# B. TECH. SEMESTER – II

## PHYSICS FOR BIOENGINEERING PY 102 (w of appgion 2015 2016)

## (w.e.f. session 2015-2016)

LTPC 3104

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#### **Unit I: Wave Optics**

Ramsden and Huygens eyepieces, coherent sources, Fresnel's biprism, thin film interference, Newton's ring, Fraunhoffer's diffraction at single slit, Fraunhoffer's diffraction at N-Slits (grating), Rayleigh's criterion of resolution, resolving power of microscope.

#### **Unit II: Polarization and LASER**

Types of Polarised light, Double refraction, Nicol prism, Optical activity, polarimeter (Laurentz and Biquartz). Characteristics of laser beam, Main components of laser, optical gain, Einstein's coefficients, He-Ne laser, Nd-YAG laser

#### **Unit III: Instrumentation and Elementary Molecular Spectroscopy**

Electron microscope: Principle and its working, Region of electromagnetic spectrum, Diatomic molecule as a rigid rotator and its spectrum, Non-rigid rotator, Vibrational spectra of diatomic molecule (simple harmonic oscillator and anharmonic oscillator, Qualitative discussions only), Raman Scattering (Quantum and classical theory of Raman effect)

#### **Unit IV: Crystal Physics**

Introduction to crystal structure (Lattice, basis, unit cell, lattice parameters) Seven crystal systems and fourteen Bravais lattices, Coordination number, nearest neighbor distance, atomic radius and atomic packing fraction for SC, BCC and FCC, Simple crystal structures of NaCl and diamond cubic, Miller indices, Origin of X-rays (Continuous and characteristic), Bragg's law, Moseley's law.

#### **Unit V: Quantum Physics and Nanotechnology**

Wave function and its physical admissibility, orthogonality of wavefunctions, normalization of wave functions, Schrödinger wave equation, A particle in a 1-D box, Identical particles, symmetric and anti symmetric wave functions. Introduction to nanotechnology and its applications, Nanostructure formation techniques (CVD, sputtering).

#### **Books recommended:**

- 1. Fundamentals of Molecular Spectroscopy by C.N. Banwell, TMH Pub.
- 2. Molecular Structures and Spectroscopy by G.Herzberg.
- 3. Introduction to Solid State Physics by Charles Kittel. John Willey Pub.

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# **Basic Professional Communication**

(w.e.f. session 2015-2016)

Course Code: LN 101 Credits Assigned: 3 L T P C 2 1 0 3

**Total No. of Hours: 32** 

## UNIT I: Professional Communication (6 hours )

Professional Communication: Its meaning & importance, Essentials of Effective Communication, Barriers to Effective Communication

## UNIT II: Language through Literature (7 hours )

A. Essays:

"The Effect of the Scientific Temper on Man" by Bertrand Russell "The Aims of Science and Humanities" by Moody E. Prior

**B.** Short Stories:

"The Meeting Pool" by Ruskin Bond "The Portrait of a Lady" by Khushwant Singh

## UNIT III: Basic Vocabulary (7 hours )

Euphemism , One-word Substitution, Synonyms, Antonyms, Homophones, Idioms and Phrases, Common mistakes, Confusable words and expressions

## UNIT IV: Basic Grammar (6 hours )

Articles, Prepositions, Tenses, Concord (Subject-Verb agreement, Verbs: its Kind & Uses, Degrees of Comparison

## UNIT V: Basic Composition (6 hours )

Report writing: What is a report? Kinds and objectives of reports, writing reports.

Business Letter writing: Introduction to business letters, types of business letters, Layout of business letters, Letter of Enquiry / Complaint

## **Books Recommended:**

- 1. Lata , Pushp & Kumar, Sanjay .*Communication Skills* , Oxford University Press-2012
- 2. Quintanilla ,Kelly M. & Wahl ,Shawn T.Business and Professional Communication , Sage Publications India Pvt. Ltd-2011
- 3. Juneja, Om P & Mujumdar, Aarati .*Business Communication :Techniques and Methods*, Orient Black Swan-2010
- Arora, V. N. & Chandra, Lakshmi . *Improve Your Writing: From Comprehensive to Effective Writing*, Oxford University Press-2010 (For the prescribed essays- "The Effect of the Scientific Temper on Man" by Bertrand Russell & "The Aims of Science and Humanities" by Moody E. Prior)
- Mukherjee, Meenakshi .*Let's Go Home and Other Stories*, Orient Black Swan-2009 (For the prescribed short stories-"The Meeting Pool" by Ruskin Bond, "The Portrait of a Lady" by Khushwant Singh)
- 6. Quirk , Randolph & Greenbaum ,Sidney .A University Grammar of English,Pearson-2013
- 7. Bolton, David & Goodey, Noel .*English Grammar in Steps*, Orient Black Swan.
- 8. Sethi, J. Standard English And Indian Usage: Vocabulary and Grammar, PHI Learning Pvt. Ltd . -2011
- Bhaskaran, M. P. & Horsburgh, D .Strengthen Your English, Oxford University -1973
- 10. Greenbaum, Sidney . *The Oxford English Grammar* ,Oxford University Press, New York -1996
- 11.Bovee, Courtland L. & Thill, John V. Business Communication Essentials ,Pearson
- 12.Board of Editors. Written and Spoken Communication in English, University Press-2007
- 13.Gairns, R. & Radman, S. Working with Words: A Guide to Teaching and Learning Vocabulary Building. Cambridge: Cambridge University Press-1986
- 14.Lewis, M. H. *Words Power Made Easy*, Goyal Publishers and Distributors Pvt. Ltd-1979
- 15.McCarthy, M. Vocabulary, Oxford University Press-1990

# Mathematics-II in Bioengineering MT113

#### (Revised w.e.f. session 2015-2016)

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Infinite series, Convergence, Divergence, Comparison test, Ratio's test, Cauchy's nth root test, Leibnitz's test (without proof), Absolute and conditional convergences, Taylor's and Maclaurin's series for a function of one variable.

## Unit-II

Successive differentiation, Leibnitz's theorem (without proof), Partial derivatives, Maxima-minima, Jacobians. Integration - reduction formulae of trigonometric functions.

## Unit-III

Differential Equations: Linear differential equations of first order, Linear differential equations of higher order with constant coefficients, Complementary functions and particular integrals, Cauchy's and Euler's equations.

## Unit-IV

Graphical Presentation of Data: Bar chart, Pie chart, Histogram, Frequency curve and Ogive curve. Central Tendency and its measures; Mean, Median, Mode, Harmonic mean and Geometric mean. Dispersion and its measures: Range, Quartile deviation, Mean deviation, Standard deviation and coefficient of variation.

## Unit-V

Bivariate data: Measures of relationship, Scatter diagram, Correlation, Karl Pearson's coefficient of correlation, Spearmen's Rank Correlation coefficient, Regression analysis, fitting of linear regression equations and its properties.

## **Reference Books:**

1. Text Book of Differential Calculus : Shanti Narayan

2. Text Book of Integral Calculus : Ram Ballabh

- 3. Text Book of Differential Calculus : Ram Ballabh
- 4. Text Book of Integral Calculus: Shanti Narayan

## Unit-I

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5. Probability and Statistics : Gupta (S. Chand Publication)6.Higher Engineering Mathematics, B.S, Grewal, Khanna Publisher.

# BASIC ELECTRICAL ENGINEERING EN-101 (w.e.f. session 2015-2016)

L T P C 3 104

## D.C CIRCUIT ANALYSIS AND NETWORK THEOREMS

**Circuit concepts:** Concept of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R L and C as linear elements, source transformation, Kirchoff's Law: loop and nodal methods of analysis, star delta transformation, network theorems: Thevenin's theorem, Norton's theorem, maximum power transfer theorem

## UNIT-2

UNIT-1

#### STEADY STATE ANALYSIS OF SINGLE PHASE AC CIRCUITS

AC fundamentals: Sinusoidal, square and triangular waveforms-average and effective value, form the peak factors, concept of phasors, phasors representation of sinusoidally varying voltage and current, analysis of series-parallel RLC circuits. Apparent, active and reactive powers, power factor, causes and problems of low power factor, power factor improvement, resonance in series and parallel circuits, bandwidth and quality factors. UNIT-3 (8)

#### THREE PHASE AC CIRCUITS

**Three phase system:** Its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relation, three phase power measurements.

#### **MEASUREMENT INSTRUMENTS**

**Types of instruments:** construction and working principle of PMMC and MI type voltmeter and ammeters, single phase dynamometer type wattmeter and induction type energy meter, use of shunts and multipliers.

UNIT-4

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**INTRODUCTION OF POWER SYSTEM:** general layout of electrical power system and function of its elements, standard transmission and distribution voltages, concept of grid.

## MAGNETC CIRCUIT

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**Magnetic circuit:** Concepts, analogy between electric and magnetic circuit, magnetic circuits with DC and AC excitation, magnetic leakage, BH curve, hysteresis and eddy current losses, magnetic circuit calculation, mutual coupling.

**Single Phase Transformer**: Principle of operation, construction, emf equation, equivalent circuit, power losses, efficiency, Introduction to auto transformers.

UNIT-5

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## Principle of Electromechanical energy conversion

**DC** Machines: Types, emf equation of generator and torque equation of motor, characteristics and applications of DC motors.

**Three Phase Induction Motor:** Type, principle of operation, slip-torque Characteristics, applications.

**Single Phase Induction Motor:** Principle of operation and introduction to methods of starting, applications.

**Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor, applications.

#### **References:**

- 1. V.Deltoro, "Principle of Electrical Engg." PHI.
- 2. M.A Mallick, Dr. I. Ashraf, "Fundamental of Electrical Engg," Word Press, Lucknow.
- 3. A. Hussain, "Basic Electrical Engg" Dhanpat Rai & sons.
- 4. I J Nagrath,"Basic Electrical Engg", TMH

#### **ECE 101 BASIC ELECTRONICS**

#### w.e.f. Session 2015-16

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#### **UNIT-I** Semiconductor Diode

Mechanism of Conduction in Semiconductors: Mobility and Conductivity, Electrons and holes in an intrinsic semiconductors, Donor and acceptor impurities, Fermi level, Carrier densities in semiconductor, Hall effect, Diffusion. Recombination

#### **Junction Diode**

PN junction characteristic and its equation, Effect of Temperature, Depletion 8 Layer, Piecewise linear diode model, Breakdown Mechanism, Zener and Avalanche Breakdown characteristics

#### **Diode as circuit element**

Half wave and full wave rectifiers, capacitive filters, Zener diode as a regulator, clamper, clipper and voltage doubler, special diode- LED, Schottkey diodes

#### **UNIT-**

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# **BJT characteristics and circuits**

8 Transistor Operation, CE, CB, CC configuration and their characteristics, transistor biasing circuits, stability factor, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE amplifier configuration

#### **UNIT-Field Effect Transistors** III

JFET: Construction and principle of working, Drain / Transfer characteristics, basic amplifier circuits, Biasing of JFET

MOSFET: Enhancement and depletion type N-channel, P-channel, Drain / Transfer Characteristics.

#### **UNIT-**Switching theory & Logic gates IV

Number system, Conversion, Compliments, Addition and Subtraction, BCD numbers, Boolean algebra, Canonical form, Logic gates, Minimization of logical function using Karnaugh map

#### UNIT-V

**Operational Amplifier** Concept of ideal operational amplifier (inverting and non-inverting) and its applications,

Inverter, integrator, differentiator, voltage follower, summing and differential amplifier

**Electronic Instruments:** Digital Multimeter (block diagram approach), CRO (block diagram and its working), Measurement of voltage, phase, frequency. Double beam CRO (block diagram & its working).

## **Text Books :**

- 1. Bolyested& Nashekey / Electronic Devices and Circuit Theory, PHI
- 2. Milliman & Halkias: Integrated Electronics, Mc Graw Hill
- 3. J. S. Katre: Electronics Engineering, Tech-Max Publication

#### **Reference :**

1. Sedra and Smith / Microelectronic Circuits/ TMH

## **Introduction to Bioengineering BE 101** (Revised w.e.f. session 2015-2016)

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## **Biomolecules**

Unit II

Biomolecules- Structure and function of Macromolecules (Carbohydrates, Proteins, Lipids, Nucleic acid). Introduction, classification and nomenclature of enzymes.

Application in Health, food, medicine, agriculture and environment; genetically modified

### **Unit III**

### **Cell: Structure and Function**

Cell as a basic unit of life. Introduction, Definition, Types, Structure and function of the cell and cell organelles, DNA and RNA, Cell division, Central dogma.

#### **Unit IV**

#### Fundamentals of Biochemical Engineering –

Concept of pH, Buffer, Physical variables, dimensions and units, Measurement conventions, Process flow diagrams, Material and energy balances, fluid flow and mixing, Heat transfer, Mass transfer, Unit operations, Homogeneous reactions, Heterogeneous reactions, History, principles and outline of fermentation process

#### Unit V

## **Practical Aspects of Bioengineering**

Handling and use of simple and compound microscope; Identification of monosacchrides, disacchrides and polysaccharides in given samples; Protein content in various food seeds; Cellular staining of a microbial, plant and animal cell: microscopic observations and morphology; Demonstration of a fermentor.

## Unit I

**Introduction to Biotechnology** 

(GM) organisms; biosafety issues.

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## **TEXT BOOKS:**

- 1. Text book of Biotechnology by H.K.Dass (Wiley India publication)
- 2. Biotechnology by B.D.Singh (Kalyani Publishers)
- 3. Text book of Biotechnology by R.C.Dubey (S.Chand and company)
- 4. Biotechnology by Smith, Cambridge Press.

## **Reference books:**

1) Introduction to Biotechnology by William J. Thieman, Michael A. Palladino, Publisher: Benjamin Cummings

2) Basic Biotechnology by Colin Ratledge Publisher: Cambridge University Press

## Engineering Physics Lab PY 104 (w.e.f. session 2015-2016)

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- 1. To determine the wavelength of sodium light by Newton's rings.
- 2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
- 3. To determine the refractive index of a liquid using laser.
- 4. To determine the specific rotation of cane sugar solution with the help of a half shade polarimeter.
- 5. To determine the wavelength of prominent spectral lines of mercury by plane diffraction grating.
- 6. To determine the resistance per unit length of Carey Foster's bridge wire and (1) to prepare one ohm coil (2) to determine the specific resistance of a given wire.
- 7. To plot the graph showing variation of magnetic field with distance along the axis of a circular coil carrying current and to determine the radius of the coil from it.
- 8. To verify Stefan's law by electrical method.
- 9. To determine the energy band gap in a semiconductor using a P-N junction diode.
- 10. To determine the coefficient of viscosity of water by Poiseuille's method.

# ELECTRICAL ENGINEERING LAB EN-102

## (w.e.f. session 2015-2016)

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#### List of Experiments:

1. Verification of Thevenin's Theorem.

2. Verification of Superposition Theorem.

3. Verification of Maximum Power Transfer Theorem.

4.To study V-I characteristics of diode.

5.To study the input & outputcharacteristics of BJT in CE configuration.

6.To study the full wave rectifier circuit with &without filter and determine the ripple factor.

7.To study the phenomenon of resonance in series RLC circuit.

8.Determination of losses in single phase transformer by OCT and SCT.

9.To calibrate a single phase induction type energy meter.

10.To study the running and reversing of a three phase SCIM.

11.Study of OP Amp based inverting and non-inverting amplifier.

# WORKSHOP PRACTICE ME-104

#### (w.e.f. session 2015-2016)

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1. Carpentry Shop: 1. Study of tools and operation and carpentry joints. 2. Simple exercise using jack plain. 3. To prepare half-lap corner joint, mortise and tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting Bench Working Shop : 1. Study of tools and operations 2. Simple exercises involving filling work. 3. Making perfect male-female joint 4. Simple exercise involving drilling/tapping/dieing.

3. Black Smithy Shop : 1. Study of tools and operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop : 1. Study of tools and operations . 2. Simple butt joint. 3. Lap joint. 4. oxy acetylene welding.

5. Sheet metal shop : 1.Study of tools and operations. 2. Making funnel complete with soldering. 3. Fabrication of tool box, tray, electrical panel box etc.

Machine Shop : 1. Study of tools and operations. 2. Plane turning. 3. Step turning. 4. Taper turning 5. Threading. 6. Single point cutting tool grinding.

# ENGINEERING GRAPHICS ME-103

## (w.e.f. session 2015-2016)

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## 1. Introduction

- Graphics as a tool to communicate ideas, Lettering and dimensioning,
- Construction of geometrical figures like pentagon and hexagon.

## 2. Orthographic Projection

- Principles of orthographic projections,
- Principal and auxiliary planes,
- First and Third angle projections.
- Projection of points.
- Pictorial view.
- Projection of lines parallel to both the planes.
- Parallel to one and inclined to other,
- Inclined to both the planes.
- Application to practical problems.
- Projection of solid in simple position,
- Axis or slant edge inclined to one and parallel to other plane,
- Solids lying on a face or generator on a plane.
- Sectioning of solids lying in various positions,
- True shape of the section.
- Development of lateral surfaces, sheet metal drawing.

## **3. Isometric Projection**

- Principles of isometric projection,
- Isometric projection using box and offset methods.

## **Books recommended:**

1. Bhatt. N.D.: Elementary Engineering Drawing, Charothar Publishing.

2. Laxmi Narayan V & Vaish W.: A Text Book of Practical Geometry on Geometrical drawing.