B.Tech
II Year IV Semester

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS

B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20AES0509	BASICS OF PYTHON PROGRAMMING	3	0	0	3

Course Objectives:
Upon completion of the course students will be able to
CO1: To learn the fundamentals of Python.
CO2: To elucidate problem-solving using a Python programming language.
CO3: To introduce a function-oriented programming paradigm through python.
CO4: To get training in the development of solutions using modular concepts.
CO5: To introduce the programming constructs of python.

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.

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 and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

UNIT II:
CASE STUDY: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.
CONDITIONALS AND RECURSION: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, 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 are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.
CASE STUDY: Reading word lists, Search, Looping with indices.
LISTS: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, 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 and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.
TUPLES: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
FILES: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.
CLASSES AND OBJECTS: Programmer-defined types, Attributes, Instances as Return values, Objects are

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, Thestrmethod, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove 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..

Text Books:

7. Allen B. Downey, "Think Python", 2nd edition, SPD/O" Reilly, 2016.

Reference Books:

15. Martin C. Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
16. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
17. R. Nageswara Rao, "Core Python Programming".

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 3: Design/Development of solutions	3.3	3.3.1

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B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20APC0407	PROBABILITY THEORY AND STOCHASTIC PROCESSES	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand the concepts of probability and random variables.
CO2: Understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.
CO3: Understand the concepts of Random Process and its Temporal Characteristics.
CO4: Understand the concepts of Random Process and its Spectral Characteristics.
CO5: Understand the Spectral characteristics of response of an LTI system.

UNIT I:

PROBABILITY: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events: The Random Variable : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT II:

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variable.

UNIT III:

RANDOM PROCESSES - TEMPORAL CHARACTERISTICS: Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict- Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation- Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT IV:

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross- Correlation Function.

UNIT V:

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response:

Power Density Spectrum of Response, Cross- Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

Text Books:

8. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.
9. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th Edition, 2002.

Reference Books:

18. R.P. Singh and S.D. Sapre, "Communication Systems Analog & Digital", TMH, 1995.
19. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd Edition.
20. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition, 1999.
21. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
22. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications, 2003.

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CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
CO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1

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Course Code	Course Title	L	T	P	Credits
20APC0408	ELECTROMAGNETIC THEORY AND TRANSMISSION LINES	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand basic laws of electric fields and Solve problems related to electric fields.

CO2: Apply laws of magnetic fields and Solve problems related to magnetic fields.

CO3: Analyze electric and magnetic fields at the interface of different media and derive Maxwell's equations for static and time varying fields.

CO4: Proficient with analytical skills for understanding propagation of electromagnetic waves in different media.

CO5: Understand the concept of transmission lines & their applications.

UNIT I:

Review of Vector Algebra, coordinate systems, Vector Calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Illustrative Problems.

UNIT II:

Biot-Savart Law, Ampere‟s Circuital Law and Applications, Magnetic Flux Density, Maxwell‟s Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere‟s Force Law, Magnetic Energy, Illustrative Problems.

UNIT III:

Faraday‟s Law and Transformer e.m.f, Inconsistency of Ampere‟s Law and Displacement Current Density, Maxwell‟s equations for time varying fields, Maxwell‟s Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric- Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT IV:

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Poynting Vector, and Poynting Theorem – Applications, Illustrative Problems.

UNIT V:

Transmission Lines: Types, Transmission line parameters (Primary and Secondary), Transmission line equations, Input impedance, Standing wave ratio & power, Smith chart & its applications, Applications of transmission lines of various lengths, Micro-strip transmission lines – input impedance, Illustrative Problems.

Text Books:

10. Matthew N.O. Sadiku, “Elements of Electromagnetics”, Oxford Univ. Press, 4th ed., 2008.
11. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics”, TMH, 7th ed., 2006.
12. John D. Krauss, “Electromagnetics”, McGraw- Hill publications.

Reference Books:

23. Electromagnetics, Schaum's outline series, Second Edition, Tata McGraw-Hill publications, 2006.

24. E.C.Jordan and K.G.Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
		1.4	2.3.1
CO2	PO 3: Design/Development of solutions	3.1	3.1.1
CO3	PO 3: Design/Development of solutions	3.1	3.1.1
CO4	PO 3: Design/Development of solutions	3.1	3.1.1
	PO 4: Conduct investigations of complex problems	4.3	4.3.2
			4.3.3
CO5	PO 3: Design/Development of Solutions	3.1	3.1.1

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B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20APC0409	ANALOG COMMUNICATION SYSTEMS	3	0	0	3

Course Outcomes:

This course provides the foundational education in Analog Communication systems, and applications. The students are provided the learning experience through class room teaching and solving assignment & tutorial problems. At the end of course, students should be able to:

CO-1: Acquire knowledge on the basic concepts of Analog Communication Systems.
CO-2: Analyze the analog modulated and demodulated systems.
CO-3: Analyze the performance of the communication system in presence of noise
CO-4: know the working of various transmitters and receivers
CO-5: Know the fundamental concepts of information and capacity.

UNIT I:

INTRODUCTION: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

AMPLITUDE MODULATION & DEMODULATION: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB- SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Quadrature amplitude modulation (QAM), Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Carrier Acquisition- phased locked loop (PLL), Costas loop, Frequency division multiplexing (FDM), and Super-heterodyne AM receiver, Illustrative Problems.

UNIT II:

ANGLE MODULATION & DEMODULATION: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves –Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM receiver, FM Capture Effect, Illustrative Problems**.**

UNIT III:

NOISE IN COMMUNICATION SYSTEMS: Thermal noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems

UNIT IV:

ANALOG PULSE MODULATION SCHEMES: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

RADIO RECEIVER MEASUREMENTS: Sensitivity, Selectivity, and fidelity.

UNIT V:

INFORMATION & CHANNEL CAPACITY: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Markoff sources, Shannon's encoding algorithm, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memoryless channels, Discrete channels with memory, Shannon–

Hartley theorem and its implications, Illustrative problems.

Text Books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.

Reference Books:

1. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
3. R.E. Ziemer & W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 2001.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CCO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 2: Problem analysis	2.3	2.3.1
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1

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Course Code	Course Title	L	T	P	Credits
20APC0410	ELECTRONIC CIRCUIT ANALYSIS	3	0	0	3

Course Objectives:
Upon completion of the course students will be able to
CO1: Understand multi stage amplifiers using BJT and FET.
CO2: Understand high frequency model and analyze its frequency responses.
CO3: Understand feedback amplifiers and oscillators along with design.
CO4: Understand power amplifiers.
CO5: Understand tuned amplifiers and their effect on bandwidth and stability.

UNIT I:
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 II:
HIGH FREQUENCY TRANSISTOR AMPLIFIERS- 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 III:
FEEDBACK AMPLIFIERS AND OSCILLATORS
FEEDBACK AMPLIFIERS: Concepts of 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 Colpitt's Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

UNIT IV:
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 V:
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:

13. J. Millman and C.C. Halkias, "Integrated Electronics", McGraw-Hill, 1972.
14. Donald A. Neaman, "Electronic Circuit Analysis and Design", McGraw Hill.
15. Salivahanan, N.Suresh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, Second Edition.

Reference Books:

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.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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AK20-REGULATIONS

B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20AES0510	BASICS OF PYTHON PROGRAMMING LABORATORY	0	0	3	1.5

Course Outcomes:

Student should be able to

CO1: Design solutions to mathematical problems.
CO2: Organize the data for solving the problem.
CO3: Develop Python programs for numerical and text based problems.
CO4: Select appropriate programming construct for solving the problem.
CO5: Illustrate object oriented concepts.

LABORATORYORATORY EXPERIMENTS

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to 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 drawn with 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 consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in “the epoch”, which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January1970.

```
>>> 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 which computes 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 to generate a numerical approximation of 1/ π: Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

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

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 by comparing it to math.pi.

11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
12. Given a text of characters, write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say „n", Rotate each character 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 case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. Write program which performs the following operations on list's. Don't use built-in functions
    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 lower case.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite 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 favorite 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 chart representing the grades obtained by N students read from a file categorizing them into 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 in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <=59)

Reference Books:

25. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3rd edition,
AvaiLaboratoryle at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf.

26. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O"Reilly,2016.

27. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education,2019.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 3: Design/Development of solutions	3.3	3.3.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20APC0411	ANALOG COMMUNICATION SYSTEMS LABORATORY	0	0	3	1.5

Course outcome:

After undergoing the Laboratory course students will be able to:

CO1: Design modulation and demodulation circuits such as AM, PM, FM.
CO2: Design the PAM, PWM&PPM circuits
CO3: Identify and understand different types of antennas, radiation pattern
CO4: Identify and measure Radio receiver measurements the parameters
CO5: Construct pre-emphasis and de-emphasis at the transmitter and receiver respectively

LIST OF EXPERIMENTS: (All Experiments are to be conducted)

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. Characteristics of Mixer.
4. Pre-emphasis & de-emphasis.
5. Pulse amplitude modulation & demodulation.
6. Pulse width modulation & demodulation
7. Pulse position modulation & demodulation.
8. Radio receiver measurements – sensitivity selectivity and fidelity.
9. Measurement of half power beam width (HPBW) and gain of a half wave dipole antenna.
10. Measurement of radiation pattern of a loop antenna in principal planes.

EQUIPMENT REQUIRED FOR THE LABORATORYORATORY

1.	Regulated Power Supply equipment	0 – 30 V
2.	CROs	0 – 20 M Hz.
3.	Function Generators	0 – 3 M Hz
4.	RF Signal Generators	0 – 1000 M Hz
5.	Multimeter	

REQUIRED ELECTRONIC COMPONENTS (ACTIVE AND PASSIVE) FOR THE DESIGN OF EXPERIMENTS FROM 1 - 7

1. Radio Receiver Demo kits or Trainers.
2. RF power meter — frequency range 0 – 1000 MHz
3. Spectrum Analyzer
4. Dipole antennas (2 Nos.) — 850 MHz – 1GHz
5. Loop antenna (1 no.) — 850 MHz – 1GHz
6. Bread Boards

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
CO4	PO 2: Problem analysis	2.3	2.3.1
CO5	PO 3: Design/Development of solutions	3.3	3.3.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS

B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20APC0412	ELECTRONIC CIRCUIT ANALYSIS LABORATORY	0	0	3	1.5

Course Outcomes:

CO1: The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
CO2: Designing and analyzing the transistor at high frequencies.
CO3: Determine the efficiencies of power amplifiers.
CO4: Determine Frequency response and design of tuned amplifiers.
CO5: Able to Analyze all the circuits using simulation software and Hardware.

LIST OF EXPERIMENTS:

(Minimum of Ten Experiments has to be performed both in hardware and software)

1. Determination of f_t of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

SOFTWARE REQUIRED FOR LABORATORYORATORY

i. Multisim/ P-Spice /Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

EQUIPMENT REQUIRED FOR LABORATORYORATORY

13. Regulated Power supplies
14. Analog/Digital Storage Oscilloscopes
15. Analog/Digital Function Generators
16. Digital Multimeters
17. Decade Résistance Boxes/Rheostats
18. Decade Capacitance Boxes
19. Ammeters (Analog or Digital)
20. Voltmeters (Analog or Digital)
21. Active & Passive Electronic Components
22. Bread Boards
23. Connecting Wires
24. CRO Probes etc.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 2: Problem analysis	2.3	2.3.1
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 3: Design/Development of solutions	3.3	3.3.1

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AK20-REGULATIONS

B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
Skill Oriented Course					
20ASC0402	INTERNET OF THINGS	1	0	2	2

Course Outcomes:
Upon completion of the course students will be able to:
CO1: Describe characteristics and functionality of IoT
CO2: Understand the types of Sensors.
CO3: Compute the different enabling technologies for Arduino IDE.
CO4: Assemble different electronic components in Development Boards.
CO5: Design an IOT application as a mini project..

List of Contents

1. INTRODUCTION TO IOT
- Characteristics of IoT
- Design Principles of IoT
- IoT Architecture

2. SENSORS
- Sensors Classification
- Working Principle of Sensors
- Criteria to choose a Sensor
- Generation of Sensors

3. BASICS OF ARDUINO
- Introduction to Arduino
- Study of Arduino Board with Specifications
- Basic Commands for Arduino
- Advantages of Arduino

4. EXAMPLES USING ARDUINO
- Digital Sensor using Arduino consists of Development Board, Digital Sensor (Pull-up switch), LED, Connecting wires.
- Development Board, Actuators, Bluetooth Module (HC-05), Connecting wires.

5. MINI PROJECT:
- Students should complete their Mini Project based on the above concepts.

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B. Tech II Year IV Semester

Course Code	Course Title	L	T	P	Credits
20AHS9905	**UNIVERSAL HUMAN VALUES**	2	1	0	3

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

UNIT 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current. scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods avaiLaboratoryle to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship.

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence

- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recycLaboratoryility and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT- V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics.

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Course Outcomes:

On completion of this course, the students will be able to

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

TEXT BOOKS

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	**PO 7: Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 2	**PO 7: Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 3	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO 4	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO5	**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2