ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
(Effective for the batches admitted in 2019-20)
ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

INDUCTION PROGRAM (3 weeks duration)
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./Branch & Innovations

I B. Tech – I Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
THEORY										
1	BS	19ABS9901	Algebra and Calculus	3	1	0	4	30	70	100
2	BS	19ABS9902	Applied Physics	3	0	0	3	30	70	100
3	ES	19AES0501	Problem Solving and Programming	3	1	0	4	30	70	100
4	HS	19AHS9901	Communicative English I	2	0	0	2	30	70	100
PRACTICAL										
5	LC	19ALC0201	Electrical and Electronics Engineering Workshop	0	0	2	1	30	70	100
6	BS	19ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
7	ES	19AES0503	Problem Solving and Programming Lab	0	0	4	2	30	70	100
8	HS	19AHS9902	Communicative English I Lab	0	0	2	1	30	70	100
			TOTAL				**18.5**	**240**	**560**	**800**

I B. Tech – II Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
THEORY										
1	ES	19AES0101	Basics of Civil and Mechanical Engineering	3	0	0	3	30	70	100
2	BS	19ABS9906	Differential Equations and Vector Calculus	3	1	0	4	30	70	100
3	BS	19ABS9904	Chemistry	3	0	0	3	30	70	100
4	ES	19AES0502	Data Structures	3	0	0	3	30	70	100
PRACTICAL										
5	LC	19ALC0301	Engineering Workshop	0	0	2	1	30	70	100
6	ES	19AES0301	Engineering Graphics Lab	1	0	4	3	30	70	100
7	ES	19AES0102	Basics of Civil and Mechanical Engineering Lab	0	0	3	1.5	30	70	100
8	BS	19ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
9	ES	19AES0504	Data Structures Lab	0	0	3	1.5	30	70	100
			TOTAL				**21.5**	**270**	**630**	**900**

II B. Tech – I Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	BS	19ABS9912	Transform Techniques and Complex Variables	3	0	0	3	30	70	100
2	HS	19AHS9903	Communicative English II	2	0	0	2	30	70	100
3	ES	19AES0505	Internet of Things (IoT)	2	0	0	2	30	70	100
4	PC	19APC0201	Electrical Circuit Analysis	3	0	0	3	30	70	100
5	PC	19APC0401	Electronic Devices and Circuits	3	0	0	3	30	70	100
6	PC	19APC0202	Engineering Electromagnetics	3	1	0	4	30	70	100
7	MC	19AMC9903	Environmental Studies	2	0	0	0	30	--	30
PRACTICAL										
8	HS	19AHS9904	Communicative English II Lab	0	0	2	1	30	70	100
9	ES	19AES0506	Internet of Things (IoT) Lab	0	0	2	1	30	70	100
10	PC	19APC0203	Electrical Circuit Analysis Lab	0	0	3	1.5	30	70	100
11	PC	19APC0404	Electronic Devices and Circuits Lab	0	0	2	1	30	70	100
			TOTAL				**21.5**	**330**	**700**	**1030**

II B. Tech – II Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	BS	19ABS9916	Numerical Methods and Probability	3	1	0	4	30	70	100
2	ES	19AES0509	Basics of Python Programming	2	0	0	2	30	70	100
3	ES	19AES0302	Design Thinking and Product Innovation	2	0	0	2	30	70	100
4	PC	19APC0204	Electrical Machines - I	3	1	0	4	30	70	100
5	PC	19APC0406	Analog Electronic Circuits	2	0	0	2	30	70	100
6	PC	19APC0408	Digital Electronic Circuits	2	0	0	2	30	70	100
7	MC	19AMC9901	Biology for Engineers	2	0	0	0	30	--	30
PRACTICAL										
8	PR	19APR0201	Socially Relevant Projects (15 hours / semester)	0	0	0	0.5	50	--	50
9	PC	19APC0205	Electrical Machines - I Lab	0	0	3	1.5	30	70	100
10	ES	19AES0510	Basics of Python Programming Lab	0	0	2	1	30	70	100
11	ES	19AES0303	Design Thinking and Product Innovation Lab	0	0	2	1	30	70	100
12	PC	19APC0409	Analog and Digital Electronic Circuits Lab	0	0	3	1.5	30	70	100
			TOTAL				**21.5**	**380**	**700**	**1080**

III B. Tech – I Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	PC	19APC0206	Power Systems - I	3	0	0	3	30	70	100
2	PC	19APC0207	Electrical Machines - II	3	0	0	3	30	70	100
3	PC	19APC0208	Control Systems	3	0	0	3	30	70	100
4	PC	19APC0209	Power Electronics	3	0	0	3	30	70	100
5	PE	19APC0404	Signals and Systems	3	0	0	3	30	70	100
		19APC0425	Analog and Digital IC Applications							
		19APC0426	Linear System Analysis							
6	OE	19AHEMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
		19APC0510	Computer Networks							
		19APC0412	Analog and Digital Communications							
7	MC	19AMC9902	Constitution of India	2	0	0	0	30	---	30
PRACTICAL										
8	PC	19APC0210	Electrical Machines - II Lab	0	0	2	1	30	70	100
9	PC	19APC0211	Control Systems Lab	0	0	2	1	30	70	100
10	PC	19APC0212	Power Electronics Lab	0	0	2	1	30	70	100
11	PR	19APR0202	Socially Relevant Projects (15 Hours /Sem)	0	0	0	0.5	50	---	50
						TOTAL	**21.5**	**350**	**630**	**980**

III B. Tech – II Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	PC	19APC0213	Power Systems - II	3	0	0	3	30	70	100
2	PC	19APC0216	Neural Networks & Fuzzy Logic	3	0	0	3	30	70	100
3	PC	19APC0214	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
4	PC	19APC0215	Power System Analysis	3	0	0	3	30	70	100
5	OE	19APC0417	Microprocessors & Microcontrollers	3	0	0	3	30	70	100
		19AHE9901	Mathematical Modeling							
		19AOE0511	Business Data Analytics							
6	HE	19AHE9902	Principles of Effective Public Speaking	3	0	0	3	30	70	100
		19AHE9907	Optics							
		19AHE9909	Quantum Mechanics							
7	MC	19AMC9904	Professional Ethics and Human values	2	0	0	0	30	--	30
PRACTICAL										
8	PC	19APC0217	Power Systems Lab	0	0	2	1	30	70	100
9	PC	19APC0420	Microprocessors & Microcontrollers Lab	0	0	2	1	30	70	100
10	PC	19APC0218	Electrical Measurements Lab	0	0	2	1	30	70	100
11	PR	19APR0203	Socially Relevant Projects (15 hours / semester)	0	0	0	0.5	50	--	50
12	PR	19APR0204	Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions	0	0	0	0	--	--	--
						TOTAL	**21.5**	**350**	**630**	**980**

IV B. Tech – I Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	PC	19APC0219	Switch Gear and Protection	3	0	0	3	30	70	100
2	PC	19APC0220	High Voltage Engineering	2	0	0	2	30	70	100
3	OE	19APE0411	Embedded Systems	3	0	0	3	30	70	100
		19APC0512	Data Base Management Systems							
		19APC0101	Mechanics of materials							
4	PE	19APE0201	Electrical Distribution Systems	3	0	0	3	30	70	100
		19APE0202	Power Semi-conductor Drives							
		19APE0203	Advanced Control Systems							
5	PE	19APE0204	Power System Operation and Control	3	0	0	3	30	70	100
		19APE0205	Flexible AC Transmission Systems							
		19APC0418	Digital Signal Processing							
6	HE	19AHE9901	Technical Writing	2	0	0	2	30	70	100
		19AHE9903	Professional Communication							
		19AHE9904	Polymer Chemistry							
PRACTICAL										
8	PC	19APC0221	Power Systems Protection Lab	0	0	2	1	30	70	100
9	PR	19APR0205	Socially Relevant Projects (15 hours / semester)	0	0	0	0.5	50	--	50
10	PR	19APR0206	Industrial Training/Internship/Research Projects in National Laboratories/Academic Institutions	0	0	0	1.5	50	--	50
TOTAL							**19**	**310**	**490**	**800**

IV B. Tech – II Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	MOOCS	19AOE0515	The joy of computing using Python (MOOCS-NPTEL)	3	0	0	3	--	--	--
		19AOE0516	Cyber security (MOOCS-NPTEL)							
		19AOE0517	Introduction to Industry 4.0 and Industrial internet of things (MOOCS-NPTEL)							
2	MOOCS	19APE0206	Design of photovoltaic systems (MOOCS-NPTEL)	3	0	0	3	--	--	--
		19APE0207	Electric vehicles and renewable energy (MOOCS-NPTEL)							
		19APE0208	Electricity and safety measures (MOOCS-NPTEL)							
PRACTICAL										
3	PR	19APR0207	Technical Paper Presentation/Seminar	0	0	0	0	50	0	50
4	PR	19APR0208	Project	3	0	0	9	60	140	200
TOTAL							**15**	**110**	**140**	**250**
Grand Total of all semesters							**160**	**2340**	**4480**	**6820**

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Year: I Semester : I Branch of Study : Common To All

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9901	Algebra and Calculus	3	1	0	4

Course Outcomes:

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. Utilize mean value theorems to real life problems.
3. Familiarize with functions of several variables which is useful in optimization.
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Unit I : Matrix Operations and Solving Systems of Linear Equations 12 hrs Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley- Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley- Hamilton theorem,

Unit II : Quadratic Forms and Mean Value Theorems 9 hrs Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.
Rolle‘s Theorem, Lagrange‘s mean value theorem, Cauchy‘s mean value theorem, Taylor‘s and Maclaurin's theorems with remainders (without proof);

Unit III: Multivariable calculus 9 hrs
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Multiple Integrals 10hrs
Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.

Unit V: Special Functions 10 hrs
Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel‘s equation, Recurrence formulae or $J_n(x)$, Generating function- Orthoganality of Bessels functions.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham amd M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

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	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO2 : Analyze complex engineering Problems	2.1	2.1.3
CO5	PO2 : Analyze complex engineering problems	2.1	2.1.3

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9902	Applied Physics	3	0	0	3

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

Unit I : Optics and EM Theory **10 Hrs**

Interference of light -principle of superposition-Conditions for sustained, Interference-Interference in thin films (reflected light) - Newton‘s Rings -Determination of Wavelength, Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating, Divergence and Curl of Electric and Magnetic Fields - Gauss‘ theorem for divergence and Stokes‘ theorem for curl - Maxwell‘s, Equations (Quantitative)-Electromagnetic wave - propagation in non-conducting medium - Poynting‘s Theorem.

Unit II : Lasers and Fiber Optics **10 Hrs**

Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein Coefficients – Population Inversion – Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd:YAG Laser – Semiconductor Diode Laser – Applications of Lasers and Holography.

Introduction to Optical Fibers – Total Internal Reflection – Critical angle of propagation – Acceptance angle – Numerical Aperture – Classification of fibers based on Refractive index profile – Propagation of electromagnetic wave through optical fiber – modes – importance of V-number-Attenuation, Block Diagram of Fiber optic Communication – Industrial Applications –Fiber optic Sensors.

Unit III : Dielectric and Magnetic Materials **8 Hrs**

Introduction—Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations : Electronic and Ionic,(Quantitative), Orientation Polarizations (Qualitative) - Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics: Ferroelectricity.

Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment – Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) – Hysteresis– soft and hard magnetic materials – Magnetic memory device applications .

Unit IV: Semiconductors **8 Hrs**

Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors –Direct and indirect band gap semiconductors- Density of charge carriers – Fermi energy–-Dependence

of Fermi energy on carrier concentration and temperature – Electrical conductivity – Drift and Diffusion currents – Continuity equation - Hall effect -Applications of Hall effect and Semiconductors.

Unit V: Superconductors and Nanomaterials 10Hrs

Superconductors-Properties-Meissner'seffect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.

Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials –Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthy‖ A Text book of Engineering Physics‖-S. Chand Publications,11th Edition2019.
2. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012.

References:

1. K Thyagarajan –Engineering Physics‖,-Mc Graw Hill Publishing Company Ltd, 2016
2. Shatendra Sharma, Jyotsna Sharma, ― Engineering Physics‖, Pearson Education,2018
3. David J.Griffiths,―Introduction to Electrodynamics‖-4/e, Pearson Education, 2014
4. T Pradeep, –A Text book of NanoScience and NanoTechnology‖-Tata Mc Graw Hill 2013.

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

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0501	Problem Solving and Programming	3	1	0	4

Course Objectives:

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programminglanguage
6. Illustrate the methodology for solving Computational problems

Unit 1:

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Unit 2:

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Unit 3:

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops- Do-while, break and continue, Goto and labels.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

Unit 4:

Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k^{th} smallest element

Unit 5:

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.

Text Books:

1. Pradip Dey, and Manas Ghosh, –Programming in C‖, 2018, Oxford University Press.
2. R.G. Dromey, –How to Solve it by Computer‖. 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, –The C Programming Language‖, 2nd Edition, Pearson.

Reference Books:

1. RS Bichkar –Programming with C‖, 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, –Information Technology in Theory‖, 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, –Programming with C‖, 4th Edition, 2019, McGraw Hill Education.

Course Outcomes:

1. Construct his own computer using parts.
2. Recognize the importance of programming language independent constructs
3. Solve computational problems
4. Select the features of C language appropriate for solving a problem
5. Design computer programs for real world problems
6. Organize the data which is more appropriated for solving a problem

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.3	1.3.1
CO2	PO2: Problem analysis	2.1	2.1.1
CO3	PO2: Problem analysis	2..2	2.2.2
CO4	PO2: Problem analysis	2.1	2.1.1
CO5	PO2: Problem analysis	2.3	2.3.1
CO6	PO2: Problem analysis	2.2	2.2.3

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHS9901	Communicative English - I	2	0	0	2

Course Outcomes:

At the end of the course, the learners will be able to

1. Identify the context, topic, and pieces of specific information from social ortransactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

Unit 1 : 10 Hours (4L+6P)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit 2: 10 Hours (4L+6P)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Unit 3: 10 Hours (4L+6P)

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit 4: 8 Hours (2L+6P)

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey

information, reveal trends / patterns / relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.

Unit 5: **8 Hours (2L+6P)**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject- verb agreement) Suggested books:

Text Book: English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge,2014.
   Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley,ELT;
   2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/, https://www.englishpractice.com/, Grammar/Vocabulary, English Language Learning Online http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/

Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner‘s dictionaries

List of COs	PO no. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1	PO6-Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues.	6.1	6.1.1
CO2	PO10-Able to comprehend and write effective reports and design documentation, makes effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO3	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO4	PO10-Able to comprehend and write effective reports and design documentation, makes effective presentations, and give and receive clear instructions.	10.1.	10.1.1
CO5	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO6	PO10-Able to comprehend and write effective reports and design documentation, makes effective presentations, and give and receive clear instructions.	10.2	10.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ALC0201	Electrical and Electronics Engineering Workshop	0	0	2	1

COURSE OUTCOMES:

CO1: Demonstrate knowledge on different tools, abbreviations and symbols used in Electrical Engineering.
CO2: Measure different electrical quantities using measuring instruments.
CO3: Demonstrate how to trouble shoot the electrical equipments (like fan, grinder, motor, etc.)
CO4: Perform Wiring and Earthing for residential houses.

From the following experiments students may select any 10 experiments:

1. Study of Introduction to Electrical tools, symbols and abbreviations
2. Study of types of sizes of wires and making –T| joint and straight joint for wires
3. Measurements of Electrical quantities (like Voltage, Current, Power, Power factor in RLC circuits)
4. Study of measurements of Energy (using Single phase and Three phase Energy meter) by connecting different loads
5. Study of earthing and measurement of earth resistance
6. Study and performance of residential wiring (using Energy meter, Fuses, Switches, Indicator, Lamps, etc.)
7. Study of Fluorescent lamp wiring
8. Study of various electrical gadgets (CFL and LED)
9. Study of PV Cell
10. Study of Induction motor and Transformer
11. Assembly of choke or small transformer
12. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc.)
13. Introduction to basics of Electronic components: Solder practice, Multi meter, Power supply
14. Measurement of wire guages using guage meter
15. Identification of color code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.

References:

1. Lab manual of Electrical Engineering by TTTI, Chennai.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering knowledge	1.1	1.3.1
		1.4	1.4.1
	PO3: Design/Development of solutions	3.2	3.2.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO4: Conduct investigations of complex problems	4.1	4.1.2
			4.1.3
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9907	Applied Physics Lab	0	0	3	1.5

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

List of Experiments

1. Determination of the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Study of the Magnetic field along the axis of a circular coil carrying current.
6. Study the variation of B versus H of the magnetic material (B-H curve)
7. Determination of the numerical aperture of a given optical fiber and angle of acceptance.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
9. Determination of the energy gap of a semiconductor
10. Determination of crystallite size using X-Ray diffraction spectra.
11. Determination of Wavelength of LASER using diffraction grating.
12. Determination of particle size using LASER.
13. Determination of the resistivity of semiconductor by Four probe method.
14. Determination of dielectric constant by charging and discharging method.
15. Study the temperature dependence of resistance of a thermister.

References:

1. S. Balasubramanian, M.N.Srinivasan, –A Text book of Practical Physics‖-S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO: 2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 4	PO 4: Analysis and interpretation of data	4.3	4.3.2
CO: 5	PO 4: Analysis and interpretation of data	4.3	4.3.2

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0503	**Problem Solving and Programming Lab**	0	0	4	2

Course outcomes:

1. Construct a Computer given its parts (L6)
2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

Laboratory Experiments #

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges a ← b ← c ← d ← a
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series
   $1 - x^2/2! + x^4/4! - x^6/6! + ...$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1and100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.

19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.

Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

References:

1. B. Govindarajulu, –IBM PC and Clones Hardware Trouble shooting and Maintenance‖, Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, –How to Solve it by Computer‖. 2014, Pearson.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.1
CO2	PO2: Problem analysis	2.2	2.2.2
CO3	PO2: Problem analysis	2.1	2.1.1
CO4	PO2: Problem analysis	2.3	2.3.1
CO5	PO2: Problem analysis	2.2	2.2.3

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHS9902	Communicative English - I Lab	0	0	2	1

Course Outcomes

1. Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
2. Apply communication skills through various language learning activities
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.
5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

List of COs	PO No. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.1.1
CO2	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO3	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO4	PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO5	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0101	Basics of Civil & Mechanical Engineering	3	0	0	3

Course Outcomes:
CO 1: understand principles of Stress and Strain
CO 2: understand basic principles of Strain Measurement and apply the concepts of Strain Rosettes for strain measurement.
CO 3: understand common building materials used in construction and analyze characteristics of common building materials.
CO 4: Apply velocity ratio concepts in power transmission.
CO 5: Understand the principles of CAD, CAM & CIM. (L.2)

PART – A

UNIT – I:
Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment – Torsion. Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

UNIT – II:
Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channelstrain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstonebridge.

UNIT – III:
Characteristics of common building materials – Brick – Types – Testing; Timber – Classification
– Seasoning – Defects in Timber; Glass – Classification – uses; steel and its applications in Construction Industry.

PART – B

UNIT – I: Power Plants
Classification of Power plants – Steam Power Plants – Nuclear Power Plants – Gas turbines – Hydro Power Plants – Solar energy – wind energy – Tidal Power – Geo Thermal Power.

UNIT – II: Transmission of Power
Transmission of Power – Belt and Rope Drives – Types of Belts – Materials – Velocity ratio – Speed Ratio – Rope Drives – V-Belt – Flat Belt.

UNIT – III: Computer Aided Design & Manufacturing
Introduction to engineering applications of computer aided design – Computer Aided Drawing – Advantages of CAD – Computer Aided Manufacturing – Functions of Robots in manufacturing Applications – advantages of Robots – Computer integrated Manufacturing (CIM).

Text Books:

1. Shanmugam G and Palanichamy M S, –Basic Civil and Mechanical Engineering‖, TataMcGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., –Basic Civil Engineering‖, Dhanpat Rai Publishing Co. (P) Ltd.

References:

1. S.Trymbaka Murthy., –Computer Aided Engineering Drawing‖ , Universities Press
2. Seetharaman S., –Basic Civil Engineering‖, Anuradha Agencies.
3. Venugopal K. and Prahu Raja V., –Basic Mechanical Engineering‖, Anuradha Publishers, Kumbakonam.
4. Er. R. Vaishnavi,Basic Civil and Mechanical Engineering, 2/e, S. Chand Publications.

List of COs	PO no. and keyword	CompetencyIndicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO2	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2
		2.3	2.3.1
CO3	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO 4	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
CO 5	PO1: Engineering knowledge	1.2	1.2.1
	PO2: Problem analysis	1.3	1.3.1
		1.4	1.4.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9906	Differential Equations and Vector Calculus	3	1	0	4

Course Outcomes:

1. Apply the mathematical concepts of ordinary differential equations of higher order.
2. Solve the differential equations related to various engineering fields .
3. Identify solution methods for partial differential equations that model physical processes .
4. Interpret the physical meaning of different operators such as gradient, curl and divergence .
5. Estimate the work done against a field, circulation and flux using vector calculus .

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral (e^{ax}, sinax (or) cosax, X^k, $e^{ax}v$, x v(x)), method of variation of parameters, simultaneous linear equations with constant coefficients.

UNIT II: Equations Reducible to Linear Differential Equations and Applications

Cauchy‘s and Legendre‘s linear equations, Applications to simple pendulum, oscillations of a spring, L-C-R Circuit problems and Mass spring system.

UNIT III: Partial Differential Equations – First order

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV:Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities

UNIT V: Vector integration

Line integral-circulation-work done, surface integral-flux, Green‘s theorem in the plane (without proof), Stoke‘s theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Text Books :

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley &Sons, 2011.

References:

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication,2008
4. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO2:Analyse complex engineering problems	2.1	2.1.3
CO3	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO5	PO2:Analyse complex engineering problems	2.1	2.1.3

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9904	CHEMISTRY	3	0	0	3

Course Outcomes:

1. Understand the behaviour of, and interactions between mater and energy at both the atomic and molecular levels
2. Compare the materials of construction for battery and electrochemical sensors
3. Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
4. HPLC and GC methods used for separation of gaseous and liquid mixtures.
5. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

Unit 1: Structure and Bonding Models (10 hrs)

Planck's quantum theory, Schrodinger wave equation, significance of Ψ^1 and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital‘s in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 , N_2 and CO, calculation of bond order.

Unit 2: Electrochemistry and Applications (10 hrs)

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nern‘st equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

Unit 3: Polymer Chemistry (10 hrs)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N– preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Unit 4: Instrumental Methods and Applications (10 hrs)

Principle and applications of Colorimetry, AAS, AES, UV-Viscible spectrophotometry (Beer-Lambert's law, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

Unit 5: Water Technology (10 hrs)

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyse complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0502	Data Structures	3	0	0	3

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

Unit 1: Introduction

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

Unit – 2: Stack, Queue and Linked lists

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

Unit 3: Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B- Trees: B-Trees, B + Trees.

Unit – 4 : Graphs and Hashing

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure, Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Unit – 5: Files and Advanced sorting

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, ―Fundamentals of Data Structures in C‖, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, ―File Organization and Processing‖, Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, ―Classic Data Structures‖, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, ―Advanced Data Structures‖, Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, ―Data Structures A Pseudo code Approach with C‖, Second Edition, Cengage Learning 2005.

Course Outcomes:

1. Select Appropriate Data Structure for solving a real world problem
2. Select appropriate file organization technique depending on the processing to be done
3. Construct Indexes for Databases
4. Analyse the Algorithms
5. Develop Algorithm for Sorting large files of data

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO4: Conduct investigations of complex problems	4.1	4.1.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO2: Problem analysis	2.1	2.1.2
CO5	PO2: Problem analysis	2.3	2.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ALC0301	Engineering Workshop	0	0	2	1

Course Outcomes:

CO: 1 Apply wood working skills in real world applications.
CO: 2 Build different parts with metal sheets in real world applications.
CO: 3 Apply fitting operations in various applications.
CO: 4 Apply different types of basic electric circuit connections.
CO: 5 Demonstrate soldering and brazing.

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit
c) Semi-circular fit d) Bicycle tyre puncture and change of two wheeler tyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two-way switch c) Godown lighting
d) Tube light e) Three phase motor f) Soldering of wires

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 2: Problem analysis	2.3	2.3.2

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0301	Engineering Graphics Lab	1	0	4	3

Course Outcomes:

CO: 1 Draw various curves applied in engineering.
CO: 2 Show projections of solids and sections graphically.
CO: 3 Draw the development of surfaces of solids.
CO: 4 Use computers as a drafting tool.
CO: 5 Draw isometric and orthographic drawings using CAD packages.

Manual Drawing

UNIT I

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid
c) Involutes

Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

UNIT II

Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.
Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT III

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.
Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Computer Aided Drafting:

UNIT IV

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations.

UNIT V

Orthographic Projections: Systems of projections, conventions and application to orthographic projections.
Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

Text Books and Reference Books:

1. K. L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N. D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agrawal & C. M. Agrawal, Engineering Drawing, Tata McGraw-Hill

Additional Sources

YouTube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0102	Basics of Civil & Mechanical Engineering Lab	0	0	3	1.5

Course Outcomes: Students will be able to

CO1: Impart basic principles of bending test on Cantilever beam and simply supported beam

CO2: Understand principles of strain measurement using electrical strain gauges

CO3: Impart concepts of Torsion, compression and water absorption

CO4: Apply velocity ratio concepts in power transmission

CO5: Understand the principles of CAD, CAM & CIM

PART - A

Laboratory Experiments:

1. Bending test on (Steel/Wood) Cantilever beam.
2. Bending test on (Steel/Wood) simply supported beam.
3. Use of electrical resistance strain gauges.
4. Compression test on Bricks
5. Water absorption test on Bricks
6. Torsion test.
7. Tests on closed coiled and open coiled helical springs

PART – B

The following contents are to be done by any 2D software package

1. Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling,
2. Mirroring, layers, templates, polyline, trimming, extending, stretching, fillets, arrays, dimensions
3. Dimensioning principles and conventional representations.
4. Any three simple 2D diagram by using software package.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO2	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO3	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
CO 4	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
CO 5	PO1: Engineering knowledge	1.2	1.2.1
	PO2: Problem analysis	1.3	1.3.1
		1.4	1.4.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9909	CHEMISTRY LAB	0	0	3	1.5

Course Outcomes:

1. To familiarize the students with the basic concepts of chemistry of materials
2. Prepare advanced polymer materials
3. Measure the strength of an acid present in secondary batteries
4. To familiarize with digital and instrumental methods of analysis

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of TIO_2/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO 4: Analysis and interpretation of Data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of Data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of Data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of Data	4.3	4.3.2

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0504	Data Structures Lab	0	0	3	1.5

Course Objectives:

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using _Ladies first‘ principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

Course Outcomes:

1. Select the data structure appropriate for solving the problem
2. Implement searching and sorting algorithms
3. Design new data types
4. Illustrate the working of stack and queue
5. Organize the data in the form of files

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering Knowledge	1.4	1.4.1
CO2	PO 2: Problem analysis	2.2	2.2.4
CO3	PO 1: Engineering Knowledge	1.3	1.3.1
CO4	PO 1: Engineering Knowledge	1.4	1.4.1
CO5	PO 1: Engineering Knowledge	1.4	1.4.1

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

Subject Code	Subject Name	L	T	P	Credits
19ABS9912	Transform Techniques and Complex Variables	3	0	0	3

Course Outcomes:

CO: 1 Apply the Laplace transform for solving differential equations(continuoussystems)
CO: 2 Find the Fourier series of periodic signals
CO: 3 Know and be able to apply integral expressions for the forwards andinverse Fourier transform to a range of non-periodic waveforms
CO: 4 Solve linear/nonlinear algebraic and transcendental equations using numerical methods
CO: 5 Solve ordinary differential equations by Euler's method, modified Euler's method, Runge Kutta method, Predictor Corrector method and Milne's method

UNIT I
Laplace transforms:
Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs).

UNIT II
Fourier series:
Dirichlet‘s conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

UNIT III
Fourier transforms:
Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem.

UNIT IV
Solution to algebraic equations:
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 V
Numerical differentiation and integration:
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.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

References

1. T.K.V.Iyengar,B.Krishna Gandhi and others, Engineering Mathematics-II,& Probability and Statistics, S.Chand Publishers
2. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1: Apply the knowledge of mathematics	1.1	1.1.2
CO 2	PO1:Apply the knowledge of mathematics	1.1	1.1.2
CO 3	PO 2: First principles of mathematics.	2.2	2.2.2
CO 4	PO1: Knowledge of mathematics	1.3	1.3.1
CO 5	PO1: Knowledge of mathematics	1.1	1.1.1

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B. Tech II Year **Semester** : **I** **Branch :** Common to all

Subject Code:	Subject Name:	L	T	P	Credits
19AHS9903	Communicative English II	2	0	0	2

Course Outcomes

At the end of the course, the learners will be able to

1. Prioritize information from reading texts after selecting relevant and useful points
2. Paraphrase short academic texts using suitable strategies and conventions
3. Make formal structured presentations on academic topics using PPT slides with relevantgraphical elements
4. Participate in group discussions using appropriate conventions and language strategies
5. Prepare a CV with a cover letter to seek internship/ job
6. Collaborate with a partner to make presentations and Project Reports

Unit 1 **(10 hrs)**

Listening : Listening for presentation strategies and answering questions on the speaker, audience, and key points.
Speaking: Formal presentations using PPT slides without graphic elements.
Reading: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.
Writing: Paraphrasing; using quotations in writing; usingacademic style - avoiding colloquial words and phrases.
Grammar and Vocabulary: Formal/academicwords and phrases.

Unit 2 **(10 hrs)**

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.
Speaking: Formal presentations using PPT slides with graphic elements.
Reading: Understand formal and informal styles; recognize the difference between facts and opinions.
Writing: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.
Grammarand Vocabulary: Phrasal prepositions; phrasal verbs.

Unit 3 **10(hrs)**

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.
Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.
Reading: Identifying claims, evidences, views, opinions and stance/ position.
Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.
Grammar andVocabulary: Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification.

Unit 4: **(8 hrs)**

Listening: Understanding inferences; processing of information using specific context clues from the text.
Speaking: Group discussion; reaching consensus in group work (academic context).
Reading: Reading for inferential comprehension.
Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.

Grammar and Vocabulary: Active and passive voice – use of passive verbs in academic writing.

Unit 5: **(8hrs)**

Listening: Understanding inferences - processing of explicit information presented in the text andimplicit information inferable from the text or from previous/background knowledge.
Speaking: Formal team presentations on academic/ general topics using PPT slides.
Reading for Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.
Grammar and Vocabulary: Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

***Course Materials would be compiled and provided to learners and teachers**

ReferenceBooks

1. Bailey, Stephen. *Academic writing: A handbook for international students*.Routledge,2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* HeinleyELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*.CUP, 2012.Sample Web Resources Grammar/Listening/Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online, http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games, Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/, Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

References:

1. www.pointblank7.in> News & Politics> Features dt. 15.05.2019
2. Learning English a Communication Approach by Orient Longman Pvt Ltd. Hyderabad , 2005.

List of Cos	PO no. and keyword	Competency Indicator:	Performance Indicator:
CO1	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO4	PO9- Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.	9.2	9.2.1 9.2.2 9.2.3
CO5	PO10-Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2
CO6	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2

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

Subject Code	Subject Name	L	T	P	Credits
19AES0505	Internet of Things (IoT)	2	0	0	2

Course Outcomes:

CO: 1 Interpret the vision of IoT from a globalcontext
CO: 2 Determine the Market perspective of IoT
CO: 3 Compare and Contrast the use of Devices, Gateways and Data Management in IoT
CO: 4 Implement state of the art architecture in IoT
CO: 5 Illustrate the application of IoT in Industrial Automation and identify Real World DesignConstraints

UNIT I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A usecase example, Differing Characteristics.

UNIT II

M2M to IoT - A Market Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT IV

IoT Architecture-State of the Art - Introduction, State of the art.

UNIT V

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.

Textbooks:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ‒From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.(ISBN-13:978-0124076846).

References

1. Vijay Madisetti and Arshdeep Bahga, ‒Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014. (ISBN-13:978-8173719547)

2. Francis daCosta, ‒Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013. (ISBN-13: 978-1430257400)P L Ballaney, Theory of Machines, Khanna Publishers.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 5: Modern Tool Usage	5.1	5.1.1
CO 2	PO 5: Modern Tool Usage	5.2	5.2.1
CO 3	PO 4: Conduct investigations of complex Problems	4.3	4.3.1
CO 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO 5	PO 6: Engineer & Society	6.1	6.1.1

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

Course Code	Course Title	L	T	P	Credits
19APC0201	Electrical Circuit Analysis	3	0	0	3

COURSE OUTCOMES:

CO1: Apply network theorems for the analysis of electrical circuits.
CO2: Determine the transient and steady-state response of electrical circuits.
CO3: Analyze circuits in the sinusoidal steady-state domain (single-phase and three phase).
CO4: Analyze two port networks using network parameters
CO5: Apply mesh and nodal analysis to solve electrical circuit problems

UNIT-I

DC Circuits: Ohm‘s Law, Kirchhoff‘s Voltage Law and Current Law**,** Types of sources, Network elements, Voltage - Current Relationship for Passive Elements, Source Transformation, Network Reduction Techniques: Series, Parallel, Series Parallel, Star-to- Delta or Delta-to-Star Transformation, Analysis with dependent current and voltage sources. Node and mesh Analysis. Super node, super mesh analysis

UNIT-II

Network Theorems: Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem, millman‘s theorem, tellegan‘s theorem, Theorems for D.C and Sinusoidal Excitations. Concept of duality and dual networks.

UNIT-III

Single Phase AC Circuits: R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Sinusoidal Alternating Quantities. Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation, Concept of Power Factor, Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power and Complex Power. Three phase a.c circuits, Relation between Line and Phase Voltages and Currents, Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems, Mutual coupled circuits, Dot convention in coupled circuits.

UNIT-IV

Two port networks & Resonance: Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Inter-connection of two port networks.

Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor. Relation between quality factor and band width

UNIT-V

TRANSIENT RESPONSE ANALYSIS

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms

Text Books:

1. Alexander and sadiku‘s fifth edition –fundamentals of electric circuits‖ Indian edition,2013
2. Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtledge/T&F, 2011.

Reference Books:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO-1 –engineering knowledge	1.3	1.3.1
CO: 2	PO-2-problem analysis	2.2	2.2.2 2.2.3
CO: 3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO: 4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO: 5	PO-1- engineering knowledge	1.4	1.4.1

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

Subject Code	Subject Name	L	T	P	Credits
19APC0401	Electronic Devices & Circuits	3	0	0	3

Course Objectives:

CO1: Ability to understand the operation of diodes and special electronic devices with V-I characteristics.
CO2: Ability to understand the operation of different rectifiers and filters.
CO3: Ability to understand the construction, operation of BJT, FET in different configurations
CO4: Ability to understand importance of biasing and design of DC biasing circuits.
CO5: Ability to understand small signal model and design of amplifiers with BJTs and FETs.

Unit 1: PN Junction Diode & Special Diode Characteristics

Review of semiconductor Physics n and p-type semiconductors, Intrinsic &Extrinsic Semiconductors and their Fermi Levels, Open circuited p-n junction, Biased p-n junction, Current components in PN junction Diode, Diode Equation, V-I characteristics of p-n junction diode, Temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.
Special Electronic Devices - Construction, Operation, V-I Characteristics of
Zener diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel diode, DIAC, TRIAC, SCR, UJT.

Unit 2: Rectifiers & Filters

Introduction to DC Power supply , Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, derivations of rectifier parameters , Rectifier circuits-Operation, Input and Output waveforms, Filters, , Capacitor filter, Inductor filter , L-section filter, π-section filter, Multiple L-section and Multiple π section filter, comparison of various filter circuits in terms of ripple factors.

Unit 3: Transistor Characteristics

BJT: Bi-polar Junction Transistor, Ebers-Moll model of a transistor, Transistor current components, Transistor as an amplifier, Transistor equation, Transistor configurations, Input-Output Characteristics of Transistor in Common Base, Common Emitter and Common Collector configurations, Punch through-Reach through, Photo transistor, Typical transistor junction voltage values.
FET:BJT Versus FET,Junction Field Effect Transistor JFET Types, Construction, Operation,parameters, Drain and Transfer characteristics, MOSFET Types -Enhancement and Depletion Types-Construction, Operation, Characteristics.

Unit 4: Transistor Biasing & Thermal Stabilization

Need for biasing, operating point, Load line analysis, BJT biasing-Methods, Basic stability Fixed bias, Collector to base bias, Self-bias, Stabilization against variations in V_{BE}, I_C, and β, stability factors, (S, S‘, S‖), Bias compensation, Thermal runaway, Thermal stability. FET Biasing- methods and stabilization.

Unit 5: Small Signal Low Frequency Transistor Amplifier Models

BJT: Two port network, Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters, analysis of CB, CE and CC amplifiers using exact analysis, approximate hybrid model, analysis of CB, CE and CC amplifiers usingapproximate hybrid model, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books and Reference Books:

1) David A.Bell, –Electronic Devices and circuits‖,5th edition,Oxford university press 2015.
2) Thomas L.Floyd, –Electronic Devices‖, 9th edition, Pearson Education, 2013
3) Robert L.Boylestad and Louis Nashelsky, –Electronic Devices & circuit theory‖, Pearson Education, 11th Edition 2013.
4) Donald Neamen, –Electronic Circuits: Analysis and Design‖, 3 rd edition, McGraw-Hill Education, 2011.
5) Muhammad Rashid, ―Microelectronic Circuits: Analysis & Design‖, 2nd edition, Cengage Learning,2010.

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)
AK19 Regulations

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

Course Code	Course Title	L	T	P	Credits
19APC0202	Engineering Electromagnetics	3	1	0	4

COURSE OUTCOMES:

CO1: Understand basic principles, concepts and fundamental laws of electromagnetic fields.
CO2: Translate from one coordinate system to another.
CO3: Describe electrostatics, magneto statics and time-varying fields
CO4: Analyze the interaction between electricity and magnetism.
CO5: Calculate the quantities associated with uniform plane wave motion in different media of Transmission.

UNIT-I
ELECTROSTATICS

Electrostatic Fields - Coulomb‘s Law - Electric Field Intensity(EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Potential Gradient - Gauss‘s Law-Application of Gauss‘s Law-Maxwell‘s First Law – Numerical Problems.
Laplace‘s Equation and Poisson‘s Equations - Solution of Laplace‘s Equation in one Variable. Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.

UNIT-II
CONDUCTORS AND DIELECTRICS

Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm‘s Law in Point Form – Equation of Continuity – Numerical Problems.

UNIT-III
MAGNETOSTATICS

Static Magnetic Fields – Biot-Savart Law – Oerstead‘s experiment – Magnetic Field Intensity(MFI) due to a Straight, Circular &Solenoid Current Carrying Wire – Maxwell‘s Second Equation. Ampere‘s Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament – Point Form of Ampere‘s Circuital Law – Maxwell‘s Third Equation – Numerical Problems.
Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors.

UNIT-IV
MAGNETIC POTENTIAL

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson‘s Equations. Magnetic Dipole and Dipole moment – A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field – Numerical Problems.
Self and Mutual Inductances – Neumann‘s Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field – Numerical Problems.

UNIT-V

TIME VARYING FIELDS

Faraday‘s Law of Electromagnetic Induction – It‘s Integral and Point Forms – Maxwell‘s Fourth Equation. Statically and Dynamically Induced E.M.F‘s – Simple Problems – Modified Maxwell‘s Equations for Time Varying Fields – Displacement Current.

Wave Equations – Uniform Plane Wave Motion in Free Space, Conductors and Dielectrics – Velocity, Wave Length, Intrinsic Impedence and Skin Depth – Poynting Theorem – Poynting Vector and its Significance**.**

Text Books :

1. _Principles of Electromagnetics', 6th Edition, Sadiku, Kulkarni, OXFORD University Press, 2015
2. _Engineering Electromagnetics‘, William.H.Hayt, Mc.Graw Hill, 2010.

Reference Books:

1. _Electromagnetics‘ 5th edition, J.D.Kraus,Mc.Graw – Hill Inc, 1999.
2. _Field & Electromagnetic waves‘ – 2nd edition, David K. Cheng
3. _Electromagnetics‘, Joseph Edminister, Tata Mc Graw Hill, 2006.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.1,1.2,1.3	1.1.1,1.1.2,1.2.1
CO: 2	PO 2: Problem analysis	2.1,2.2	2.1.1, 2.2.3
CO: 3	PO 2: Problem analysis	2.1	2.1.1,2.1.2
CO: 4	PO4: Conduct investigations of complex problems	4.1	4.1.2
CO: 5	PO 2: Problem analysis	2.1	2.1.2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

Subject Code	Subject Name	L	T	P	Credits
19AMC9903	Environmental Studies	3	0	0	3

Course Outcomes:

CO: 1 Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

CO: 2 Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.

CO: 3 Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

CO: 4 Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage

CO: 5 To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT I

Multidisciplinary Nature o**f Environmental Studies:** Introduction − Multidisciplinary Nature of Environmental Studies − Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable energy resources –Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources

UNIT II

Ecosystems: Concept of an ecosystem. – Structure and functions of anecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition:genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man − wildlife conflicts − Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity

UNIT III

Environmental Pollution: Definition, Causes, effects and its controlmeasures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: Causes**,** effects and control measures ofurban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable toSustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people − Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies–Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act − Public awareness.

UNIT V

Human Population and the Environment: Population growth,variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

Reference Books:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

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: I** **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19AHS9904	Communicative English II Lab	0	0	2	1

Course Outcomes:

CO: 1 Prioritize information from reading texts after selecting relevant and useful points.

CO: 2 Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.

CO: 3 Participate in Group discussions using appropriate conventions and language strategies.

CO: 4 Paraphrase short academic text using suitable strategies and conventions.

CO: 5 Collaborate with a partner to make presentations and Project

UNIT I

Oral Presentation: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

UNIT II

Power point Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions. Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

UNIT III

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

UNIT IV

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text.

UNIT V

Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

Reference Books:

1. Effective Technical Communication, Rizvi,Tata McGraw-Hill Education2007.
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning PvtLtd, 2012.
3. A Course in Communication Skills, P.Kiranmai Dutt,Geetha Rajeevan,C.L.N.Prakash, 2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press.
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand & Company Ltd, 2001.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO: 2	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2 .
CO: 3	PO9 Functioneffectivelyasanindividual,andasamemberorlead erindiverse teams, and in multidisciplinarysettings.	9.2.	9.2.1 9.2.2 9.2.3
CO: 4	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	10.3	10.3.1 10.3.2
CO: 5	PO10 Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2

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

Subject Code	Subject Name	L	T	P	Credits
19AES0506	Internet of Things Lab (IoT Lab)	0	0	2	1

Lab Experiments:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board usingBluetooth.
4. Read data from sensor and send it to a requesting client.(using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Identify a problem in your local area or college which can be solved by integrating the thingsyou learned so far and create a prototype to solve it (MiniProject).

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRCPress.

Reference sites:

https://www.arduino.cc/,https://www.raspberrypi.org/

Course outcomes: At the end of the course, students will be able to

- Choose the sensors and actuators for an IoTapplication.
- Select protocols for a specific IoTapplication.
- Utilize the cloud platform and APIs for IoTapplication.
- Experiment with embedded boards for creating IoTprototypes.

Design a solution for a given IoTapplication

List of Cos	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 5: Modern Tool Usage	5.1	5.1.1
CO 2	PO 5: Modern Tool Usage	5.2	5.2.1
CO 3	PO 4: Conduct investigations of complex Problem	4.3	4.3.1
CO 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO 5	PO 6: Engineer & Society	6.1	6.1.1

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

Course Code	Course Title	L	T	P	Credits
19APC0203	Electrical Circuit Analysis Lab	0	0	3	1.5

COURSE OUTCOMES:

CO1: Analyze complex DC and AC linear circuits
CO2: Apply concepts of electrical circuits across engineering
CO3: Evaluate response in a given network by using theorems

From the following experiments students may select any 10 experiments:

1. Verification Of Ohms Law
2. Verification Of KCL And KVL
3. Verification Of Nodal And Mesh Analysis
4. Verification Of Superposition Theorem
5. Verification Of Reciprocity Theorem & Milliman's Theorem
6. Verification Of Maximum Power Transfer Theorem
7. Verification Of Thevenin‘s Theorem & Norton ‘S Theorem
8. Verification Of Compensation Theorem
9. Verification Of Series & Parallel Resonance
10. Determination Of Self, Mutual Inductance And Coefficient Of Coupling
11. Z and Y Parameters
12. Transmission and Hybrid Parameters

Text books:

1. Alexander and Sadiku‘s fifth edition ―fundamentals of electric circuits‖ Indian edition,2013
2. Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill

References:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO-1 –engineering knowledge	1.3	1.3.1
CO 2	PO-2-problem analysis	2.2	2.2.2 &2.2.3
CO 3	PO-4-conduct investigations of complex problems	4.1	4.1.1

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

Subject Code	Subject Name	L	T	P	Credits
19APC0404	Electronic Devices & Circuits Lab	0	0	2	1

Course Objectives:

CO1: Ability to test and operate diodes and special electronic devices.
CO2: Ability to construct and operate rectifiers without and with filters
CO3: Ability to construct and operate BJT, FET in different configurations
CO4: Ability to design DC biasing circuits for Transistors
CO5: Ability to design amplifiersusing BJTs and FETs.

List of Experiments:

1. PN Junction Diode Characteristics
2. Zener Diode Characteristicsand Zener Diode as Voltage Regulator.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics (CS Configuration).
7. SCR Characteristics
8. Transistor Biasing
9. BJT-CE Amplifier
10. Emitter Follower-CC Amplifier
11. FET-CS Amplifier
12. UJT Characteristics

Equipment required for Laboratory

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.

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
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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
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Year: II **Semester:II** **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

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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 PO 4: Conduct investigations of complex problems	2.3 4.2	2.3.1, 2.3.2 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

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

Subject Code	Subject Name	L	T	P	Credits
19APC0408	Digital ElectronicsCircuits	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

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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

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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 PO 4: Conduct investigations of complex problems	2.3 4.2	2.3.1, 2.3.2 4.2.1, 4.2.2
CO 5	PO 2: Problem analysis	2.3	2.3.1, 2.3.2

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Year: II **Semester:II** **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 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 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
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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

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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

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0206	Power Systems - I	3	0	0	3

Course Outcomes:

CO1: Acquire knowledge on thermal, gas and nuclear power plants operation. CO2: Understand the operation of AC and DC distribution systems.
CO3: Understand the operation of Air Insulated & Gas Insulated (GIS) Substations.
CO4: Familiarize with voltage control and power factor improvement techniques.
CO5: Analyze economic aspects of power generation and different types of tariff methods.

UNIT-I:

Power Stations:

Thermal Power Station: Brief description of thermal power plant components - Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses.

Nuclear Power Stations: Nuclear Fission and Chain reaction, nuclear fuels, Principle of operation of nuclear reactor, Reactor Components- Moderators, Control rods, Reflectors and Coolants, Radiation hazards- Shielding and Safety precautions, Types of Nuclear reactors and brief description of PWR, BWR and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).

UNIT-II:

General Aspects of D.C & A.C Distribution Systems: Bulk Power Grids and Micro-grids. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Classification of Distribution Systems - Comparison of DC vs. AC and Under-Ground vs. Over - Head Distribution Systems.

UNIT-III:

Air Insulated & Gas Insulated (GIS) Substations: Classification of substations: - Indoor & Outdoor substations: Sub-stations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams. Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-IV:

Power Factor & Voltage Control: Causes of low power factor -Methods of Improving power factor

-Phase advancing and generation of reactive KVAR using static Capacitors-Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems. Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

UNIT-V:

Economic Aspects of Power Generation & Tariff: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors-Numerical Problems. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

Desirable Characteristics of a Tariff Method-Tariff Methods: Flat Rate, Block- Rate, two-part, three
–part, and power factor tariff methods and Numerical Problems.

TEXT BOOKS:

1. Principles of Power Systems by V. K Mehta and Rohit Mehta S. Chand Company Pvt. Ltd, New Delhi 2004.
2. Electrical Power Systems, PSR. Murty, BS Publications.

REFERENCE BOOKS:

1. A Text book of Power system Engineering, R. K. Rajput, Laxmi Publications (P) Limited.
2. Electrical Power Generation, Transmission and Distribution, S.N.Singh., PHI.
3. Electrical Power Systems by C.L.Wadhawa New Age International (P) Limited, Publishers.
4. Generation of Electrical Energy, Dr. B. R. Gupta, S. Chand.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0207	Electrical Machines - II	2	1	0	3

Course Outcomes:

1. Understand the fundamentals of windings, pulsating magnetic fields and revolving magnetic field.
2. Understand the fundamentals and performance analysis of three phase and single-phase induction.
3. Understand operation, various methods of starting, braking and speed control of induction motors.
4. Analyze the phasor diagrams, parallel operation of alternators, synchronization and load division of synchronous generators.
5. Analyze the phasor diagram, determination of V and inverted V curves and power circles of synchronous motor.

UNIT-I

Fundamentals of AC machine windings

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factors.

UNIT-II

Induction Machines

Operating principle, Construction, Types, Equivalent circuit, Phasor Diagram, Torque-Slip Characteristics, power flow in induction machines, Losses and Efficiency, No load and blocked rotor test, Circle diagram- performance characteristics, Numerical problems. Methods of starting, braking and speed control for induction motors, crawling and cogging.

UNIT-III

Single-phase induction motors

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and its applications, capacitor start and run single phase motors, reluctance single phase motors, stepper motors, BLDC motors.

UNIT-IV

Synchronous generators

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation-EMF, MMF, ZPF and ASA methods. Operating characteristics of synchronous machines, Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

UNIT-V

Synchronous motors

Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, Predetermination of V and inverted V curves, Hunting and use of damper bars, Synchronous condenser and power factor correction, Excitation and power circles.

Text Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

References:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0208	CONTROL SYSTEMS	2	1	0	3

Course Outcomes:

1. Understand the basics of systems, modelling of various kind of systems, detection of transfer function from the pictorial representation.
2. Acquire knowledge of open loop and closed loop systems.
3. Learn to use block diagram to find the overall transfer function of first and second order systems.
4. Understand transient and steady state response, time domain specifications and the concept of Root loci.
5. Analyze frequency domain specifications, Bode diagrams and Nyquist plots.

UNIT - I
CONTROL SYSTEMS CONCEPTS

Basic elements of control systems- open and close loop systems – Differential equation - Transfer function – Modelling of Electrical systems, translational and rotational mechanical systems – Block diagram reduction techniques – Signal flow graphs.

UNIT-II
TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

UNIT- III
STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability - Routh's stability criterion - Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT- IV
FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain Margin-Stability Analysis.
Compensation techniques - Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT- V
STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model- State Transition Matrix and it's Properties-System response through State Space models-The concepts of controllability and observability, Duality between controllability and observability.

TEXT BOOKS:

1. Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall of India Pvt. Ltd., 2010.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering" 5th edition, New Age International (P) Limited Publishers, 2007.

REFERENCE BOOKS:

1. M. Gopal, "Control Systems Principles & Design" 4th Edition, Mc Graw Hill Education, 2012.
2. B. C. Kuo and Farid Golnaraghi, "Automatic Control Systems" 8th edition, John wiley and sons, 2003.
3. Joseph J Distefano III, "Feedback and Control Systems", Allen R Stubberud & Ivan Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Graham C. Goodwin, "Control System Design" Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Gene F. Franklin, "Feedback Control of Dynamic Systems", J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson, 2010.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO4: Conduct investigations of complex problems	4.3	4.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0209	Power Electronics	3	0	0	3

Course Outcomes:

1. Understand the basic operating principles of power semiconductor switching devices.
2. Analyze the operation of AC-DC and DC to DC converters and their control.
3. Analyze the operation of DC-AC and AC to AC converters and their control.
4. Understand the operation of cycloconverters.

UNIT-I
POWER SEMICONDUCTOR DEVICES

Basic structure and switching characteristics of Power Diode, Power Transistor, Power MOSFET, IGBT and GTO.SCR-Basic Operation, VI characteristics, Turn-on, Turn-off methods, Switching characteristics, Combination of SCRs, Snubber circuits, Ratings and Protection circuits.

UNIT-II
AC-DC CONVERTERS

Principles of Phase control, Natural commutation, Operation of single-phase half wave-controlled converters with R, RL, RL+FWD, RLE Loads, fullwave-controlled converters with R, RL load, RL+FWD for bridge type converters. Operation of three phase half wave-controlled converters and full wave-controlled converters with R, RL, Effect of source inductance on single phase and three phase-controlled converters - Operation of dual converters.

UNIT-III
DC-DC CONVERTERS

Voltage, Current and Load commutation, Principles of chopper, Control strategies, step-up, step-down, Step-up-down choppers, Classification and operation of Choppers (A,B,C,Dand E). Introduction to Resonant converters – Effect of EMI on converters.

UNIT-IV
DC-AC CONVERTERS

Inverters - Single Phase Inverter - Basic Series Inverter - Basic Parallel Capacitor Inverter Bridge Inverter - Waveforms - Simple Forced Commutation Circuits for Bridge Inverters - Single Phase Half and Full Bridge Inverters-Pulse Width Modulation Control-Harmonic Reduction Techniques-Voltage Control Techniques for Inverters -Numerical Problems, Three Phase VSI in 120° and 180° Modes of Conduction.

UNIT-V
AC-AC CONVERTERS

Types of control (phase & Integrated cycle control), Operation of single-phase voltage regulator with R, RL Loads.Operation of three phase AC voltage controls (with Anti parallel SCR configuration) with R load operation.Cyclo-converters: single phase - step up & step down cyclo-converters, three phase cyclo-converter with R, RL loads.

Text Books:

1. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition, 2014.
2. Theory of Power Electronics, "K.L.Rao, C.H.SaiBabu - S.Chand& Company Ltd.", New Delhi.-2006

References:

1. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata McGraw – Hill Publishing Company, 2nd Edition, 2010.
2. N.Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics, Converters and Applications & Design",3rd Edition John Wiley & sons.
3. Dr P S Bimbhra "Power Electronics ", Khanna Publishers, New Delhi, Edition 2012.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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R19 Regulations

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

Course Code	Course Title	L	T	P	Credits
19APC0403	SIGNALS AND SYSTEMS	3	1	0	3

Course Outcomes: Students will be able to
CO1. Understand mathematical description and representation of continuous time and discrete time signals.
CO2: Resolve signals in frequency domain using Fourier series and Fourier Transforms.
CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
CO4: Understand the properties of systems, response of LTI systems and filters.
CO5: Able to analyz**e** LTI systems using Laplace and Z-Transforms.

Unit I: Signals
Introduction: Definition of Signals, classification of signals: continuous time and discrete time signals, standard signals: impulse function, step function, ramp function complex exponential and sinusoidal signals, signum and sinc functions. Operations on signals and sequences. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, mean square error, orthogonality of complex functions. Representation of signals using Fourier series: Trigonometric Fourier series (TFS) and complex exponential Fourier series (CEFS). Illustrative problems.

Unit II: Fourier Transforms
Continuous Time Fourier Transform, definition, properties, Fourier Transforms of standard signals, complex Fourier spectrum, inverse Fourier Transform. Discrete Time Fourier Transform, definition, properties of Discrete Time Fourier Transform transforms of standard signals. Introduction to Hilbert Transform. Illustrative problems.

Unit III: Sampling Theorem
Definition of sampling, types: impulse and pulse sampling. Sampling theorem for band limited signals-Graphical and analytical proof, Nyquist criterion, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Sampling theorem for bandpass signals. Illustrative problems.

Unit IV: Systems
Definition of Systems, Classification of Systems, impulse response, response of a linear time invariant system, Convolution and correlation: time domain, frequency domain and Graphical representation. Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time. Illustrative problems.

Unit V: Laplace Transforms & Z Transform
Laplace transforms: Review of Laplace transforms, concept of region of convergence (ROC) for Laplace transforms, inverse Laplace transform, constraints on ROC for various classes of signals, properties of Laplace Transforms. Analysis of CT-LTI systems using Laplace transforms: causality and stability.
Z-Transforms: Review of Z-Transforms, concept of region of convergence (ROC) for Z- transforms inverse Z- transform, partia and constraints on ROC for various classes of signals, properties of Z-Transforms. Analysis of DT-LTI systems using Z- transforms: causality and stability. Illustative problems.

Text Books:

1. B.P. Lathi, Signals, Systems & Communications, BS Publications, 2003.
2. A.V. Obppenheim, A.S. Willsky and S.H. Nawab, Signals and Systems PHI, 2nd Edition. 2009.

References:

1. Simon Haykin and Van Veen, Signals & Systems, Wiley, 2nd Edition.
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms,and Applications, 4 th Edition, PHI, 2007.
3. BP Lathi, Principles of Linear Systems and Signals Oxford University Press, 2015.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of Solutions	3.3	3.3.1
			3.3.2
	PO 4: Conduct investigations of complex problems	4.3	4.3.1
			4.3.2
			4.3.3.
			4.3.4
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO3	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
	PO 10: Communication	10.3	10.3.1
			10.3.2
CO4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
			4.2.2
		4.3	4.3.1
			4.3.2
			4.3.3
			4.3.4
CO5	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:TIRUPATI
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AK19 Regulations

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

Course Code	Course Title	L	T	P	Credits
19APC0425	ANALOG AND DIGITAL IC APPLICATIONS	3	1	0	3

Course Outcomes:

CO1: Understand the basic building blocks of linear integrated circuits and its characteristics.
CO2: Design the Multivibrator circuits using IC555 and determine the frequency of oscillation and time delay, and understand the concept of A/D and D/A Converters.
CO3: Understand the concept of active filters and oscillators.
CO4: Design of CMOS logic circuits and analysis of performance characteristics.
CO5: Implementation of digital logic circuits with the estimation of power and speed.

UNIT I

OP-AMP CHARACTERISTICS: Basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics - DC and AC characteristics, 741 Op-amp and its features, modes of operation-inverting, non-inverting, differential. Basic applications of Op-amp, instrumentation amplifier, AC amplifier, V to I and I to V converters, sample & Hold circuits, multiplier and divider, Differentiator and Integrator, Comparators, Schmitt trigger, multivibrator.

UNIT II

TIMERS, D-A AND A-D CONVERTERS: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC specifications.

UNIT III

ACTIVE FILTERS & OSCILLATORS: Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien, and quadrature type, waveform generators-triangular, sawtooth, square wave and VCO.

UNIT IV

CMOS LOGIC: introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families.

UNIT V

INTIGRATED CIRCUITS: Classification, Chip size and circuit complexity, Classification of integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics, TTL open collector o/ps, Tristate TTL, MOS & CMOS open drain and tri- state outputs, CMOS transmission gate, IC interfacing-TTL driving CMOS & CMOS driving TTL.

Text Books:

1. Linear Integrated Circuits – D.RoyChowdhury, New Age International (p) Ltd, 2nd Edition., 2003.
2. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.

Reference Books:

1. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications – Denton J.Daibey, TMH.
2. Design with Operational amplifiers & Analog Integrated circuits-Sergio Franco, Mc Graw Hill, 3rd Edition , 2002.
3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition 2005.
4. Op-amps & Linear ICs – RamakanthA.Gayakwad, PHI, 1987.

List of Cos	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 2: Problem analysis	2.1	2.1.2
CO: 3	PO 3: Design/Development of Solutions	3.4	3.4.2
CO: 4	PO 4: Conduct investigations of complex problems	4.3	4.3.2
CO: 5	PO 4: Conduct investigations of complex problems	4.3	4.3.3

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

Course Code	Course Title	L	T	P	Credits
19APC0426	LINEAR SYSTEM ANALYSIS	3	0	0	3

Course Outcomes: Students will be able to

CO1: Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis
CO2: Represent CT and DT systems in the Frequency domain using CTFT, DTFT
CO3: Apply the Laplace transform for analyze of continuous-time signals and systems
CO4: Apply the Z- transform for analyze discrete-time signals and systems
CO5: Understand the process of sampling and the effects of under sampling

UNIT–I FOURIER SERIES REPRESENTSATION AND ITS APPLICATIONS

Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Introduction, Effective value and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

UNIT–II FOURIER TRANSFORM REPRESENTSATION AND ITS APPLICATIONS

Fourier integrals and transforms, Fourier transform of a periodic function , Properties of Fourier Transform , Parseval's theorem , Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.

UNIT – III LAPLACE TRANSFORM REPRESENTSATION AND ITS APPLICATIONS

Applications of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications.

UNIT-IV Z-TRANSFORMS

Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.

UNIT-V SAMPLING

Sampling theorm – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

TEXT BOOKS:

1. Signals, Systems and Communications by B.P. Lathi, BS Publications 2003.
2. Network Analysis and Synthesis – Umesh Sinha- Satya Prakashan Publications

REFERENCE BOOKS:

1. Linear System Analysis – A N Tripathi, New Age International
2. Network and Systems – D Roy Chowdhary, New Age International
3 Engineering Network Analysis and Filter Desgin- Gopal G Bhisk & Umesh
4. Linear system anlysis by A.Cheng, Oxford publishers.

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 2: Problem analysis	2.3	2.3.1
CO5	PO 2: Problem analysis	2.3	2.3.1

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Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	C
19AHSMB01		3	0	0	3
	(Common to All branches of Engineering)				

Course Outcomes (CO):

CO1: Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
CO2: Apply the Concept of Production cost and revenues for effective Business decision
CO3: Analyze how to invest their capital and maximize returns.
CO4: Evaluate the capital budgeting techniques.
CO5: Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity.

UNIT - I	**Managerial Economics**

Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function,Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNIT - II	**Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost& Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - III	**Business Organizations and Markets**

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT - IV	**Capital Budgeting**

Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

UNIT - V	**Financial Accounting and Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). ***Financial Analysis*** - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage,2013.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting.

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B.Tech III Year **I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0510	COMPUTER NETWORKS	3	0	0	3

Course Objectives:

The students will be able to

- run and manage the Internet, part of the Internet, or an organization's network that is connected to the Internet.
- understand the basics of data communications and networking
- the protocols used in the Internet communication

Course Outcomes:

Student will be able to

- understand the basics of data communications and networking
- classify the functionalities of two sub layers of Data link Layer
- know briefly about Network Layer through algorithms and protocols
- distinguish the services provided by Transport Layer
- recognize the services offered by Application Layer to the user

Unit I

Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration.

Network Models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model

Introduction to Physical Layer: Data and Signals, Transmission Impairment, Data Rate Limits, Performance.

Transmission Media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet Switching

Unit II

The Data Link Layer: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol.

Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

Unit III

The Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking.

The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

Unit IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.

Unit V

The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.

Text Books:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.

References:

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture - Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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B. Tech III Year **I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0412	ANALOG AND DIGITAL COMMUNICATIONS	3	0	0	3

Course Outcomes:

Upon completing this course, the student will be able to

CO1. Describe of various amplitude modulation and demodulation techniques.
CO2. Understand various angle modulation and demodulation techniques.
CO3. Explain AM, FM Transmitters and Receivers.
CO4. Analyze and design the various pulse modulation techniques.
CO5. Design various digital carrier modulation techniques and baseband transmission.

UNIT-I:

Amplitude Modulation: Modulation, Amplitude Modulation, Limitations and Modifications of Amplitude Modulation-switching modulator, detection of AM waves: envelope detector, DSB-SC modulation- Time and frequency domain description, Balanced modulators, Synchronous Detector, Costas Receiver, Quadrature Carrier Multiplexing, SSB modulation Generation - frequency and phase discrimination methods , Detection methods, VSB modulation, generation and detection method

UNIT-II:

Angle Modulation: Angle modulation, FM, PM, Relationship between FM and PM, NBFM, WBFM, Transmission bandwidth of FM waves, Generation of FM: Direct, Indirect Demodulation of FM signals : Balanced slope detector, PLL, Noise in AM and FM

UNIT III:

Transmitters & Receivers: AM Transmitters, FM Transmitters, Radio Receivers-types, RF Section and Characteristics, Mixer, IF section, AGC, Frequency Tracking , RF receivers

Pulse Modulation: PAM, Pulse time modulation –PWM and PPM, Generation and detection, Time Division Multiplexing.

UNIT–IV

Digital Modulation: Block diagram of Digital communication system, Advantages of Digital Communication Systems, PCM Generation and Reconstruction, Quantization, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM

UNIT-V

Digital Carrier Modulation Schemes: ASK, FSK, PSK –Modulator and detector, Comparison of digital carrier modulation schemes, M-ary Signaling Schemes, QAM.

Baseband Transmission: Signal Receiver, Probability of error-ASK, FSK, PSK, Optimum Receiver, Coherent reception, ISI, Eye Diagrams

Text Books:

1. Simon Haykin, Introduction to Analog & Digital Communications, Second edition, Wiley Publications, 2014
2. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley Publications, 2007

Reference Books:

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. B.P.Lathi, Modern Digital and Analog Communication Systems, 4/e, Oxford University Press, 2017.
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.2
CO2	PO2: Problem analysis	2.1	2.1.2
CO3	**PO1: Engineering knowledge**	1.4	1.4.1
CO4	PO3: Design/Development of Solutions	3.3	3.3.1
CO5	PO3: Design/Development of Solutions	3.4	3.4.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI
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AK 19 Regulations

B.Tech- II,III Year **Semester: I** **Branch: Common to all**

Subject Code	Subject Name	L	T	P	Credits: 0
19AMC9902	CONSTITUTION OF INDIA	3	0	0	

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

Syllabus

Unit:1 **4 hrs**

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

Unit:2 **8 hrs**

Philosophy of the Indian Constitution - Preamble Salient Features

Unit:3 **8hrs**

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Unit:4 **8hrs**

Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

Unit:5 **8hrs**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 2	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 3	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 4	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 5	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2	6.1.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0210	Electrical Machines – II Lab	0	0	2	1

Course outcomes:

1. Analyze and apply load test, no-load and blocked-rotor tests for construction ofcircle diagram and equivalent circuit determination in a single-phase induction motor.
2. Predetermine regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
3. Predetermine the regulation of Alternator by Zero Power Factor method X_d and X_q determination of salient pole synchronous machine.
4. Evaluate and analyze V and inverted V curves of 3 phase synchronous motor

List of experiments:

1. No-load & Blocked-rotor tests on Squirrel cage Induction motor.
2. Load test on three phase slip ring Induction motor.
3. Speed control of three phase induction motor
4. Rotor resistance starter for slip ring induction motor
5. Load test on single phase induction motor.
6. Determination of Equivalent circuit of a single-phase induction motor.
7. Predetermination of Regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
8. Predetermination of Regulation of three-phase alternator by Z.P.F. method.
9. Determination of X_d and X_q of a salient pole synchronous machine.
10. V and inverted V curves of a 3-phase synchronous motor.

Reference Book:

1. D. P.Kothari and B. S. Umre, "Laboratory Manual for Electrical Machines" I.K International Publishing House Pvt. Ltd, 2017.
2. D.R. Kohli and S.K. Jain, "A Laboratory Course in Electrical Machines" NEM Chand & Bros.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO4: Conduct investigations of complex problems	4.3	4.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0211	Control Systems Lab	0	0	2	1

Course Outcomes:

1. Acquire knowledge of feedback control and transfer function of DC servo motor.
2. Familiarize mathematical modelling of systems and design controllers and compensators.
3. Get the knowledge on transient and steady state behaviour of second order systems.
4. Determine the performance and time domain specifications of first and second order systems.
5. Implement MATLAB analysis to real life systems.

Any Eight of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros.
3. Programmable logic controller - Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation - Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor

Any two simulation experiments are to be conducted:

1. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
2. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
4. State space model for classical transfer function using MATLAB - Verification.

REFERENCE BOOKS:

1. M.H.Rashid, “Simulation of Electrical and electronics Circuits”, using PSPICE ,M/s PHI Publications.
2. PSPICE A/D user’s manual - Microsim, USA.
3. PSPICE reference guide - Microsim, USA.
4. MATLAB and its Tool Books user’s manual and - Mathworks, USA.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0212	Power Electronics Lab	0	0	2	1

Course Outcomes:

1. Understand and analyze various characteristics of power electronic devices with gate firing circuits and forced commutation techniques.
2. Analyze the operation of single-phase half & fully-controlled converters and inverters with different types of loads.
3. Analyze the operation of DC-DC converters, single-phase AC Voltage controllers, cyclo-converters with different loads.
4. Create and analyze various power electronic converters using MATLAB software.

Any Eight of the Experiments in Power Electronics Lab

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cycloconverter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase half-controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase dual converter with RL loads

Any two simulation experiments with MATLAB

14. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
15. Simulation of resonant pulse commutation circuit and Buck converters and chopper.
16. Simulation of single-phase Inverter with PWM control.

REFERENCE BOOKS:

1. O.P. Arora, "Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems)", Alpha Science International Ltd., 2007.
2. M.H.Rashid, "Simulation of Electric and Electronic circuits using PSPICE", M/s PHI Publications.
3. MATLAB and its Tool Books user's manual and - Math works, USA.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0213	POWER SYSTEMS - II	3	0	0	3

COURSE OUTCOMES:

1. Understand the classification and parameters of conductors, transmission lines.
2. Analyze power system transients and the effect on power systems.
3. Understand the factors governing the performance of transmission lines.
4. Analyze the properties of overhead lines and their types.
5. Understand the types and construction of underground cables.

UNIT-I: TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT-II: PERFORMANCE OF SHORT, MEDIUM AND LONG LENGTH TRANSMISSION LINES:

Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical & Asymmetrical Networks.

Long Transmission Line-Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves.

UNIT – III POWER SYSTEM TRANSIENTS & FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINES

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples). Skin and Proximity effects - Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT-IV

OVERHEAD LINE INSULATORS & SAG, TENSION CALCULATIONS:

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding. Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT-V UNDERGROUND CABLES

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress. Capacitance of Single and 3-Core belted cables. Grading of Cables - Capacitance grading, Description of Inter-sheath grading, HV cables.

TEXT BOOKS:

1. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited, Publishers.
2. Electrical Power Systems, PSR. Murty, BS Publications.

REFERENCE BOOKS:

1. A Text Book on Power System Engineering, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. A Textbook of Power System Engineering, R. K. Rajput, Laxmi Publications (P) Limited.
3. Electrical Power Generation, Transmission and Distribution, S.N.Singh, PHI.
4. Principles of Power Systems**,** V. K Mehta and Rohit Mehta S. Chand Company Pvt. Ltd.
5. Power System Engineering, I.J.Nagarath & D.P Kothari , TMH.
6. Power System Analysis and Design, Dr. B. R. Gupta, S. Chand & Company Limited.
7. Power System Analysis, Operation and control, Abhijit Chakrpabarti, Sunitha Halder, PHI, 3/e, 2010
8. Electrical Power Transmission system engineering Analysis and design by Turan Gonen, CRC Press (Taylor & Francis Group) Special Indian Edition,2/e.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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Year: III **Semester: II** **Branch of Study: CSE,EEE,ECE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0216	NEURAL NETWORKS AND FUZZY LOGIC	3	0	0	3

COURSE OUTCOMES

1. Understand the basic architecture of artificial neural network terminologies and techniques.
2. Understand approaches and architectures of Artificial Intelligence.
3. Perform the training of neural networks using various learning rules.
4. Create different neural networks of various architectures both feed forward and feed backward.
5. Application of ANN to System Identification and Pattern recognition.

UNIT – I ARTIFICIAL NEURAL NETWORKS

Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems. Introduction and motivation: Neural Network, Human Brain, Structure of biological neuron, Memory, Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies, Artificial Intelligence and Neural Networks.

UNIT – II

Learning Process: Layers, activation functions, learning methods: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Memory, Adaption, Back Propagation and Differentiation, Supervised Learning, unsupervised learning.

UNIT – III NETWORKS

Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories - Self-Organization Map – Hopfield models – ART networks.

UNIT – IV UNIT – IV FUZZYLOGC

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT – V FUZZY LOGIC APPLICATIONS

Fuzzy pattern recognition – Fuzzy control system – Aircraft landing control problem - Statistical process control- Fuzzy cognitive mapping – Probability measures – Possibility and necessity measures.

TEXT BOOKS:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Neural Networks using MATLAB”, McGraw Hill Edition, 2006.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Third Edition, WILEY India Edition, 2012.

REFERENCES:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Laurene V. Fausett "Fundamentals of Neural Networks: Architectures, Algorithms and Applications" United States Edition.
3. Yung C. Shin and Chengying Xu, "Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0214	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	3	0	0	3

Course outcomes:

1. Understand different types of measuring instruments, their construction, operation and characteristics.
2. Identify the instruments suitable for typical measurements.
3. Apply the knowledge about transducers and instrument transformers to use them effectively.

UNIT- I INTRODUCTION TO MEASURING INSTRUMENTS:

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

UNIT– II POTENTIOMETERS & INSTRUMENT TRANSFORMERS:

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

UNIT –III MEASUREMENT OF POWER & ENERGY:

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeters, expression for deflecting and control torques – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

UNIT – IV DC & AC BRIDGES:

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge.

Measurement of capacitance and loss angle –Desaunty's Bridge - Wien's bridge – Schering Bridge.

UNIT-V TRANSDUCERS:

Definition of transducers, Classification of transducers, Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

Measurement of Non-Electrical Quantities: Measurement of strain, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

TEXT BOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

REFERENCE BOOKS:

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.

2. "R. K. Rajput", "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. "Buckingham and Price", "Electrical Measurements", Prentice – Hall, 1988.
4. "Reissland, M.U", "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
5. "E.W. Golding and F. C. Widdis", "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0215	POWER SYSTEM ANALYSIS	3	0	0	3

COURSE OUTCOMES:

1. Remember and understand the concepts of per unit values, Y_{Bus} and Z_{Bus} formation.
2. Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution.
3. Analyse the symmetrical faults and unsymmetrical faults.
4. Analyze algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations.
5. Understand and select efficient Circuit Breakers to improve system stability.

UNIT –I Power flow analysis and Y_{BUS} formation:
Per-Unit representation of Power system elements. Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Graph Theory: Definitions, Bus Incidence Matrix, Y_{Bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT –II Formation of Z_{Bus}:
Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of Z_{Bus} for the changes in network (Problems)

UNIT –III Power flow analysis
Static load flow equations - Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses). Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.

UNIT – IV Short Circuit Analysis
Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Unsymmetrical Fault Analysis: LG, LL, LLG and LLLG faults with and without fault impedance, Numerical Problems.

UNIT –V Stability Analysis
Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. G.W.Stagg and A.H.El "Computer Methods in Power System Analysis", Abiad, Mc Graw-Hill, 2006.
2. I.J.Nagrath & D.P.Kothari, "Modern Power system Analysis", 4th Edition, Tata McGraw-Hill Publishing Company, 2011.

REFERENCE BOOKS:

1. Grainger and Stevenson, "Power System Analysis", McGraw Hill, 1994.
2. Hadi Saadat, "Power System Analysis", McGraw Hill, 1998.
3. B.R.Gupta, "Power System Analysis and Design", S. Chand & Company, 2005.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1
CO5	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0417	MICROPROCESSORS AND MICROCONTROLLERS	3	1	0	3

Course Outcomes:
After completion of this subject the students will be able to :
CO1: Understand concepts of Intel x86 series of processors
CO2: Do programming with 8086 microprocessors
CO3: Understand concepts of MSP 430 Controllers
CO4: Program MSP 430 for designing any basic Embedded System
CO5: Design and implement some specific real time applications Using MSP 430 low power microcontroller.

UNIT I

Introduction-8086 Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

UNIT II
Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives- Macros and Procedures.- Sorting, Multiplication, Division and multi byte arithmetic code conversion. String Manipulation instructions-Simple ALPs.

UNIT III
Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, Addressing modes, Instruction set Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT-IV
I/O ports pull up/down resistors concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.
Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT-V:
Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using CC3100

Text Books:

1. "Microprocessor and Microcontrollers", N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1st Edition, 2010
2. "The X86 Microprocessors , Architecture, Programming and Inerfacing" , Lyla B. Das, Pearson Publications, 2010
3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition, 2008

References:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra- Low_Power_MCU_Training

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 2	PO 4: Conduct investigations of complex problems	4.1	4.1.1
CO: 3	PO 5: Modern tool usage	5.1	5.1.2
CO: 4	PO 5: Modern tool usage	5.2	5.2.1
CO: 5	PO 5: Modern tool usage	5.2	5.2.2

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Year : **III B. TECH** **Semester: II**

Subject Code: 19AHE9910	**Mathematical Modeling**	**L** 3	**T** 0	**P** 0	**Credits** 3

Course Outcomes:

CO1: Understand Basic Model Forms.
CO2: Understand Basic Simulation Approaches.
CO3: Evaluate Handling Stepped And Event-Based Time In Simulations
CO4: Distinguish Discrete Versus Continuous Modeling
CO5: Apply Numerical Techniques And Calculate Sources And Propagation Of Error

Unit I: What is mathematical modelling? What objectives can modelling achieve? Classifications of models Stages of modelling . Systems analysis- Making assumptions- Flow diagrams- Choosing mathematical equations.

Unit II: Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modeling-Numerical Techniques-Sources and Propagation of Error.

Unit III: Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations

Unit IV: Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms Handling Inter-partition Dependencies

Unit V: Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise Random Variate Generation-Sensitivity Analysis

Text books and Reference books:

1. Mathematical modeling, JN Kapur, Newage publishers
2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers by Kai Velten, Wiley Publishers.

3. . Introduction to Mathematical Modeling and Computer Simulations By Vladimir Mityushev,Wojciech NawalaniecNatalia RylkoPublished by Chapman and Hall/CRC

Online Learning Resources:

http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf
https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379
https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers

AK19 REGULATIONS

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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B.Tech III Year **II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0511	**Business Data Analytics**	3	0	0	3

Course Outcomes:

Student will be able to

- Understand the fundamental of Business Intelligence and to design a customized solution.
- Familiarize on the concepts, techniques and reporting methods of descriptive analytics and predictive analytics
- Explore the methods used to analyze speech and text and implement optimized search engines
- Design and implement Decision Support systems
- Familiarize on the processes needed to develop, report, and analyze business data

Unit I

Introduction to Business Intelligence – Designing Business Intelligence Application Requirements Gathering, Establishing the Technical Architecture, Designing a Business Intelligence Solution, Designing Dimensional Models, Designing the Physical Databases

Data Warehousing- Definitions and Concepts -- Data Warehousing Architectures - Data Integration and the Extraction, Transformation, and Load (ETL) Processes - Transaction processing- Data Warehouse Development Approaches - Data Warehousing Implementation Issues - Data Warehouse Administration, Security Issues, and Future Trends- Business Reporting, Visual Analytics, and Business Performance Management

Unit II

Data Mining Concepts- Definitions, Characteristics, and Benefits - How Data Mining Works - Data Mining Versus Statistics Data Mining Process - Data Mining Methods - Data Mining and Privacy Issues - Regression – Classification –Association Rules – clustering -Techniques for Predictive Modeling – ANN- SVM

Unit III

Text Analytics, Text Mining, and Sentiment Analysis - Natural Language Processing - Text Mining Process- tools - Sentiment Analysis -Overview, Process, Applications - Speech Analytics – Rule based, Multi, Layer, Hybrid Sentimental analysis – Machine Learning in Sentimental analysis

Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools

Unit IV

Decision Support Systems Modeling - Mathematical Models for Decision Support - Certainty, Uncertainty, and Risk- Decision Modeling with Spreadsheets - Mathematical Programming Optimization - Decision Analysis with Decision Tables and Decision Trees - Problem-Solving Search Methods - Problem-Solving Search Methods

Unit V

Knowledge Management –Concepts, Definitions , Approaches, tools and techniques - Big Data and Analytics- Fundamentals of Big Data Analytics – Technologies - Data Scientist - Big Data and Data Warehousing - Automated Decision Systems and Expert Systems - Business Analytics: Emerging Trends and Future Impacts. Recent Trends and future impacts.

Text Books:

3. Efraim Turban, Ramesh Sharda, Dursun Delen, “Business Intelligence and Analytics”, 10th Edition, Pearson , 2015.

References:

6. S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis & Decision Making, 6th Edition, CENGAGE INDIA , 2017
7. Dinabandhu Bag, Business Analytics, Routledge, 1st edition, 2016
8. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics, Morgan Kaufmann, 1st edition 2014

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III B.Tech **Semester**-II **Branch : Common to all**

Subject Code	Subject Name	L T P	Credit: 3
19AHE9902	**Principles of Effective Public Speaking**	3 0 0	

Course Objectives:

1. Gain and demonstrate the basic skills of effective oral communication, for use throughout your academic career and beyond.
2. Learn and develop the skills necessary to maximize public speaking effectiveness, including effective research and organization of information, how to make the most of presentation aids (and not become reliant on them!), and understanding the speaker-audience relationship.
3. Develop critical thinking and listening skills, enabling you to maximize your own understanding as an audience member, and offer considered and constructive critiques of others' speeches.
4. Become more confident in public speaking arenas, whether as a formal speech giver or as a participant in group settings. Improvement will be valued over perfection.

Syllabus

Unit -1

Introduction to Public Speaking:

Basic communication concepts, processes, and models Communication concepts and principles and public speaking Steps and methods of speech preparation; Ethics in public speaking

Unit -2

Listening and Speech Criticism:

Effective listening, the listening process, and types of listening; Listening barriers; Identifying and improving listening styles; Evaluating speech and effective speech techniques.

Unit -3

Selecting Topic and Knowing your Audience:

Identifying sources; Tools and techniques for selecting and refining speech topics; Identifying speech purposes; Central idea statement; The central idea; Audience analysis techniques.

Unit – 4

Speaking with a Purpose:

Informative, persuasive, and ceremonial speeches

Unit:5

Delivering your speech and using Visual Aids.

The mechanics of verbal and nonverbal communication in speech delivery; Modes of speech delivery; Speaking style and language; Effective delivery techniques; Incorporating presentation aids

Course Outcomes:

Students will be able to:

1. Apply knowledge of principles, concepts and skills learned in speech preparation.
2. Develop skills in effective listening.
3. Evaluate the delivery of speeches.
4. Develop skills in speech composition.
5. Use supporting materials and presentation aids in speech preparation.

References:

1. DeVito, J.A. (2009). The Essential Elements of Public Speaking. (3rd ed.) Boston: Pearson Education, Inc.

2. Lucas, S.E. (2009). The Art of Public Speaking. (10th ed.) New York: McGraw - Hill Co.

3. Zarefsky, D. (2011). Public Speaking: Strategies for Success. (6th ed. Boston: Pearson Education, Inc).

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO2	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO3	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings..	9.2	9.2.1
CO4	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO5	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1

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III B.Tech **AK 19 Regulations**

Common to II Sem ECE/EEE

SubjectCode:19AHE9907	Subject Name **OPTICS**	L T P **3 0 0**	Credits:3

Course Outcomes

1. Analyze the wave properties of light.
2. Interpret the interaction of energy with matter.
3. Analyze the semiconductor photo devices.
4. Interpret structural spectroscopic techniques.
5. Analyze NMR and ESR spectra.

UNIT I Polarization **10 Hours**

Polarization-Experimental observation-Polarization by reflection and refraction-Brewster angle-Pile of plates-Biot's polariscope- Malus laws, Double refraction - Optic axis, Uniaxial and biaxial crystals, Geometry of calcite crystals, Nicol prism, Nicol as analyzer and polarizer. Huygen's explanation of double refraction, Quarter wave and Half wave plates, Production and detection of plane, elliptical and circular polarization of light

UNIT II Semiconductor Optics **12 Hours**

Semiconductor light emitting diodes (LEDs)- Radiative and non-radiative recombination mechanisms in semiconductors-LED: device structure, materials and characteristics,- Review of laser physics-Rate equations for carrier- and photon-density, and their steady state solutions-Semiconductor laser: structure, materials, device characteristics, and figures of merit; DFB, DBR, and vertical-cavity surface-emitting lasers (VECSEL)- Tunable semiconductor lasers.

UNIT III Photo devices and their instrumentation **8 Hours**

Photodetectors -Types of semiconductor photodetectors -p-n junction, PIN, and Avalanche --- and their structure, materials, working principle and characteristics-Noise limits on performance- Solar cells. Low-dimensional optoelectronic devices -Quantum-well, -wire, and -dot based LEDs, lasers, and photodetectors.

UNIT IV Spectroscopic Techniques-I **9 Hours**

UV-visible Spectroscopy: principles- instrumentation- quantitative analysis by absorption measurements- simultaneous determinations- applications.

Raman Spectroscopy**:**Quantum theory of Raman effect –degree of depolarisation–FT Raman spectrometer- Instrumentation and sampling methods– construction of character table – calculation of normal modes of vibration - Raman and I.R activity.

UNIT V Spectroscopic Techniques-II **11 Hours**

NMR Spectroscopy **:** Theory of NMR method – Bloch equations- Steady state solution of Bloch

equations- Theory of chemical shifts- Experimental methods –Single coil and double coil methods – Pulse method –High resolution method –Application of NMR to quantitative measurements. ESR Spectroscopy: Quantum mechanical treatment of ESR- hyperfine structure-Basic principles of spectrographs-Application of ESR method.

Textbooks:

1. Optics by Ajay Ghotak.
2. A textbook of Optics by Brij Lal and Dr. M. Subhramanyam.
3. Optics by Dr. S. P. Singh and Dr. A.P. Agarwal.

References:

1. Fundamental of Optics by F.A. Jenkins and H. E. White.
2. The Feynman Lecture of Physics by Richard Feynman.
3. Optics by Eugene Hecht.

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

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III B.Tech **AK 19 Regulations**

Common to II Sem ECE & EEE

Subject Code:19AHE9909	Subject Name: **Quantum Mechanics**	L T P 3 0 0	Credits:3

Course Outcomes

1. Analyze the Classical theory of quantum mechanics and Different effects.
2. Illustrate the experimental evidence of matter waves.
3. Analyze Heisenberg's Uncertainty Principle and Experimental Verification.
4. Analyze the Time dependent and independent Schrodinger's Equation.
5. Evaluate the One Dimensional Potential Well and Barrier Potential.

UNIT I

Origin of Quantum Mechanics

Introduction, Black body radiation, Rayleigh-Jeans law of spectral distribution of energy, Planck's radiation law, Photoelectric effect, Experimental observations, Einstein theory for photoelectric effect Compton effect, Classical theory of specific heat Einstein theory of specific heat of solids.

UNITII

Basics of Wave Mechanics

Introduction, de Broglie Matter Wave, Derivation of deBroglie's Relation ,deBroglie wavelength of High Energy Electrons, Properties of deBroglie Waves (Matter Waves) , Experimental Evidence of Matter Wave: Proof of deBroglie's Hypothesis, Davisson and Germer Experiment, G.P. Thomson's Experiment, Electron Double Slit Experiment, Group and Wave Velocities , Wave Packet and its Formation , Relation between Group Velocity and Particle Velocity. , Relation between Phase Velocity and Group Velocity.

UNIT III

Heisenberg's Uncertainty Principle

Introduction, Heisenberg's Uncertainty Principle, Elementary Proof of Uncertainty Principle, Conclusions from Uncertainty Relation, Time-Energy Uncertainty Relation, Elementary Proof of Time Energy Uncertainty Relation ,Angular Position – Angular Momentum Uncertainty Principle. , Derivation of Uncertainty Principle from deBroglie's Wave Concept. Illustration (Experimental Verification) of Heisenberg's Uncertainty Principle. , Electron Diffraction through a Single Slit.

UNIT IV

Schrodinger Wave Equation

Introduction, Schrodinger's Equation, Time dependent Schrodinger's Equation, Validity of Schrodinger's Equation, Time dependent Schrodinger's Equation in three Dimensions, Time independent Schrodinger's Equation, One dimensional Time Independent Schrodinger's Equation , Three dimensional Time Independent Schrodinger's Equation, Wave function, Physical Significance of Wave function, Conditions on a Wave function, Probabilistic Interpretation of a Wave function, Eigen Values and Eigen Function and Operators.

UNIT- V

One Dimensional Potential Well and Barrier Potential

Introduction, Properties of one-dimensional motion, Bound States (Discrete Spectrum, Unbound States (Continuous Spectrum), One dimensional potential well,Energy levels for one-dimensional square well potential of finite depth (OR finite potential well), Potential step or a single step barrier, Boundary conditions.

Textbooks:

1. Introduction to Quantum Mechanics by J. Griffithis David.
2. A.K.Ghatak and S.Lokanathan – Quantum Mechanics – Theory and applications – 3rd edition – Macmillan Publisher (2012).[units 1-5]
3. S.N.Biswas - Quantum Mechanics - Books & Allied Ltd; 2nd Revised edition (2012)

References:

1. Quantum Mechanics by E. Mearzbacher
2. Quantum Mechanics: A textbook for Undergraduates by Jain Mahesh

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

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B.Tech II,III Year Semester: I Branch of Study: Common to all
MANDATORY COURSE

Subject Code 19AMC9904	Subject Name: Professional Ethics And Human Values	L: 3	T: 0	P: 0	Credits: 0

Course Outcomes:

1. It ensures students sustained happiness through identifying the essentials of human values and skills.
2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.
3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.
4. Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
5. Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Syllabus

UNIT - I: 12hrs

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - II: 12hrs

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT – III: 12hrs

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – IV: **15hrs**

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – V: **12hrs**

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Text Books:

1.R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

2.Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins, 4e , Cengage learning, 2015.

4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO2	PO8:Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO3	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO4	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO5	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0217	POWER SYSTEMS LAB	0	0	2	0

Course Outcomes:

1. Acquire practical knowledge on calculation of sequence impedance, fault currents, voltages and sub transient reactance's. Get the practical knowledge on how to draw the equivalent circuit of three winding transformer.
2. Acquire knowledge on development of MATLAB program for formation of Y and Z buses.
3. Acquire knowledge on development of MATLAB programs for Gauss-Seidel and Fast Decouple Load Flow studies.
4. Acquire knowledge on development of SIMULINK model for single area load frequency problem.

List of Experiments

Conduct any 8 experiments (4 from S.Nos.1 to 7 & 4 from Sl.Nos.8 to 12)

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. LG Fault Analysis on an un loaded alternator.
3. LL Fault Analysis on conventional phases.
4. LLG Fault Analysis.
5. LLLG Fault Analysis.
6. Determination of Sub transient reactance of silent pole synchronous machine
7. Equivalent circuit of three winding transformer.
8. Y_{Bus} formation using MATLAB
9. Z_{Bus} formation using MATLAB
10. Gauss-Seidel load flow analysis using MATLAB
11. Fast decoupled load flow analysis using MATLAB
12. Develop a Simulink model for a single area load frequency problem and simulate the same.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0420	MICROPROCESSORS AND MICROCONTROLLERS LAB	0	0	2	1

Course Outcomes :
After completion of this subject the students will be able to :
CO1: To apply the assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.
CO2: To demonstrate the steps in executing an assembly language program using an assembler.
CO3: Understand concepts of MSP 430 Controllers
CO4: Program MSP 430 for designing any basic Embedded System
CO5: Design and implement some specific real time applications Using MSP 430 low power microcontroller.

Part A: 8086 Microprocessor Programs using MASM/8086 microprocessor kit.

1. Introduction to MASM Programming.
2. Programs using arithmetic operations
3. Programs using ASCII arithmetic operations
4. Programs using logical operation
5. Programs for code conversion
6. Sorting of the given numbers
7. String operations

Part B: Embedded C Experiments using MSP430 Microcontroller

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs, push buttons)
2. Usage of Low Power Modes: (Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430
6. Using ULP advisor in Code Composer Studio on MSP430
7. Low Power modes and Energy trace++:

Note : Any six experiment from Part A and Six experiments from Part B are to be conducted

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/Development of Solutions:	3.3	3.3.1
CO: 2	PO 4: Conduct investigations of complex problems:	3.3	3.3.2
CO: 3	PO 5: Modern tool usage:	5.1	5.1.2
CO: 4	PO 5: Modern tool usage:	5.2	5.2.1
CO: 5	PO 5: Modern tool usage:	5.3	5.3.2

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0218	ELECTRICAL MEASUREMENTS LAB	0	0	2	1

Course outcomes:

1. Understand calibration of various electrical measuring instruments.
2. Accurately determine the values of inductance and capacitance using AC bridges.
3. Analyze coefficient of coupling between two coupled coils.
4. Accurately determine the values of very low resistances.
5. Understand the working principles of displacement transducers.

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single-phase energy Meter
2. Calibration of dynamometer power factor meter
3. Calibration of D.C. Potentiometer: PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge - Measurement of low resistance - Determination of Tolerance.
5. Determination of Coefficient of coupling between two mutually coupled coils
6. Schering Bridge & Anderson bridge
7. Measurement of 3-phase reactive power with single-phase wattmeter
8. Measurement of parameters of a choke coil using 3-voltmeter and 3-ammeter methods

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Maxwell's bridge and DeSauty bridge
10. Calibration of LPF wattmeter - by Phantom loading
11. Wheatstone bridge - measurement of medium resistances
12. LVDT and capacitance pickup - characteristics and Calibration
13. Resistance strain gauge - strain measurement and Calibration
14. Measurement of Earth Resistance by Megger.

Reference Books:

1. Patranabis, ‘Sensors and Transducers’, Prentice Hall of India, 2004
2. Cooper W.D., “Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, New Delhi, 2003.Joseph J Carr, Elements of Electronic Instrumentation & Measurement, Pearson, 3rd Edition 1995.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.2
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO5	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.4	2.4.2