**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: II** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19ABS9916 | Numerical Methods and Probability | 3 | 1 | 0 | 4 |

**Course Outcomes:**

1) Evaluate approximating the roots of polynomial and transcendental equations by different algorithms
2) Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations
3) Apply discrete and continuous probability distributions
4) Design the components of a classical hypothesis test
5) Infer the statistical inferential methods based on small and large sampling tests

**Unit 1: Solution to algebraic equations** **8 hrs**

Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method. finite differences, relation between operators, interpolation using Newton‘s forward and backward difference formulae. Interpolation with unequal intervals: Newton‘s divided difference and Lagrange‘s formulae.

**Unit 2: Numerical differentiation and integration** **8 hrs**

Numerical Differentiation, numerical integration- trapezoidal rule and Simpson‘s 1/3rd and 3/8 rules. Ordinary differential equations-Taylor‘s series, Euler and modified Euler‘s methods. Runge-Kutta method of fourth order for solving first and second order equations.

**Unit 3: Probability** **10 hrs**

probability axioms, addition law and multiplicative law of probability, conditional probability, Baye‘s theorem, random variables (discrete and continuous)**,** probability distribution: Binomial -

Poisson approximation to the binomial distribution and normal distribution-their properties.

**Unit 4: Testing of Hypothesis** **8 hrs**

Formulation of null hypothesis, critical regions, level of significance.

Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means.

**Unit 5: Small Sample Tests** **8 hrs**

Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2/e, Reprint 2012.

**References**

1. T.K.V.Iyengar, B.Krishna Gandhi and others, Engineering Mathematics- III , S.Chand Publishers
2. T.K.V.Iyengar, B.Krishna Gandhi and others, Probability And Statistics , S.Chand Publishers
3. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi

Publications, Reprint, 2010.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO2 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.2 |
| CO3 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO4 | PO2: Conclusions using first principles of mathematics | 2.4 | 2.4.1 |
| CO5 | PO2: Conclusions using first principles of mathematics | 2.4 | 2.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: I** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0509 | Basics of Python Programming | 2 | 0 | 0 | 2 |

**Course Objectives:**

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

**Unit – I**

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.
Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.
Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions andUses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stackdiagrams, Fruitful Functions and Void Functions, Why Functions.

**Unit – II**

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interfacedesign, Refactoring, docstring.
Conditionals and Recursion: floor division and modulus, Boolean expressions, Logicaloperators, Conditional execution, Alternative execution, Chained conditionals, Nestedconditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions,More recursion, Leap of Faith, Checking types.

**Unit – III**

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots,Algorithms.
Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings areimmutable, Searching, Looping and Counting, String methods, The in operator, Stringcomparison.
Case Study: Reading word lists, Search, Looping with indices.
Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, Listmethods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values,Aliasing, List arguments.

**Unit – IV**

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping anddictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-lengthargument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
Files: Persistence, Reading and writing, Format operator, Filename and paths, Catchingexceptions, Databases, Pickling, Pipes, Writing modules.
Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objectsare mutable, Copying.

**Unit – V**

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, The

str method, Operator overloading, Type-based Dispatch, Polymorphism, Interface andImplementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, AddRemove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all,Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

**Course Outcomes:**

Student should be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

**Text books:**

1. Allen B. Downey, –Think Python‖, 2nd edition, SPD/O'Reilly, 2016.

**Reference Books:**

1. Martin C.Brown, –The Complete Reference: Python‖, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, –Fundamentals of Python‖, CENGAGE, 2015.
3. R. Nageswara Rao, –Core Python Programming‖, 2nd edition, Dreamtech Press, 2019

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)**

**Year: II** **Semester:II** **Branch of Study:EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0302 | Design Thinking and Product Innovation | 2 | 0 | 0 | 2 |

**Course Outcomes**:
CO: 1 Summarize the basics of Engineering design process.
CO: 2 Explain historical development of Physics and science to Engineering.
CO: 3 Apply systematic approach to innovative designs.
CO: 4 Identify new technologies and requirement for new product development.
CO: 5 Explain and study of Product Development.

**UNIT I**
**Engineering Design:** Introduction to Engineering design process, the process of design by evolution, the morphology of design, identification and analysis of need, true need, specifications, standards of performance, use of checklists, morphological analysis, measure of physical realizability, economic and financial feasibility, designing for shipping, handling and installation, design for maintenance, detaileddesign.
**UNIT II**
**Physics to Engineering:** Applied Physics, Application of Newton laws, Law of conservation of Energy, Ohm's law, Electrostatic laws, Electromagnetic laws, solid state electronics.
**Science to Engineering:** Scientist, Engineer, engineering units and measurement, Materials science: non-conductors, conductors, super conductors, science fields and engineering fields.
**UNIT III**
**Systematic approach to product development:** Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation.
**UNIT IV**
**New product development:** Procedure for new product development, study of introducing electrical and electronic controls to the old products, importance of IOT in product development, environmental considerations in design, safety considerations indesign, testing, customer support.
**UNIT V**
**Study of Product Development**- Agriculture: development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of: electrical vehicles, unmanned vehicles, design principles in drones.

**Reference Books:**


1. Philip Kosky, Robert T. Balmer,William D. Keat,George Wise, ―Exploring Engineering: An Introduction to Engineering and Design‖, 4/e, Elsevier,2016.
2. David Ralzman, –History of Modern Design‖, 2/e, Laurence King Publishing Ltd.,2010.
3. An AVA Book, ―Design Thinking‖, AVA Publishing,2010.
4. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, ―Engineering Design: A Systematic Approach‖, 3/e, Springer,2007.
5. Tom Kelley, Jonathan Littman, –Ten Faces in Innovation‖, Currency Books,2006.
6. Fundamentals of Design and Manufacturing by G. K. Lal, Vijay Gupta, and N. Venkata Reddy, Narosa PublishingHouse.


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO3: Design/development of solutions | 3.1 | 3.1.1 |
| CO: 2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 4 | PO3: Design/development of solutions | 3.1 | 3.1.1 |
| CO: 5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: II** **Branch of Study: EEE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0204 | Electrical Machines - I | 3 | 1 | 0 | 4 |

**COURSE OUTCOMES**:

CO1: Apply the concepts of magnetic circuits to compute induced EMF and force in Electro-magnetic systems.
CO2: Analyze the operation, conditions required of self excitation of DC Generators and parallel operation of DC Generators.
CO3: Distinguish the operation of various dc motors and determine the performance of DC machine using the results of tests.
CO4: Explain the principle, constructional features and evaluate the performance characteristics of single phase transformers by conducting various tests.
CO5: Analyze the operations of Auto Transformer, Three Phase Transformer and parallel operation of Transformers.

**UNIT-I**

**Magnetic Circuits:** Introduction, Magnetic materials and their properties, magnetically induced EMF and force, AC operation of magnetic circuits, hysteresis and eddy current losses, permanent magnets, and applications of permanent magnet materials.
**Principles of electromechanical energy conversion**: Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, energy conversion via electric field, dynamical equations of electro mechanical systems

**UNIT-II**

**DC Generators:** Constructional details of DC machine, armature windings and its types, EMF equation, wave shape of Induced EMF, armature reaction, effect of brush lead, demagnetizing and cross magnetizing ampere turns, compensating windings, commutation, EMF induced in a coil undergoing commutation, time of commutation, methods of improving commutation, OCC and load characteristics of different types of generators. Parallel operation of DC Generators**:** DC shunt and series generators in parallel, Equalizing connections.

**UNIT-III**

**DC Motors:** Force on conductor carrying current, Torque and power developed by armature, speed control of DC Motors, starting of DC Motors: constructional details of 3-point and 4-point starters, load characteristics of DC Motors Losses in DC Machine, condition for maximum efficiency.
**Testing of DC machines:** Brake test, Swinburne‘s test, Hopkinson's test, Fields test, Retardation test, Separation of iron and frictional losses.

**UNIT-IV**

**Transformers:** Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency. Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.

**UNIT-V**

Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material.
**Three-phase transformer** – construction, types of connection and their comparative features, Phase conversion - Scott connection, three-phase to six-phase conversion

**Text books:**

1. I. J. Nagrath and D. P. Kothari, –Electric Machines‖, McGraw Hill Education, 2010.
2. P. S. Bimbhra, –Electrical Machinery‖, Khanna Publishers, 2011.

**References:**

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery‖, New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, –Performance and design of DC machines‖, CBS Publishers, 2004.
3. M. G. Say, –Performance and design of AC machines‖, CBS Publishers, 2002.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO 1 | PO 1: Engineering Knowledge | 1.2 | 1.2.1 |
| CO2 | PO 2: Problem analysis | 2.3 | 2.3.1, 2.3.2 |
| CO3 | PO 4: Conduct investigations of complex problems | 4.2 | 4.2.1, 4.2.2 |
| CO4 | PO 2: Problem analysis<br>PO 4: Conduct investigations of complex problems | 2.3<br>4.2 | 2.3.1, 2.3.2<br>4.2.1, 4.2.2 |
| CO5 | PO 2: Problem analysis | 2.3 | 2.3.1, 2.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: II** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0406 | Analog Electronic Circuits | 2 | 0 | 0 | 2 |

**Course Objectives:**

CO1: Ability to understand multi stage amplifiers using BJT and FET.
CO2: Ability to understand high frequency model and analyze its frequency responses.
CO3: Ability to understand feedback amplifiers and oscillators along with design.
CO4: Ability to understand power amplifiers.
CO5: Ability to understand tuned amplifiers and their effect on bandwidth and stability

**UNIT- 1**

**MULTI STAGE AMPLIFIERS**

Introduction, Classification of Amplifiers, Analysis of Cascaded amplifiers, Different Coupling Schemes used in Amplifiers, Analysis of two stage RC Coupled Amplifier, high input resistance transistor amplifiers-Darlington Pair Amplifier, Boot Strap Emitter Follower, Cascade Amplifier, Differential Amplifier, Analysis of multi stage amplifiers using FET.

**UNIT-2**

**FREQUENCY RESPONSE**

**BJT:**Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, Single Stage CE Amplifier frequency response with short circuit load and resistive load, gain cutoff frequencies, Gain-Bandwidth Product, Emitter follower at higher frequencies, Illustrative design problems.

**FET:**FET at High Frequencies, High Frequencies FET Model, Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

**UNIT-3**

**FEEDBACK AMPLIFIERS:**Conceptsof Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics: Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.

**OSCILLATORS**: Introduction,Classification of Oscillators, Conditions for Oscillations, RC and LC Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

**UNIT-4**

**POWER AMPLIFIERS:** Introduction, Classification of power amplifiers**,** Class A large signal Amplifiers-Series fed and Transformer coupled amplifier, Efficiency, Class B Amplifier -Push-pull amplifiers, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Cross over Distortion, Phase Inverters, Class AB operation, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink, Second harmonic Distortions, Higher order harmonic Distortion.

**UNIT-5**

**TUNED AMPLIFIERS:** Introduction, series resonance, Transformation of resistor and inductor ,Parallel Resonance, Q-Factor, Impedance variation near resonance,Classification of tuned amplifiers, Small Signal Tuned Amplifier – Capacitance and transformed coupled single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

**Text Books:**

1. J. Millman and C.C. Halkias, –Integrated Electronics‖, McGraw-Hill, 1972.
2. Donald A. Neaman, –Electronic Circuit Analysis and Design‖, McGraw Hill.
3. Salivahanan, N.Suressh Kumar, A. Vallavaraj, ―Electronic Devices and Circuits‖, Tata McGraw Hill, Second Edition.

**References:**

1. Robert T. Paynter, –Introductory Electronic Devices and Circuits‖, Pearson Education, 7th Edition
2. Robert L. Boylestad and Louis Nashelsky, –Electronic Devices and Circuits Theory‖ Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, ―Micro Electronic Circuits‖, Oxford University Press, 5th Edition.

**Table: Course Outcomes (CO), Programme Outcomes (PO), Competency Indicator (CI) and Performance Indicator (PI) Mapping**

| CO | PO | CI | PI |
|---|---|---|---|
| CO1 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO2 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO3 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO4 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO5 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: II** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0408 | Digital Electronics Circuits | 2 | 0 | 0 | 2 |

**Course Objectives:**

CO1: Ability to realize and implement Boolean and switching functions.
CO2: Ability to minimize switching functions.
CO3: Ability to design combinational circuits.
CO4: Ability to design sequential logic circuits.
CO5: Ability to understand concepts of Programmable Memories

**UNIT I**
**NUMBER SYSTEM & BOOLEAN ALGEBRA**

Digital systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary
numbers, Binary codes. Boolean Algebra-Basic definition, Basic theorems and properties, Boolean
Functions, Canonical & Standard forms, Other logic operations & Logic gates.

**UNIT II**
**GATE LEVEL MINIMIZATION**

The map method, four variable, K-map, Five variable map, POS & SOP Simplification, Don‘t care
conditions, NAND & NOR Implementation, Other two-level Implementation, Ex-or Function, Tabular
Method- Simplification of Boolean function using tabulation Method.

**UNIT III**
**ANALYSIS AND SYNTHESIS OF COMBINATIONAL CIRCUITS:**

Combinational circuits, Analysis & Design procedure, Binary Adder-subtractor, Decimal Adder, Binary
Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

**UNIT IV**
**ANALYSIS AND SYNTHESIS OF SEQUNTIAL CIRCUITS:**

Sequential Circuits, Latches Flips-Flops, Analysis of Clocked sequential circuits, State Reduction &
Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters,
Synchronous counters, other counters.

**UNIT V**
**PROGRAMMABLE MEMORIES**

Memory and Programmable Logic: Introduction, Random Access Memory, Memory Decoding, Error Detection and Correction, Read Only Memory, Programmable Logic Array, Programmable Array Logic and Sequential Programmable Devices.

***Text Books:***

*1. M.Morris Mano & Michel D. Ciletti, “Digital Design” ,Pearson ,5th Edition.*
*2. ZviKOhavi and NirahK.Jha, “Switching theory and Finite Automata Theory” ,Cambridge,3rd Edition*

***Reference Books:***

*1. SubrathaGoshal, “Digital Electronics”, Cambridge.*

*2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD.*

| CO | PO | CI | PI |
|---|---|---|---|
| CO1 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO2 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO3 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO4 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO5 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester : II** **Branch of Study : EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AMC9901 | Biology for Engineers | 3 | 0 | 0 | 0 |

**Course Outcomes**:

CO: 1 Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.

CO: 2 Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.

CO: 3 Brief about human physiology.

CO: 4 Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.

CO: 5 Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals

**UNIT I**

Evolution: Different patterns of evolution, Darwin‘s theory of evolution, Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification, Tissue Engineering.

**UNIT II**

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

**UNIT III**

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

**UNIT IV**

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

**UNIT V**

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus, Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

**TEXT BOOKS :**

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications.
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017.

**REFERENCE BOOKS :**

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, –Biology: A Global Approach‖, Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014.

6. Richard Dawkins, River Out of Eden: A Darwinian View of LifeFluid Mechanics and Machinery by D.RamaDurgaiah, New Age International.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 2 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 3 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 4 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 5 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**Year: II** **Semester: II** **Branch of Study: EEE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0205 | Electrical Machines – I Lab | 0 | 0 | 3 | 1.5 |

**COURSE OUTCOMES:**

CO1: Identify the reason as to why D.C. Generator is not building up voltage
CO2: Conduct experiments to obtain the no-load and load characteristics of D.C. Generators
CO3: Conduct tests on D.C. motors for determination and predetermination of efficiency
CO4: Control the speed of D.C. motor in a given range using appropriate method
CO5: Conduct tests on transformers for predetermination of efficiency and load sharing

**From the following experiments students may select any 10 Experiments:**

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Swinburne‘s test and speed control of DC shunt motor. Predetermination of efficiencies.
5. Fields test on DC series machines. Determination of efficiency.
6. Brake test on DC compound motor. Determination of performance curves.
7. O.C. & S.C. Tests on Single phase Transformer.
8. Parallel Operation of Single Phase Transformers.
9. Sumpner‘s Test on a Pair of identical Single Phase Transformers.
10. Scott Connection of Transformers.
11. Load test on DC series generator. Determination of characteristics.
12. Load test on single phase transformer

**Text book:**

1. I. J. Nagrath and D. P. Kothari, ―Electric Machines‖, McGraw Hill Education, 2010.
2. P. S. Bimbhra, ―Electrical Machinery‖, Khanna Publishers, 2011.

**References:**

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery‖, New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, ―Performance and design of DC machines‖, CBS Publishers, 2004.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO 1 | PO 1: Engineering Knowledge | 1.2 | 1.2.1 |
| CO 2 | PO 2: Problem analysis | 2.3 | 2.3.1, 2.3.2 |
| CO 3 | PO 4: Conduct investigations of complex problems | 4.2 | 4.2.1, 4.2.2 |
| CO 4 | PO 2: Problem analysis<br>PO 4: Conduct investigations of complex problems | 2.3<br>4.2 | 2.3.1, 2.3.2<br>4.2.1, 4.2.2 |
| CO 5 | PO 2: Problem analysis | 2.3 | 2.3.1, 2.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: I** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| **19AES0510** | **Basics of Python Programming Lab** | **0** | **0** | **2** | **1** |

**Lab Outcomes:**

Student should be able to

- Design solutions to mathematical problems.
- Organize the data for solving the problem.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Illustrate object oriented concepts.

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Tryto do all the operations present in a Scientific Calculator

**2.** Write a function that draws a grid like the following**:**

```
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
                #
              #   #   #
            #   #   #   #   #
          #   #   #   #   #   #   #
```

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements,like vertical and horizontal lines and a few curves. Design an alphabet that can be drawnwith a minimal number of basic elements and then write functions that draw the letters.The alphabet can belong to any Natural language excluding English. You should considerat least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current GreenwichMean Time in –the epoch, which is an arbitrary time used as a reference point. On UNIXsystems, the epoch is 1 January 1970.

   ```
   >>> import time
   >>>time.time()
   1437746094.5735958
   ```

   Write a script that reads the current time and converts it to a time of day in hours,minutes, and seconds, plus the number of days since the epoch.
8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program whichcomputes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used togenerate a numerical approximation of $1/\pi$ :

Write a function called estimate_pi that uses this formula to compute and return anestimate of $\pi$.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than $1e^{-15}$ (which is Python notation for $10^{-15}$). You can check the result bycomparing it to math.pi.

11. Choose any five built-in string functions of C language. Implement them on your own inPython. You should not use string related Python built-in functions.
12. Given a text of characters, Write a program which counts number of vowels, consonantsand special characters.
13. Given a word which is a string of characters. Given an integer say _n‘, Rotate eachcharacter by _n‘ positions and print it. Note that _n‘ can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume caseinsensitivity and don‘t consider special characters). Draw a histogram to represent thesame
16. Write program which performs the following operations on list‘s. Don‘t use built-infunctions
    a) Updating elements of a list
    b) Concatenation of list‘s
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list
    g) Sorting of list
    h) Finding biggest and smallest elements in the list
    i) Finding common elements in the list
17. Write a program to count the number of vowels in a word.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favourite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (http://gutenberg.org) and download your favourite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar charter presenting the grades obtained by N students read from a file categorizing them in to distinction, first class, second class, third class and failed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

26. Design a Python Script to determine the time difference between two given times inHH:MM:SS format.( 0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

**Reference Books:**

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, –How to Think Like a Computer Scientist: Learning with Python 3‖, 3rd edition,
Available athttp://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, –Head First Python a Brain Friendly Guide‖ 2nd Edition, O'Reilly, 2016
3. Dainel Y. Chen –Pandas for Everyone Python Data Analysis‖ Pearson Education, 2019

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester : II** **Branch of Study : Common to all**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| **19AES0303** | **Design Thinking and Product Innovation Lab** | **0** | **0** | **2** | **1** |

Practice Problems use software wherever applicable.

1) (a) Study of mechanisms: linear motion to rotary motion and rotary motion to linear motion and their applications.
   (b) Study of eccentric, cam, linear actuator.
2) Study of motion transmission through belts, chains and gears.
3) Study of mechanical advantage through pulleys and other mechanisms.
4) Study of different electrical equipments such as mechanical calculators, automotive devices such as wiper.
5) To design a device for measurement of Temperature/ pressure.
6) Open any mechanical part to identify bad features and improve the design.
7) Exercise in 3D printing of a design
   Ex: Institute emblem, small toy car or any other item of student choice.
8) To design a device for Water Level Indicator.
9) Design and Simulation of a Hydraulic Shaper.
10) Design of simple pneumatic and hydraulic circuits using basic components.

| List of Cos | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 2 | PO2: Modern tool usage | 2.1 | 2.1.3 |
| CO: 3 | PO4: Conduct investigations of complex problems | 4.1 | 4.1.2 |
| CO: 4 | PO2: Problem analysis | 2.1 | 2.1.2 |
| CO: 5 | PO7: Environment and sustainability: | 7.1 | 7.1.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)**

**Year: II** **Semester: II** **Branch of Study: EEE**

| Subject Code | Subject Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0409 | Analog and Digital Electronics Lab | 0 | 0 | 3 | 1.5 |

**Course Objectives:**

CO1: Ability to design multi stage amplifiers, power amplifier and tuned amplifier
CO2: Ability to design feedback amplifiers and oscillators along with design.
CO3: Ability to verify all basic Logic gates
CO4: Ability to design Combinational Circuits
CO5: Ability to design flip flops and Counters

**PART-A List of Experiments (Any Five experiments)**

1. Determination of $f_T$ of a given transistor.
2. Voltage-Series Feedback Amplifier
3.4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt‘s Oscillator
6. Two Stage RC Coupled Amplifier
7. Class A Series-fed Power Amplifier

**PART-B List of Experiments (Any Five experiments)**

1. Logic Gates- 74XX.
2. Half Adder, Half Subtractor, Full Adder, Full Subtractor
3. 3-8 Decoder -74138 & 8-3 Encoder- 74X148.
4. 8 x 1 Multiplexer -74X151 and 2x4 Demultiplexer-74X155.
5. 4-bit Comparator-74X85.
6. D Flip-Flop 74X74 and JK Flip-Flop 74X109.
7. Decade counter74X90.

**PART C: Equipment required for Laboratory Software:**

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.
13.ICs and Bread Boards

| CO | PO | CI | PI |
|---|---|---|---|
| CO1 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO2 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO3 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO4 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |
| CO5 | PO1 | 1.3 | 1.3.1 |
| | PO2 | 2.3 | 2.3.1 |
| | PO3 | 3.3 | 3.3.1 |