| Course Title | BIOLOGY FOR ENGINEERS | | | | B. Tech.<br>CE,ME & EEE -III Sem<br>ECE & CSE - IV Sem | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | |
| **1823301** | **BSC** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exams** | **Total** |
| | | 2 | -- | -- | 2 | 30 | 70 | 100 |
| **Mid Exam Duration: 2Hrs** | | | | | **End Exam Duration: 3Hrs** | | |

**Course Objectives:**

- Introduction to Basics of Biology which includes cell, the unit of life, Different types of cells and classification of living organisms.
- Understanding what are biomolecules present in a cell, their structure function and their role in a living organism. Application of certain bio molecules in Industry.
- Brief introduction to human physiology, which is essential for bioengineering field.
- Understanding the hereditary units, that is genes and genetic materials (DNA and RNA) present in living organisms and how they replicate and pass and preserve vital information in living organisms.
- How biology can be applied in our daily life using different technology, for production of medicines to transgenic plants and animals to designing new biotechnological products

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | **Define** the cells, its structure and function, and Different types of cells and basis for Classification of living organisms. |
| **CO 2** | **Explain** about biomolecules its structure and function and their role in a living organism How biomolecules are useful in Industry & explain about human physiology. |
| **CO 3** | **Demonstrate** the concept of biology and its uses in combination with different technologies for production of medicines and production of transgenic plants and animals. |
| **CO 4** | **Illustrate** about genes and genetic materials (DNA & RNA) present in living organisms and how they replicate, transfer & preserve vital information in living organisms. |

## UNIT-I

**Introduction to Basic Biology**

Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes
The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Brief introduction to five kingdoms of classification.

## UNIT-II

**Introduction to Bio-molecules**

Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types.
Enzymes and their application in Industry. Large scale production of enzymes by Fermentation.

## UNIT-III

**Human Physiology**

Nutrition (Classes of nutrients or food substances), Digestive systems, Respiratory system (two kinds of respiration – aerobic and anaerobic) Respiratory organs, respiratory cycle. Excretory system

## UNIT-IV

**Genes, Replication of DNA, And Introduction to recombinant DNA Technology:**

Prokaryotic gene and Eukaryotic gene structure, gene replication, Transcription and Translation in Prokaryote and Eukaryote and synthesis of protein in Eukaryotes. Recombinant DNA technology and cloning introduction.

## UNIT-V

**Application of Biology**

Brief introduction to Production of vaccines, Enzymes, antibodies, Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels, and Biosensors. What is Tissue engineering? And its application, transgenic plants and animals, Bio engineering (production of artificial limbs, joints and other parts of body).

**Text Books:**


1. Cell and Molecular Biology-P.K.Gupta
2. Cell Biology-Verma and Agarwal
3. Cell Biology-Rastogi
4. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
5. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.


**Reference Books:**


1. AlbertsEt.Al. The molecular biology of the cell, 6/e, Garland Science, 2014
2. De Robertis EDP & EMF De Robertis. 2001. Cell and Molecular biology. Lippincott Williams &Wilkins.Bombay.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
4. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012 Principles of Biochemistry. 2nd ed. 1993. A.L. Lehninger, D.L.Nelson.M.Cox. Paniama Publications. PP. 1090.
5. Harper's biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.
6. Introductory Microbiology. 1995, by Trevor Gross.
7. Molecular Biology by G. Padmanabhan, K. SivaramSastry, C. Subramanyam, 1995, Mac Millan.
8. Biochemistry of Nucleic Acids.1992.11thed.R.L.P.Adams.J.T.Knowler.D.PLeader.Chapman and Hall.
9. Genetic Engineering –SandhyaMitra.

Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH Publishers).

| Course Title | Electronic Devices & Circuits | | | | | B. Tech. EEE III Sem | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| 1814302 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration: 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn the working of various diodes and its circuits, transistors and its applications, multivibrators and the fundamentals of logic families.

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | Understand the principles of semiconductor devices. |
| **CO 2** | Apply semiconductor devices in the design of electronic circuits. |
| **CO 3** | Analyze electronic circuits using diodes and transistors. |
| **CO 4** | Illustrate frequency response of amplifiers. |

## UNIT - I

**Diode and its Characteristics:** PN Junction diode, Symbol, V-I characteristics, Diode Applications, Rectifiers-Half Wave, Full Wave and Bridge Rectifiers (Simple Problems), Zener Diode- Volt-Ampere Characteristics, Zener Diode as Voltage Regulator, Light Emitting Diode, SCR characteristics and its applications.

## UNIT - II

**Bipolar Junction Transistor (BJT):** Types of Transistors, Operation of NPN and PNP Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations, Relation between IC, IB and IE. Transistor Biasing- Fixed Bias, Voltage Divider Bias, Transistor Applications-Transistor as an Amplifier, Transistor as a Switch, Single Stage CE Amplifier, Frequency Response of CE Amplifier.

## UNIT - III

**Junction Field Effect Transistor:** Theory and Operation of JFET, Output Characteristics, Transfer Characteristics, Configurations of JFET- CD, CS and CG Configurations, JFET Applications- JFET as an Amplifier, JFET as a Switch, Comparison of BJT and JFET, MOSFET-The Enhancement and Depletion MOSFET, Static Characteristics of MOSFET, Applications of MOSFET.

## UNIT - IV

**Oscillators:** Concepts of Feedback Amplifier, Necessary conditions for Oscillators, RC phase shift Oscillator, Colpits Oscillator, Hartley Oscillator, and Crystal Oscillator.

**Power amplifiers:** Classification of power amplifiers, efficiency of class-A, class-B, class-C and class-D power amplifiers, complementary symmetry push pull power amplifier.

## UNIT - V

**Digital Logic Circuits:** AND, OR & NOT Gates using Diodes and transistors, Analysis of DCTL, RTL, DTL, TTL, ECL, IIL, MOS, CMOS Logic families and Comparison between the logic families.

**Text Books:**


1. Jacob Millman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.
3. David A. Bell, "Solid State Pulse Circuits", PHI, 4th edition, 2002.


**Reference Books:**


1. Electronic Devices and Circuits-K.Lal Kishore, 2nd Edition, 2005, BSP.
2. J.Millman, H.Taub and Mothiki S. Prakash Rao, " Pulse, Digital and Switching Waveforms", TMH, 2nd Edition, 2008.

J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.

| Course Title | Electrical Circuit Analysis | | | | | B. Tech. EEE III Sem | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| 1802303 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| Mid Exam Duration: 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn network theorems, application of resonance, transients applied for ac and dc circuits, necessary conditions for network functions, various parameters and its relationships, balanced & unbalanced systems applied for three phase circuits.

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | Understand the basic concepts of three phase circuits, resonance, network functions and locus diagrams. |
| **CO 2** | Solve DC & AC circuits by using various theorems . |
| **CO 3** | Analyse R-L,R-C and R-L-C circuits for DC and AC transient response. |
| **CO 4** | Evaluate the voltage, Current and Power for balanced and unbalanced circuits. |
| **CO 5** | Analyse two port circuit behaviour for various parameters. |

## UNIT - I

**Network Theorems:** Reciprocity, compensation & millman's theorem for dc and sinusoidal excitations, superposition theorem, thevenin's & norton's theorems, maximum power transfer theorems to ac excitation, simple problems.

## UNIT - II

**Resonance:** Series, parallel circuits, concept of half power frequencies, bandwidth and q factor. simple problems.

**Locus diagrams:** Impedance and admittance locus diagrams of series and parallel combinations R-L, R-C, R-L-C with variation of various parameters.

## UNIT - III

**Network Functions:** Single port and multiport networks, immittance functions of two port parameters, necessary conditions for driving point and transfer functions, poles and zeros, time domain response from pole zero plots, restrictions from pole zero locations.

**Two Port Networks :** Two port networks, impedance, admittance, transmission parameters, hybrid and inverse hybrid parameters, relationships between parameters, conditions for symmetry and reciprocity.

## UNIT - IV

**DC Transient Analysis:** Determination of initial conditions – transient response of R-L, R-C and R-L-C circuits for DC–solution method using differential equation and laplace transforms.

**AC Transient Analysis:** Transient response of R-L, R-C and R-L-C series circuits for sinusoidal excitations – solution method using differential equation and laplace transforms.

## UNIT - V

**Three Phase Circuits:** Phase sequence, balanced and unbalanced systems – magnitude & phasor relationship between line and phase voltages and currents in balanced Y and Δ circuits. Analysis of unbalanced loads- neutral displacement method, Y-Δ conversion and loop current method.

Measurement of three phase power by two wattmeter method, measurement of three phase reactive power by single wattmeter method.

**Text Books:**

1. Theory and Problems of Electrical Circuits – Joseph A. Edminister, Schaum Series
2. Circuit Theory - A.Chakrabarty
3. Electrical Circuits - N. Sreenivasulu.
4. Network Analysis – Van Valkenburg - 3rd edition.

**Reference Books:**

1. Circuits & Networks – A. Sudhakar, Shayammohan. S. Pillai, 4th Edition – TMH.
2. Networks and Systems – D. Roy Chowdari – New Age International
3. Network Analysis with applications – Stanely - Pearson education 4th edition.
4. Network Analysis by G.K. Mittal, Khanna Publishers.

| Course Title | Electromagnetic Fields | | | | | B. Tech. EEE III Sem | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| 1802304 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration: 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn the concepts of electric and magnetic fields under static conditions which will be used in theory of transmission lines and electrical machines

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | Understand the concepts of electrostatic and magneto static fields due to electric charges and steady currents, faraday's laws. |
| **CO 2** | Apply maxwell's equations for time variant and invariant fields |
| **CO 3** | Analyse divergence of electric field, electric dipole, behaviour of conductor, boundary conditions and polarization in dielectrics. |
| **CO 4** | Analyse curl of magnetic field. force on a current carrying conductor and inductance of solenoid and toroid. |
| **CO 5** | Evaluate electric and magnetic fields by various laws for time variant and invariant fields |
| **CO 6** | Solve the problems on force due to electric charges & steady currents |

## UNIT - I

**Electric Field & Gauss Law:** Coulomb's law, electric field intensity (efi), efi due to a line charge, surface charge and volume charge, work done in moving a point charge in an electric field, gauss law, gauss law using infinite line charge and co-axial cable, gauss law in point form (Maxwell first law, div(**D**) = $\rho_v$), numeric problems

**Electric Potential & Dipole:** Electric potential, potential gradient electric dipole, dipole moment – potential & EFI due to an electric dipole, numeric problems.

## UNIT - II

**Conductors:** Current and current density, conduction and convection current densities, continuity equation, behaviour of conductors in electric fields, ohm's law in point form, numeric problems.

**Polarization & Capacitance:** Polarization, boundary conditions – dielectric -conductor, dielectric - dielectric. capacitance – capacitance of parallel plate, spherical and co-axial capacitors, numeric problems.

## UNIT - III

**Magneto Static Fields:** Biot-savarat's law, MFI due to a straight current carrying filament, circular, square and solenoid current carrying wire. maxwell's second equation,

**Ampere's Law:** Ampere's circuital law and its applications, ampere's circuital law in point form, maxwell third equation , numeric problems

## UNIT - IV

**Magnetic Force:** Lorentz force equation, Force on a current element in a magnetic field, Force on a straight and long current carrying conductors in magnetic fields, Force between two and straight parallel current carrying conductors, Numeric Problems.

**Torque & Inductance:** Torque on a current loop placed in a magnetic dipole. Self Inductance, Application of self inductance of a Solenoid and Toroid, Numeric Problems

## UNIT - V

**Time varying Fields:** Faraday's laws of electromagnetic induction, its integral and point forms, maxwell's fourth equation. statically and dynamically induced emfs, modification of maxwell's equation for time varying fields, displacement current, and maxwell's equation in differential and integral form, numeric problems.

**Text Books:**


1. Principles of Electromagnetics, Mathew N. O. Sadiku, Oxford (I) student 4th edition
2. Electromagnetic Fields, Dr. S. Kamakshaiah, Right Publishers, 2007.
3. Engineering Electromagnetics, William H. Hayt and John A. Buck, TMH, 7th edition 2006.


**Reference Books:**


1. Electromagnetics, J. D. Kraus, TMH, 4th edition 1992.
2. Electromagnetic Fields, TVS Arun Murthy, S. Chand & Company Ltd., 1st edition 2008
3. Field Theory, K. A. Gangadhar, P. M. Ramanathan, Khanna Publishers, 15th edition, 2003.
4. Electromagnetics, J. P. Tewari, Khanna Publishers.
5. Electromagnetic Waves & Radiating Systems, Edward C. Jordan and Keith G. Balmain, Prentice Hall of India Pvt. Ltd.

| Course Title | Electrical Machines-I | | | | | B. Tech. EEE III Sem | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| 1802305 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| Mid Exam Duration: 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn principle, operation, construction, characteristics of dc machines, and transformers

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | Understand the principle, operation and constructional details of dc machines and transformers |
| **CO 2** | Analyse the characteristics of dc machines, phasor diagrams and parallel operation of single phase transformers |
| **CO 3** | Compare losses and efficiency by conducting different test on dc machines and transformers |
| **CO 4** | Choose different types of connections to be considered for three phase transformers |

## UNIT - I

**DC Generators:** Construction, principle of operation, emf equation, armature reaction, commutation, numerical problems.

Types of dc generators, open circuit characteristics, load characteristics of shunt, series and compound generators, parallel operation of dc generators, numeric problems.

## UNIT - II

**DC Motors:** Principle of operation, back emf, torque equation, characteristics and application of series, shunt and compound motors, numerical problems.

**Speed Control:** Speed control of dc shunt & series motors, starters (3 & 4point), design of starters, numerical problems.

## UNIT - III

**Testing of DC Machines:** Losses & efficiency, condition for maximum efficiency, brake test, swinburne's test, hopkinson's test, field's test, retardation test, separation of stray losses in a dc motor, numerical problems.

## UNIT - IV

**1Φ Transformer:** Construction, principle of operation, types, emf equation, operation on no load and load, phasor diagrams, equivalent circuit, losses, efficiency & regulation, all day efficiency, numerical problems.

**Testing of Transformer:** OC & SC tests, sumpner's test, predetermination of efficiency & regulation, separation of losses test, numeric problems.

## UNIT - V

**Parallel Operation & Auto transformer:** Parallel operation with equal & unequal voltage ratios, auto transformer, equivalent circuit, comparison with two winding transformer, numeric problems.

**3Φ Transformer:** Types of connections, Y-Y, Y-Δ, Δ-Y, Δ-Δ, open delta, scott connection, 3-winding transformers, tertiary windings.

### Text Books


1. Electrical Machines, P. S. Bimbra, Khanna Publishers
2. Electrical Machines, I.J. Nagarath & D.P. Kothari, TMH, 7th Edition 2005
3. Electrical Machines, J.B. Gupta, Kataria Publications


### Reference Books


1. Electrical Machinery, A. E. Fitzgerland, C. Kingsley and S. Umlauts, TMH,5th Edition
2. Performance and Design of DC machines, Clayton and Hancock, BPB Publishers, 2004
3. DC Machines & Transformers, R.K. Rajput, Laxmi Publications.

| Course Title | Power Systems-I | | | | | B. Tech. EEE III Sem | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| 1802306 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration: 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn conventional & non conventional energy sources, economic aspects mechanical and electrical design of transmission lines, and underground cables.

**Course Outcomes:** On successful completion of this course, the students will be able to

| | |
|---|---|
| **CO 1** | Understand the basic concepts of various generating systems and its load characteristics |
| **CO 2** | Understand the construction and types of cables used for underground |
| **CO 3** | Analyse the mechanical aspects of transmission lines and corona phenomenon |
| **CO 4** | Evaluate inductance and capacitance of transmission lines and grading of underground cables |
| **CO 5** | Determine the cost of electrical energy, tariff charges on consumers |

## UNIT – I

**Thermal, Hydro & Nuclear Power Stations:** Line diagram & its explanation for thermal, hydro & nuclear power stations, and principle of operation of nuclear reactor.

## UNIT - II

**Economic Aspects of Power Generation:** Load curve, load duration curve, integral load duration curves, load factor, demand factor, diversity factor, capacity factor, utilization factor and plant use factors-numerical problems.

Choice of size and number of generating units cost of electrical energy, problems, types of tariff charges on consumers – numerical problems.

## UNIT - III

**Mechanical Design of Transmission Lines:** Insulators, types of insulators, string efficiency, methods of improving string efficiency, numerical problems.

Sag and tension calculations for equal and unequal heights of towers, effect of wind and ice on weight of conductors, numerical problems.

## UNIT - IV

**Electrical Design of Transmission Lines:** Types of conductors, calculation of resistance for solid conductor, concept of GMR & GMD, calculation of inductance and capacitance for 1Φ and 3Φ single and double circuit lines, symmetrical and asymmetrical conductor configuration with and without transportation, effect of earth on capacitance - numerical problems.

## UNIT - V

**Underground Cables:** Construction, types of cables, insulation in cables, calculation of insulation resistance and stress in insulation. capacitance of single and 3 core belted cables. grading of cables, capacitance grading, description of intersheath grading, numeric problems.

**Corona:** Description of corona phenomenon, factors affecting corona, critical disruptive voltage, visual disruptive voltage and power loss, radio interference, numeric problems.

### Text Books:


1. Electrical power systems - by C. L. Wadhwa, New Age International (P) Limited, Publishers, 4th Edition, 2005.
2. Power system Engineering-by I. J. Nagrath and D. P. Kothari, Tata McGraw Hill
3. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A. Chakrabarti, Dhanpat Rai & Co Pvt. Ltd., 2003.


### Reference Books:


1. Power System Analysis and Design by B. R. Gupta, S. Chand & Co, 6th Revised Edition, 2010.
2. Principles of power systems by V.K.Mehta, S Chand publishers.

Electric Power Systems by S. A. Nasar, Schaum Outline Series, TMH, 3rd Edition, 2008.

# K. S. R. M. College of Engineering - Kadapa

**(Autonomous)**

**Department of Electrical & Electronics Engineering**

## B. Tech – IV Semester (Theory - 6, Lab - 3)

| S. No. | Subject Code | SUBJECT | SC | L | T | P | IM | EM | CR |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1821401 | Mathematics - III | BSC | 3 | 0 | 0 | 30 | 70 | 3 |
| 2 | 1814402 | Digital System Design | PCC | 3 | 0 | 0 | 30 | 70 | 3 |
| 3 | 1802403 | Electrical Measurements | PCC | 3 | 0 | 0 | 30 | 70 | 3 |
| 4 | 1802404 | Control Systems | PCC | 3 | 0 | 0 | 30 | 70 | 3 |
| 5 | 1802405 | Electrical Machines - II | PCC | 3 | 0 | 0 | 30 | 70 | 3 |
| 6 | 1802406 | Power Systems - II | PCC | 3 | 0 | 0 | 30 | 70 | 3 |
| 7 | 1802407 | Electrical Measurements Lab | PCC | 0 | 0 | 2 | 50 | 50 | 1 |
| 8 | 1802408 | Electrical Machines - I Lab | PCC | 0 | 0 | 2 | 50 | 50 | 1 |
| 9 | 1805409 | Python Programming Lab | ESC | 0 | 0 | 4 | 50 | 50 | 2 |
| 10 | 18994M1 | Environmental Science | MC | 2 | 0 | 0 | 30 | 00 | 0 |
| **Total** | | | | 20 | 00 | 08 | 360 | 570 | 22 |

**B.Tech., IV Semester**

<table>
<tr><td>Course Title</td><td colspan="5">Mathematics - III</td><td colspan="3">B. Tech. EEE II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1821401</td><td rowspan="2">Basic Sciences (BSC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 2Hrs</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="8">Course Objectives: The objective of the course is to familiarize the students Bessel functions, Legendre's equations and the concepts of complex variables to equip the students to solve application problems in their disciplines.</td></tr>
<tr><td colspan="8">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="7">Understand analytic function, singularities, poles and residues</td></tr>
<tr><td>CO 2</td><td colspan="7">Discuss the various special transformations.</td></tr>
<tr><td>CO 3</td><td colspan="7">Determine the differentiation of complex functions used in engineering problems</td></tr>
<tr><td>CO 4</td><td colspan="7">Solve Bessel and Legendre equations in terms of polynomials</td></tr>
<tr><td>CO 5</td><td colspan="7">Analyze images from z-plane to w-plane, real integrals in definite regions.</td></tr>
</table>

## UNIT - I

**Bessel functions**: Introduction – Recurrence formulae for $J_n(x)$ – Generating function for $J_n(x)$ – Jacobi series – Orthogonality of Bessel functions – Legendre polynomials – Solution of Legendre's equation – Legendre Polynomials – Rodrigue's formula – Generating function for $P_n(x)$ - Recurrence formulae for $P_n(x)$ – Orthogonality of Legendre polynomials.

## UNIT - II

**Functions of a complex variable**: Limit – Continuity -Differentiability – Analytic function – Properties – Cauchy – Riemann equations in cartesian and polar coordinates – Harmonic and Conjugate harmonic functions. Construction of analytic function using Milne's Thomson method.

## UNIT - III

**Conformal Mapping**: Some standard transforms – translation, rotation, magnification, inversion and reflection. Bilinear transformation – invariant points. Special conformal transformations = $e^z$ , $z^2$, sinz and cosz.

## UNIT - IV

**Complex integration**: Line integral - Evaluation along a path – Cauchy's theorem – Cauchy's integral formula – Generalized integral formula. Singular point – Isolated singular point – Simple pole, Pole of order *m* – Essential singularity.

## UNIT - V

**Residues**: Evaluation of residues by formula. Cauchy's residue theorem – Evaluation of the real definite integrals of the type (i) Integration around the unit circle (ii) integration around a small semi circle.

### Text Books:


1. Higher Engineering Mathematics, Dr. B.S Grewal, Khanna Publishers.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Willey Publications, 9th edition.


### Reference Books:


1. Higher Engineering Mathematics, B.V.Ramana, Mc.Graw Hill Education(India) Private Limited.
2. Advanced Engineering Mathematics by N. Bali, M Goyal, Firewall Media 7th edition.
3. Engineering Mathematics, Volume – III , E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

| Course Title | Digital System Design | | | | B. Tech. EEE IV Sem | | |
|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | Credits | Maximum Marks | | |
| 1814402 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration : 2Hrs | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to provide fundamentals of number systems and boolean algebra, the design of combinational and sequential circuits, various memories and PLDs.

**Course Outcomes:** On successful completion of this course, the students will be able to,

| | |
|---|---|
| **CO 1** | Understand various number systems and binary codes. |
| **CO 2** | Apply K-map to simplify Boolean functions. |
| **CO 3** | Design combinational logic circuits |
| **CO 4** | Design synchronous sequential logic circuits. |
| **CO 5** | Realize Switching functions using Programmable Logic Devices |

## UNIT I

**Number Systems & Codes:** Overview of number systems –complement representation of negative numbers- binary arithmetic, binary codes, code conversion, error detecting & error correcting codes – hamming codes.

## UNIT II

**Boolean Algebra and Minimization of Switching Functions**

Fundamental postulates of boolean algebra - basic theorems and properties –canonical and standard forms-minimal SOP and POS forms, algebraic simplification, digital logic gates –universal gates-multilevel NAND/NOR realizations. the K- map method, tabulation method

## UNIT III

**Combinational Logic Design**

Design using conventional logic gates, half and full adders, sub tractors, serial and parallel adders, encoder, decoder, multiplexer, de- multiplexer, realization of switching functions using multiplexer, parity bit generator, code-converters, hazards and hazard free realizations.

## UNIT IV

**Sequential Logic Design**

Synchronous and asynchronous sequential circuits, flip-flop-triggering and excitation tables, flip flop conversions, shift registers, design of synchronous and asynchronous counters, ring and Johnson counters. Finite state machines (mealy model, Moore model) and their representation, designing synchronous sequential circuits like serial binary adder, sequence detector.

## UNIT V

**Semiconductor Memories & Programmable Logic Devices**

ROM- Internal structure, Static RAM and Dynamic RAM. Basic PLD‟s-ROM, PROM, PLA, and PAL, Realization of Switching functions using basic PLD‟s. Concept of PLD‟s like CPLDs and FPGAs.

### Text Books


1. ZVI Kohavi, Switching & Finite Automata theory –, TMH, 2nd Edition.
2. Morris Mano, “Digital Design”, PHI, 3rd Edition, 2006.
3. A. Anand Kumar, “Switching Theory & Logic Design”, 2008, PHI.


### Reference Books


1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. W.H. Gothmann,“Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition, 2006.
3. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989.
4. William I. Fletcher, “An Engineering Approach to Digital Design”, PHI.
5. Charles H. Roth, “Fundamentals of Logic Design”, Thomson Publications, 5th Edition, 2004.
6. John M. Yarbrough, “Digital Logic Applications and Design”, Thomson Publications, 2006.

| Course Title | Electrical Measurements | | | | B. Tech. EEE IV Sem | | |
|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | |
| 1802403 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration : 2Hrs | | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn about the measuring instruments, ac and dc bridges, instrument transformer, potentiometer and CRO.

**Course Outcomes:** On successful completion of this course, the students will be able to,

| | |
|---|---|
| **CO 1** | Classify the types of instruments and bridges. |
| **CO 2** | Choose suitable instrument to measure Voltage, Current, Power, Energy and lissajous patterns. |
| **CO 3** | Determine circuit parameters using Bridges. |
| **CO 4** | Measure Phase angle errors from CT's and PT's, magnitude and frequency from the CRO. |

## UNIT - I

**Measuring Instruments**

Classification, deflecting, control and damping torques, ammeters and voltmeters, PMMC, moving iron, dynamometer type instruments, expression for the deflecting torque and control torque, errors and compensations, extension of range using shunt and multipliers, numeric problems.

## UNIT - II

**Measurement of Power**

Single phase dynamometer wattmeter, expression for deflecting and control torques, types of p.f. meters – dynamometer and moving iron type, 1Φ& 3Φ meters

**Measurement of Energy**

Single phase induction type energy meter, driving and braking torques, errors and compensations. Three phase energy meter.

## UNIT - III

**D.C. Bridges**

Method of measuring low, medium and high resistance – sensitivity of wheatstone's bridge – kelvin's double bridge for measuring low resistance,measurement of high resistance – loss of charge method.

**A.C Bridges**

Measurement of inductance - maxwell's bridge, anderson's bridge, measurement of capacitance and loss angle, desauty's bridge, schering bridge- frequency measurement- wien's bridge.

## UNIT - IV

**Instrument Transformers**

CT and PT – ratio and phase angle errors–design considerations.

**Potentiometers**

Principle and operation of d.c. crompton's potentiometer, standardization, measurement of unknown resistance, current and voltage. a.c. potentiometers: polar and coordinate type's, standardization – applications.

## UNIT - V

**Electronic Measurements**

Cathode ray oscilloscope – cathode ray tube – time base generator – horizontal and vertical amplifiers – application of cro – measurement of phase, frequency, current & voltage – lissajous pattern.

**Digital meters**

Digital voltmeter – successive approximation, ramp and integrating type.

## Text Books

1. Electrical measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.
2. Electrical & Electronic Measurement & Instruments by A. K. Sawhney, Dhanpat Rai & Co. Publications.
3. Electronic Instrumentation and measurement techniques by William D Cooper- Prentice Hall Publishers

## Reference Books

1. Electrical Measurements – by Buckungham and Price, Prentice – Hall
2. Electrical Measurements: Fundamentals, Concepts, Appliations – by Ressland, M.U, New Age International (P) Limited, Publish.
3. Electronic Instrumentation by H. S. Kalsi, Tata Grawhill Mc, 3rd Edition.

| Course Title | Control Systems | | | | B. Tech. EEE IV Sem | | |
|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | Credits | Maximum Marks | | |
| 1802404 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration : 2Hrs | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn mathematical modeling of physical systems, electrical systems, time response of first order and second order Systems, stability analysis using time domain and frequency domain and design compensator in frequency domain to improve the performance.

**Course Outcomes:** On successful completion of this course, the students will be able to,

| | |
|---|---|
| **CO 1** | Understand modelling of physical systems, time and frequency domain specifications and stability of the system. |
| **CO 2** | Analyze the stability of the system in time and frequency domains. |
| **CO 3** | Evaluate the transfer function using block diagram reduction technique and signal flow graph, steady state error and static error constants. |
| **CO 4** | Design lag, lead, lag-lead compensators in frequency domain. |

## UNIT - I

**Control System Concepts**

Introduction to control systems, classification, transfer function, effect of feedback, mathematical modeling of physical systems, block diagram, reduction techniques, signal flow graphs and mason's gain formula, transfer function of simple electrical systems.

## UNIT - II

**Time Domain Analysis**

Standard test signals, time response of first and second order systems- time response specifications, steady state error and error constants, response of P, PI, and PID controllers.

## UNIT - III

**Concept of Stability and Root Locus**

The concept of stability, necessary conditions for stability – Routh Hurwitz's criterion – limitations of Routh's stability – Root locus concept – construction of Root loci, effect of poles & zeros on stability.

## UNIT - IV

**Frequency Domain Analysis**

Introduction, correlation between time and frequency response, frequency domain specifications, bode plots, Nyquist stability criterion - gain and phase margin.

**UNIT - V**

**Compensation Techniques**

System design and compensation – realization of basic lead, lag and lead – lag cascade compensations in frequency domain.

## Text Books

1. “Control Systems Engineering” by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.
2. “Automatic Control Systems” by B. C. Kuo and Farid Goinaraghi – John Wiley and Son’s, 8th edition, 2003.
3. Control Systems” by A. Anand Kumar, Prentice Hall of India Pvt. Ltd.

## Reference Books

1. “Modern Control Engineering” by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. “Control Systems Engineering” by NISE, 5th edition, John Wiley.
3. “Modern Control Systems” by C. Dorf, Robert H.Bishop, 12th edition, Pearson New International Edition.

<table>
<tr><td>Course Title</td><td colspan="4">Electrical Machines – II</td><td colspan="3">B. Tech. EEE II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="2">Maximum Marks</td></tr>
<tr><td rowspan="2">1802405</td><td rowspan="2">Professional Core (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>--</td><td>--</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 2Hrs</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="8">Course Objectives: The objective of the course is to learn principles, operation, construction, characteristics and starting methods of induction motor and synchronous machines.</td></tr>
<tr><td colspan="8">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="7">Understand Constructional details, working, characteristics, starting methods of a synchronous machines and induction motors.</td></tr>
<tr><td>CO 2</td><td colspan="7">Distinguish torque-speed curves and Speed control methods of induction motors.</td></tr>
<tr><td>CO 3</td><td colspan="7">Analyze the regulation, synchronization, hunting of synchronous machines and power factor improvement.</td></tr>
<tr><td>CO 4</td><td colspan="7">Evaluate the performance of three phase induction machines and synchronous machines by direct and indirect tests.</td></tr>
</table>

**UNIT - I**

**3-Φ Induction Motors:** Production of rotating magnetic field - construction, types (squirrel cage and slip-ring), torque slip characteristics, starting and maximum torque, equivalent circuit. phasor diagram, losses and efficiency, effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, and frequency), circle diagram construction.

**UNIT - II**

**Starting methods:** Methods of starting and speed control for induction motors.

**1-ø Induction Motor:** Introduction - double field revolving theory– equivalent circuit – determination of equivalent parameters- problems - starting methods – resistance & capacitance split phase and shaded pole motors.

**UNIT - III**

**Synchronous Generators:** Constructional details of synchronous machines, armature windings, distribution, pitch and winding factors - emf equation; armature reaction, concept of leakage flux, synchronous reactance, equivalent circuit, phasor diagram, voltage regulation, determination of regulation by synchronous impedance method, MMF and ZPF method.

**UNIT - IV**

**Salient Pole Machines:** Theory of salient pole machines, phasor diagrams, and determination of $X_d$ and $X_q$ from slip test, expression for power output of salient pole and cylindrical pole synchronous generators, power angle characteristics, Synchronizing power and torque.

**Parallel Operation:** Conditions for parallel operations, synchronizing and load sharing of synchronous generators

## UNIT - V

**Synchronous Motors:** Principle of operation, methods of starting, phasor diagram of synchronous motor, variation of current and power factor with excitation, hunting and use of damper bars, synchronous condenser and power factor correction, excitation and power circles.

**Text Books:**


1. Electric Machines by I. J. Nagrath and D. P. Kothari, TMH Publishers, 4th Edition 2010.
2. Electrical Machines by P. S. Bimbhra, Khanna Publishers.
3. Electrical Machines by Abhijit Chakrabarti, Sudipta Debnath, Mcgraw Hill Education (INDIA) Private Limited.


**Reference Books:**


1. Theory of Alternating Current Machinery by Langsdorf, TMH Publishers, 2nd Edition
2. Electro mechanics – II& III (Induction Motors, Synchronous and Single Phase Machines) by S. Kamakashiah, Overseas Publishers Private Ltd.
3. Electrical Machines by M. S. Sarma and M. K. Pathak, CENGAGE Learning.
4. The Performance and Design of AC Machines, M. G. Say, ELBS and Pitman & Sons.

| Course Title | Power Systems - II | | | | B. Tech. EEE II Sem | | |
|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | Credits | Maximum Marks | | |
| 1802406 | Professional Core (PCC) | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | -- | -- | 3 | 30 | 70 | 100 |
| Mid Exam Duration : 2Hrs | | | | | End Exam Duration : 3Hrs | | |

**Course Objectives:** The objective of the course is to learn transmission line performance, per unit system, fault analysis on transmission and iterative methods.

**Course Outcomes:** On successful completion of this course, the students will be able to,

| | |
|---|---|
| **CO 1** | Understand various transmission lines, the formulation of impedance and admittance bus matrices for a power system network, symmetrical and unsymmetrical faults, importance of power flow studies. |
| **CO 2** | Evaluate the performances of transmission lines and $Y_{bus}$ for a given power system network. |
| **CO 3** | Analyze per unit quantities and fault calculations for various types of faults. |
| **CO 4** | Investigate the load flow studies using different iterative techniques. |

## UNIT - I

**Performance of Transmission Lines:** Classification of transmission lines – short, medium and long line and their model representation – estimation of regulation and efficiency by nominal T, nominal π and rigorous methods - problems. equivalent T and π, surge impedance loading, Ferranti effect.

## UNIT - II

**System Modelling:** Representation of power system components– per unit representations and advantages – single line diagram representation – impedance and reactance diagram – changing the base of per unit quantities.

## UNIT - III

**Symmetrical Fault Studies:** Introduction to symmetrical fault analysis – short circuit capacity of a bus – the short circuit currents and the reactance of synchronous machines – internal voltages of loaded machines under transient conditions – expressions for fault MVA in terms of per unit and percentage quantities – need for current limiting reactors and their location.

## UNIT - IV

**Unsymmetrical Fault Studies:** Symmetrical components – phase shift of symmetrical components in star-delta transformer banks – power in terms of symmetrical components –sequence impedances and sequence networks of synchronous machines, transmission lines, transformers – zero sequence networks of 3 Φ loads and 3 Φ transformer banks – unsymmetrical fault analysis on unloaded generator and on power systems with and without fault impedance.

## UNIT - V

**Load Flow Studies:** Need for load flow studies in a power system – formation of bus admittance matrix – classification of types of buses in a power system – formulation of load flow equations – gauss-seidel iterative method for load flow studies – treatment of pv bus – acceleration factors – problems (sample one iteration only), newton - raphson method in rectangular and polar coordinates – formulation of load flow solution with or without pv buses – derivation of jacobian elements, algorithm and flowchart.

**Text Books:**


1. Elements of power system analysis, William. D. Stevenson, 4th Edition Jr., MGH
2. Computer Methods in Power Systems by Stagg EI – Abiad & Stags, TMH
3. Modern Power System Analysis by I. J. Nagarath & D. P. Kothari, TMH, 2nd Edition.
4. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar, Chakrabarti, Dhanpat Rai & Co Pvt. Ltd., 2003.
5. Power System Analysis by Nagsarkar and Sukhija, OXFORD University Press.
6. A course in Power Systems by J. B. Gupta, S. K. Kataria & Sons, 11th Edition, 2013.


**Reference Books:**


1. Electrical power systems by C. L. Wadhwa, New Age International publications.
2. Power system analysis by Hadi Saadat, MGH International.
3. Power system analysis by AR Bergen and Vijay Vittal, Pearson education Asia, 2001.
4. Power System Analysis by Grainger and Stevenson, TMH.
5. Computer Techniques in Power System Analysis by M. A. Pai, TMH, 2nd Edition.
6. Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International.
7. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH.

<table>
<tr><td>Course Title</td><td colspan="5">Electrical Measurements Lab</td><td colspan="3">B. Tech. EEE II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1802407</td><td rowspan="2">Professional Core (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>--</td><td>--</td><td>2</td><td>1</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="6"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to calibrate instruments and measure various circuit parameters.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Compare and calibrate various measuring Instruments</td></tr>
<tr><td>CO 2</td><td colspan="8">Identify balanced conditions among bridges</td></tr>
<tr><td>CO 3</td><td colspan="8">Measure the percentage errors among measuring instruments</td></tr>
</table>

**List of Experiments ( Any Ten Experiments)**

1. Calibration and testing of single phase energy meter.
2. Calibration of dynamometer power factor meter.
3. Crompton d.c. potentiometer – calibration of pmmc ammeter and pmmc voltmeter.
4. Kelvin's double bridge – measurement of resistance – determination of tolerance.
5. Measurement of % ratio error and phase angle of given C. T. by comparison.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter.
8. Measurement of parameters of a choke using 3 voltmeter and 3 ammeter methods.
9. Calibration lpf wattmeter – by phantom testing.
10. Measurement of 3 phase power with two wattmeter method (balanced & unbalanced).
11. Dielectric oil testing using H. T. testing kit
12. AC potentiometer – calibration of ac voltmeter, parameters of choke.

<table>
<tr><td>Course Title</td><td colspan="5">Electrical Machines – I Lab</td><td colspan="3">B. Tech. EEE II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1802408</td><td rowspan="2">Professional Core (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>--</td><td>--</td><td>2</td><td>1</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="6"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn and illustrate the performance of DC machines and transformers.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Analyze performance characteristics of DC machines and transformers</td></tr>
<tr><td>CO 2</td><td colspan="8">Evaluate regulation and efficiency of transformers</td></tr>
<tr><td>CO 3</td><td colspan="8">Distinguish various tests between DC motor and DC generator</td></tr>
</table>

**List of Experiments (Any Ten)**

1. OCC Characteristics of DC shunt generator.
2. Brake test on DC shunt motor.
3. Swinburne's test and Speed control of DC shunt motor
4. Fields test on DC series machines.
5. Hopkinson's test on DC shunt machines.
6. Load test on DC shunt generator.
7. OC and SC Test on single phase transformer
8. Brake test on DC compound motor.
9. Load test on DC compound Generator.
10. Load test on DC series generator.
11. Sumpner's test on single phase transformer
12. Scott connection of three phase transformer
13. Load test on single phase transformer
14. Separation of losses on single phase transformer

<table>
<tr><td>Course Title</td><td colspan="5">Python Programming Lab</td><td colspan="3">B. Tech. EEE II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1805409</td><td rowspan="2">Engineering Sciences (ESC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>--</td><td>--</td><td>4</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn syntax and semantics, create functions in python, Handle Strings and files in Python, understand lists, dictionaries and regular expressions in Python.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Examine python syntax and semantics and be fluent in the use of python flow control and functions</td></tr>
<tr><td>CO 2</td><td colspan="8">Demonstrate proficiency in handling Strings and file Systems</td></tr>
<tr><td>CO 3</td><td colspan="8">Create, run and manipulate Python programs using core data structures like lists, dictionaries and use regular Expressions.</td></tr>
</table>

**List of Experiments**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First 'n' prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

**Software Required:** Python 3 interpreter for Windows/Linux.