh-Jeans and Planck's radiation laws, free electrons in a metal, electron-energy distribution, Fermi energy, electronic specific heat, conduction in metals, thermionic emission **(9)**

ADDITIONAL TOPICS FOR HONOURS STUDENTS: Specific heat of solids, Bose-Einstein condensation

4. SOLIDS AND SEMICONDUCTOR PHYSICS

Band theory of solids, Kronig-Penney Model (qualitative), conductors, insulators and semiconductors, p-type and n-type semiconductors, statistics of electrons and holes, Hall effect (for single as well as both type of charge carriers) **(5)**

ADDITIONAL TOPICS FOR HONOURS STUDENTS: p-n junction, rectifier, LED, tunnel diode

5. SUPER CONDUCTIVITY

Occurrence, destruction of super conductivity, Meissner effect, type I and type II Super-conductors; heat capacity, isotope effect, thermodynamical considerations, London equations & penetration depth, coherence length, BCS theory (elementary description), applications of superconductors. **(5)**

ADDITIONAL TOPICS FOR HONOURS STUDENTS: High temperature superconductivity, Josephson junctions

TEXT BOOK: Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)

REFERENCE BOOKS:

1. Nuclear Physics, by I. Kaplan (Addison-Wesley)
2. Solid State Physics, by C. Kittel (Wiley Eastern)
3. Solid State Physics, by S.O. Pillai (New Age International)
4. Introduction to Modern Physics, by Richtmyer, Kennard & Cooper (McGraw Hill)
5. Introduction to Modern Physics, by Mani & Mehta (East West Press)

Modern Physics, by Bernstein, Fishbane & Gasiorowicz (Pearson Education)

Course Name: PHYSICS LAB

Course Code: PY 202 Credits: 2 L T P: 0 0 3

Pre-requisite: None

Lecture-wise breakup **(No. of Lectures)**

TWELVE EXERCISES OUT OF THE FOLLOWING:

1. Familiarization with various measuring instruments – Vernier calipers, screw gauge, spherometer, spectrometer etc. **(3)**

2. To find the wavelength of sodium light using Fresnel's biprism. **(3)**

3. (i) To determine the wavelength of He-Ne laser using transmission grating.
(ii) To determine the slit width using the diffraction pattern. **(3)**

4. To determine the wave length of sodium light by Newton's rings method. **(3)**

5. To determine the wave length of sodium light using a diffraction grating. **(3)**

6. To find the specific rotation of sugar solution using a Bi-quartz Polarimeter. **(3)**

7. To find the energy band gap of the given semiconductor by four probe method. **(3)**

8. To find the angle of prism and the angle of minimum deviation with the help of a spectrometer, and hence to determine the refractive index of the material of the prism. **(3)**

9. To design a method to draw equipotential lines with various geometries of electrodes kept at different potentials. **(3)**

10. To study the Hall effect of a given semiconductor. **(3)**

11. To determine the dielectric constant of the given materials. **(3)**

12. To study the photoelectric effect. **(3)**

13. To study the B-H curve of the ferromagnetic materials. **(3)**

14. To design a hollow prism and used it find the refractive index of a given liquid. **(3)**

TEXT BOOKS:

1. Practical Physics, by Gupta & Kumar (Pragati Prakashan)
2. B.Sc. Practical Physics, by C.L.Arora (S. Chand)

COURSE NAME : COMPUTER NETWORKS
COURSE CODE : ENN 206
CREDITS : 04
L T P : 4 00

LECTURE WISE BREAKUP **NO. OF LECTURES**

Computer Networks and the Internet: 10
Internet and its Architecture, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, Protocol Layers and Service Models, Brief History of Computer Networking and the Internet.

Application Layer: 10
Principles of Network applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS - The Internet's Directory Service, P2P file sharing, Socket Programming with TCP & UDP

Transport Layer: 10
Introduction and Transport-Layer Services and Principles, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable of Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control

The Network Layer: 10
Introduction, Virtual circuit and datagram networks, Router Internals, Internet Protocol(IP): Forwarding and addressing in the Internet, Subnetting, Routing Algorithms ,– shortest path, flooding, distance vector routing and link state routing, Routing in the Internet, Broadcast and Multicast Routing, Other troubleshooting protocols

The Data Link Layer: 10
Link Layer: Introduction and Services, Error Detection and Correction Techniques, Multiple Access Protocols, Link-layer Addressing, Ethernet, Hub and Switches, PPP, Link Virtualization: a network as a link layer.

NETWORK TECHNOLGIES
Overview of Local Area Networks and Wide Area Networks, LAN Standards, How LANs operate, LAN Topologies, ALOHA, CSMA, CSMA/CD, Overview of Ethernet

BOOK:
1. James F. Kurose and Keith W. Ross, “Computer Networking: A top down approach featuring the Internet”, Pearson Education, third ed.

REFERENCES:
1. A.S. Tanenbaum, “Computer Networks”, 4th Edition, PHI, 2004.
2. D. Bertesekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2000.
3. U. Black, “Computer Networks”, PHI, 1997.
4. S. Keshav, “An engineering approach to computer networking”, Addison Wesley, 1999.

5. William Stallings, "Data & Computer Communication", PHI, 6th Edition, 2002.
6. B.A. Forouzan, "Data communications and networking", TMH, 1st ed, 2000.

Course Name: **POWER ELECTRONICS**
Course No.: **ENN 204** **Credit:** **4** **L T P :** **4-0-0**
Design Points: **2**
Pre Req: **---**

Lecture wise break up **No of Lectures**

1. INTRODUCTION (07)

Applications of Power Electronics, Power Semiconductor Devices : Power diodes, Thyristors and Power Transistors, Control Characteristics of Power devices, Characteristics and Specifications of Switches, Types of power Electronic circuits, Design of Power Electronics Equipment, Peripheral Effects, Power and Intelligent Modules

2. POWER TRANSISTORS (05)

Bipolar Junction transistors, Power MOSFETs, IGBTs and Comparisons of Transistors.

3. THYRISTORS (08)

Thyristor Characteristics, Two- Transistor Model of Thyristors, Transistor Turn-on, Transistor Turn-off, Phase Controlled Thyristors , Fast-Switching Thyristors, LASCRs, GTOs, IGCTs, MCTs, SITHs, Comparisons of Thyristors, Series Operation of Thyristors, Parallel Operation of Thyristors, di/dt Protection, dv/dt Protection.

4. **CONTROLLED RECTIFIERS (10)**

Principle of Phase controlled converter operation, Single Phase Full converters, Single Phase dual converters, Principle of three phase Half wave converters, Three Phase Full Converters , Three Phase Dual Converters, Single Phase Semi Converters, Three Phase semi Converters, Effects of Load and Source Inductances

5. DC-DC CONVERTERS (07)

Principle of Step Down Operation, Step-Down Converter with RL Load, Principle of Step-up Operation, Step-up converter with a Resistive Load, Converter Classification

6. INVERTERS (08)

Principle of Operation, Performance Parameters, Single-Phase bridge Inverters, Three Phase Inverters, Voltage control of single phase Inverters, Series Resonant Inverters, Parallel Resonant Inverters

7. AC VOLTAGE CONTROLLERS (03)

Principle of ON-OFF control, Principle of Phase control, Cycloconverters.

8. APPLICATIONS OF POWER ELECTRONICS (04)

Uninterrupted power supply, switch mode power supply, zero voltage switch, speed control of dc drives.

BOOKS:

1. Power Electronics by Dr. P.S.Bhimra, Khanna Publishers.
2. Power Electronics, by Muhammad H. Rashid, Pearson Education, Third Edition

Honors For students registering for honors course in this subject are to be given advanced problem to check their capabilities to earn in the subject. The assignment/projects/exploring an idea using e-support involving independent effort of the student.

Course Name : SIGNALS AND SYSTEMS
Course Code : ENN 203
Credits : 4
L T P : 4 0 0

Rationale:

After going through this course students would be able to analyze signals for communication systems in time and frequency domain. It would enable them to troubleshoot the communication systems hence with.

Lecture wise break up No of Lectures

SIGNALSAND SYSTEMS (05)

Signals and their classification, size of the signal, continuous and discrete time signals, Systems and their classification, signal operations on elementary CT/DT signals: Shifting, flipping, multiplication, addition, modulation, windows and pulse, Impulse. Continuous and discrete time systems and their applications.

FOURIER SERIES (09)

Overview of trigonometric, compact and exponential fourier series, Fourier spectrum of signals, properties of fourier series components, distribution of average power in frequencies, parsevals theorem.

FOURIER TRANSFORM (15)

Aperiodic signal representation by Fourier integral, concept of continuous and discrete spectrum, essential and absolute bandwidth, convolution, correlation, auto-correlation and cross-correlation and their properties, energy spectral density, power spectral density, calculation of the energy and power signal respectively, sampling theorem, properties of Fourier transform and applications

RANDOM SIGNAL THEORY AND NOISE (12)

Sample space, random variables-discrete and continuous variable, conditional probability, probability density function, cumulative density function and their properties, noise and its types, white noise, noise calculations, noise figure and its calculations for cascaded networks, nose equivalent temperature, optimum detection and matched filters.

INFORMATION THEORY (09)

Concept of information, entropies of discrete system, rate of transmission-redundancy, efficiency and information rate, channel capacity theorem, source encoding including Huffman encoding, Shannon coding theorem, comparisons of analog and digital communication systems on the basis of the ideal channel capacity theorem.

BOOK:

1. Modern Digital & Analog Communication Systems by B.P.Lathi, pub. Oxford Univ. Press, 3rd Edition

REFERENCES:

- Signal And System by M.J.Robert, TMH, Third Edition.
- Signals and systems by A.V.Oppenheim & A.S. willisky, 2nd edition, Pearson education.
- Introduction to Communication Theory by P.D. Sharma
- Signals and systems by HAWI.P. HSU, Schaum Series by TMH