ANNAMACHARYA INSTITUTE OFTECHNOLOGYANDSCIENCES, TIRUPATI
(Autonomous)
Course Structure for Four Year Regular B.Tech Degree Program
(Effective for the batch admitted from 2020-21)
ELECTRCIAL & ELECTRONICS ENGINEERING (EEE)

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

Semester I (First Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science course	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	Basic Science course	20ABS9902	Applied Physics	3	0	0	3	30	70	100
3	Humanities and Social Science	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0304	Engineering Workshop Practice	1	0	4	3	30	70	100
5	Engineering Science Courses	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	Humanities and Social Science LAB	20AHS9902	Communicative English Lab	0	0	2	1.5	30	70	100
7	Basic Science course (LAB)	20ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses (LAB)	20AES0503	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
			Total credits				**19.5**	**240**	**560**	**800**

Semester II (First Year)

Sl. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9906	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	Basic Science courses	20ABS9904	Chemistry	3	0	0	3	30	70	100
3	Engineering Science Courses	20AES0101	Basics of Civil and Mechanical Engineering	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0505	Internet of Things (IoT)	3	0	0	3	30	70	100
5	Engineering Science Courses	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
6	Engineering Science Courses (LAB)	20AES0102	Basics of Civil and Mechanical Engineering Lab	0	0	3	1.5	30	70	100
7	Basic Science course (LAB)	20ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses (LAB)	20AES0506	Internet of Things (IoT)Lab	0	0	3	1.5	30	70	100
9	Mandatory course (AICTE suggested)	20AMC9902	Constitution of India	3	0	0	0	30	-	30
			Total Credits				**19.5**	**270**	**560**	**830**

Semester III (Second Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9912	Transform Techniques and Complex Variables	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0201	Electrical Circuits-I	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0401	Electronic devices and circuits	3	0	0	3	30	70	100
4	Professional Core Courses	20APC0202	Power Systems-I	3	0	0	3	30	70	100
5	Professional Core Courses	20APC0203	Electrical Machines-I	3	0	0	3	30	70	100
6	Professional Core Courses (LAB)	20APC0204	Electrical Circuits-I Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses (LAB)	20APC0404	Electronic Devices and Circuits Lab	0	0	3	1.5	30	70	100
8	Professional Core Courses (LAB)	20APC0205	Electrical Machines-I Lab	0	0	3	1.5	30	70	100
9	Skill Oriented Course	20AHE9902	Principles of Effective Public Speaking	1	0	2	2	100	-	100
10	Mandatory Course (AICTE suggested)	20AMC9903	Environmental Studies	3	0	0	0	30	-	30
			Total Credits				**21.5**	**370**	**560**	**930**

Semester IV (Second Year)

Sl. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Engineering Science Courses	20AES0509	Basics of Python Programming	3	0	0	3	30	70	100
2	Basic Science Course/Prof. core course	20APC0206	Electrical Circuits-II	3	0	0	3	30	70	100
3	Professional Core courses	20APC0207	Electrical Machines-II	3	0	0	3	30	70	100
4	Professional Core courses	20APC0208	Engineering Electromagnetics	3	0	0	3	30	70	100
5	Humanities and Social Sciences	20AHSMB01	Managerial Economics and financial analysis	3	0	0	3	30	70	100
6	Humanities and Social Sciences	20AHS9905	Universal Human Values	2	1	0	3	30	70	100
7	Engineering Science Courses/Prof. Core (Interdisciplinary)(LAB)	20AES0510	Basics of Python Programming Lab	0	0	3	1.5	30	70	100
8	Professional Core courses (LAB)	20APC0209	Electrical Circuits-II Lab	0	0	3	1.5	30	70	100
9	Professional Core courses (LAB)	20APC0210	Electrical Machines-II Lab	0	0	3	1.5	30	70	100
10	Skill Oriented Course	20ASC0201	Simulation of circuits using PSPICE	1	0	2	2	100	-	100
			Total Credits				**24.5**	**370**	**630**	**1000**
Community service project [To visit the selected Community to conduct survey (Socio-economic and Domain survey) and conduct sensitization/ awareness program / activities at the end of IV semester and before commencement of V semester and complete immersion program also during V semester and submit report in V semester. Assessment will be done at the end of V semester]										
Honors/Minor courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	**0**	**0**	**4**	**100**		**100**

Semester V (Third Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Core Courses	20APC0211	Electrical Machines-III	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0212	Power Electronics	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0213	Control Systems	3	0	0	3	30	70	100
4	Open Elective Course/Job Oriented Elective	20APC0425	Analog and Digital IC Applications	3	1	0	3	30	70	100
5	Professional Elective Courses	20APE0201	Power Systems-II	3	0	0	3	30	70	100
		20APC0403	Signals and Systems	3	0	0	3	30	70	100
		20APC0426	Linear System Analysis	3	0	0	3	30	70	100
6	Professional Core Courses Lab	20APC0214	Control Systems Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses Lab	20APC0215	Power Electronics Lab	0	0	3	1.5	30	70	100
8	Skill advanced course/soft skill course	20ASC0202	Introduction to Programming with MATLAB	1	0	2	2	100	-	100
9	Mandatory Course (AICTE suggested)	20AMC9901	Biology for Engineers	3	0	0	0	30	-	30
10	Community Service Project	20CSP0201	Community service project	0	0	0	1.5	100	-	100
Total Credits							**21.5**	**440**	**490**	**930**
Honors/Minor courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	**0**	**0**	**4**	**100**		**100**

S. No	Open Elective	Professional Elective
1	An Introduction to Artificial Intelligence	Solar Energy Technology
2	Joy Of Computing Using Python	Design of photovoltaic systems
3	Ethical Hacking	Sustainable Power Generation Systems
4	Cyber security and Privacy	Sustainable transportation systems
5	Air pollution and control	Solar Energy Engineering and Technology
6	Remote sensing essentials	Fundamentals of Electrical Engineering
7	Environment & Development	Smart Grid Basics to advanced Technologies
8	Physics of Renewable Energy Systems	Analog Electronic Circuit
9	Introduction To Semiconductors	Economic Operations and Control of Power Systems
10	Modern Digital Communication Techniques	Introduction To Photonics

***Student shall register any number of MOOC courses listed by the department as approved by the BOS. But student is required to submit the pass certificate on NPTEL platform for at least one program within the Course duration (Before IV-II examination notification).**

Semester VI (Third Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Core Courses	20APC0216	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0217	Power System Analysis	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0218	Switch Gear and Protection	3	0	0	3	30	70	100
4	Professional Elective Courses	20APE0202	Power Semi-conductor Drives	3	0	0	3	30	70	100
		20APC0418	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
		20APE0205	Power Quality	3	0	0	3	30	70	100
5	Professional Core Courses Lab	20APC0219	Electrical Measurements Lab	0	0	3	1.5	30	70	100
6	Professional Core Courses Lab	20APC0220	Power System Analysis Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses Lab	20APC0221	Switch Gear and Protection Lab	0	0	3	1.5	30	70	100
8	Skill advanced course/soft skill course	20ASC0203	Numerical techniques using MATLAB	1	0	2	2	100	-	100
9	Mandatory Course (AICTE)	20AMC9904	Professional Ethics and Human Values	3	0	0	0	30	-	30
Total Credits							**18.5**	**340**	**490**	**830**
Honors/Minor Courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	0	0	**4**	**100**		**100**
Industrial/Research Internship (Mandatory)2Months during summer vacation										

Semester VII (Fourth Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Elective courses	20APE0204	Flexible AC Transmission Systems	3	0	0	3	30	70	100
		20APE0207	Advanced Control Systems	3	0	0	3	30	70	100
		20APE0208	Power System Operation and Control	3	0	0	3	30	70	100
2	Professional Elective courses	20APE0203	Neural networks and fuzzy logic	3	0	0	3	30	70	100
		20APC0419	Digital Signal Processing	3	0	0	3	30	70	100
		20APE0306	Renewable energy technologies	3	0	0	3	30	70	100
3	Professional Elective courses - Choice Based Credit System (CBCS)	20AHSMB02	Entrepreneurship Development	3	0	0	3	30	70	100
		20APE0411	Embedded systems	3	0	0	3	30	70	100
		20AOE0501	Air pollution and control (MOOCS-NPTEL)	-	-	-	3	25	75	100
4	Open Elective Courses/Job oriented elective	20AHSMB03	Principles of Management	3	0	0	3	30	70	100
5	Professional Elective Courses	20APE0206	Electrical Distribution System Automation	3	0	0	3	30	70	100
		20APE0209	High Voltage Engineering	3	0	0	3	30	70	100
		20APE0210	Electric Vehicle Technologies	3	0	0	3	30	70	100
6	Humanities and Social Science Elective	20AHE9903	Professional Communication	3	0	0	3	30	70	100
7	Skill advanced course/soft skill course	20ASC0204	Fundamentals of using AI tools	1	0	2	2	100	-	100
Industrial/ResearchInternship2 Months (Mandatory)after third year (to be evaluated during VII semester)				0	0	0	3	100	-	100
				Total Credits			**23**	**380**	**420**	**800**
Honors/Minor courses(The hours distribution can be 3-0-2 or 3-1-0 also)				**4**		**0**	**4**	**100**		**100**

Semester VIII (Fourth Year)

Sl. No	Category	Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	MOOCS (NPTEL 12 Weeks)			-	-	-	3	**25**	**75**	**100**
2	INTERNSHIP(3Months)						3	**100**	**-**	**100**
3	Major Project	20APR0201	Project Work	-	-	-	9	**60**	**140**	**200**
Total Credits							**15**	**185**	**215**	**400**
Grand Total							**163**	**2440**	**3780**	**6420**

Semester I (First Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science course	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	Basic Science course	20ABS9902	Applied Physics	3	0	0	3	30	70	100
3	Humanities and Social Science	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0304	Engineering Workshop Practice	1	0	4	3	30	70	100
5	Engineering Science Courses	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	Humanities and Social Science LAB	20AHS9902	Communicative English Lab	0	0	2	1.5	30	70	100
7	Basic Science course(LAB)	20ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses (LAB)	20AES0503	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
			Total credits				**19.5**	**240**	**560**	**800**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI
AUTONOMOUS
AK 20 Regulations

Year: I B.Tech **Semester** : I **Branch of Study :** Common to All

Subject Code:20ABS9901	Subject Name: **Algebra and Calculus**	L T P 3 0 0	Credits 3	CLC 3

Course Outcomes:

1.Make use of matrix algebra techniques that is needed by engineers for practical applications.
2.Utilize mean value theorems to real life problems.
3.Interpret with functions of several variables which is useful in optimization.
4.Analyze 2- dimensional and 3- dimensional concepts in coordinate systems
5.Utilize the concept of special functions

Unit I : Matrix Operations and Solving Systems of Linear Equations 12 hrs
Rank of a matrix by echelon form, Consistency of system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors of the matrix of the linear transformation 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 of functions of single variable 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 of plane regions enclosed by plane curves. Evaluation of triple integrals(Cartesian coordinates only).

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.VIyengar, B.Krishna Gandhi, S. Ranganathamamd 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, McGraw Hill Education.

4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Correlation of COs with the POs & PSOs for B. Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes (POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Algebra & calculus	CO1	3													
	CO2	3													
	CO3	3													
	CO4		3												
	CO5		3												

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

I B. Tech **AK20 Regulations**

Common to I Sem ECE, EEE, AI&DS, AI&ML, CSD& II Sem CSE, CIC

Subject Code:20ABS9902	Subject Name: **Applied Physics**	L T P 30 0	Credits:3	CLC 3

Course Outcomes

1. Analyze the intensity variation of light due to interference, diffraction and polarization
2. Analyze and apply the concepts of LASERs and optical fibers.
3. Infer the properties of dielectric and magnetic materials.
4. Apply the fundamentals of semiconductors for device applications.
5. Implement the behavior of superconductors in diverse fields & interpret the properties of nanomaterials for multiple applications.

Unit I : Optics **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.
Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization, Uniaxial and Biaxial Crystal, Double Refraction, Polarization by Double Refraction, Nicol Prism.

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.

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.

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 10 Hrs

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

Nanomaterials–Significanceofnanoscale - Physical, Mechanical, Magnetic, Optical propertiesof nanomaterials –Synthesisofnanomaterials:Top-down-BallMilling,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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4	3		1											
CO5	3		1											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(AUTONOMOUS)

AK20 Regulations

I B.Tech **Branch : Common to all**

Subject Code 20AHS9901	Subject Name **COMMUNICATIVE ENGLISH**	L T P 3 0 0	Credit: 3	CLC 2

Course Objectives

* Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers

- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

SYLLABUS

UNIT -1
Lesson: On the Conduct of Life: William Hazlitt
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.
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- I : Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form – Wh questions; word order in sentences.
Vocabulary -2: Formal/academic words and phrases.

UNIT -2
Lesson: The Brook: Alfred Tennyson
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 & Vocabulary building-1: Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article; prepositions.
Vocabulary building: 2 Idioms and Phrases, Homonyms, Homophones and Homographs.

UNIT -3
Lesson: The Death Trap: Saki
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.
Grammar and Vocabulary building-II: Direct and indirect speech, reporting verbs for academic purposes.
Technical Writing-1: personal experiences, unforgettable incidents, travelogues. (Imaginative, Narrative and Descriptive)

UNIT-4
Lesson: Innovation: Muhammad Yunus
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: Letter Writing: Official Letters/Report writing***, e-mail writing***
Grammar and Vocabulary: Quantifying expressions – adjectives and adverbs; comparing and contrasting; Voice – Active & Passive Voice.
Vocabulary:2 : Jigsaw Puzzles, Vocabulary Activities through Web tools

UNIT -5
Lesson: Politics and the English Language: George Orwell
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.
Technical Writing-2: Narrative short story, News paper articles on science fiction.

Course Outcomes:

Students will be able to
1. Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
2. Apply grammatical structures to formulate sentences and correct word forms.
3. Analyze discourse markers to speak clearly on a specific topic in informal discussions.
4. Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
5. Create a coherent paragraph interpreting a figure/graph/chart/table

Text Book:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.

2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Web links

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html
www.myenglishpages.com

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Communicative English	CO1										3		
	CO2									3			
	CO3										3		
	CO4										3		
	CO5										3		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)

Year: I **Semester : II** **Branch of Study : CE, ECE, ME, EEE**

Subject Code	Subject Name	L	T	P	Credits
20AES0304	Engineering Workshop Practice	1	0	4	3

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:
Study the difference types of fits and tolerances, surface finishing materials. 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:

Study the different types of circuits and connections,
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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					2			3						
CO2			2												
CO3		3			3										
CO4				2											
CO5	2		2						3						

Course Code	**Problem Solving And Programming**		**L**	**T**	**P**	**C**
20AES0501			**3**	**0**	**0**	**3**
Pre-requisite	**Basic Mathematics**	**Semester**	**I - I**			

Course Objectives:

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

Course Outcomes (CO):

CO1: Able to know interconnection of peripherals and connects of algorithms and flowcharts
CO2: Able to know problem solving aspects, design and analysis of algorithm
CO3: Able to know flow control, input output and implementation functions
CO4: Able to solve computational problems using functions, array and pointers
CO5: Able to organise real world heterogeneous data and apply searching ,sorting techniques with exception handling

UNIT – I		8 Hrs

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 – II		9 Hrs

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, and 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 – III		8 Hrs

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 – IV		9 Hrs

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 – V		9 Hrs

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.

Textbooks:

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.

Online Learning Resources:

www.nptel.ac.in

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											3	
CO2	3	3	2										2	
CO3	2	3	3										2	
CO4	2	1	3	2									2	
CO5	2	1	3	3	2			2				3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(AUTONOMOUS)

AK20 Regulations

B. Tech I-Year **Branch : Common to all**

Subject Code: 20AHS9902	Subject Name: **Communicative English Lab**	L T P 0 0 2	Credits: 1.5	CLC - 1

Course Objectives:

1. Students will be exposed to a variety of self-instructional, learner friendly modes of language learning.
2. Students will learn better pronunciation through Phonetics.
3. Students will be trained to use language effectively to face interviews, group discussions, public speaking .
4. Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

Syllabus

Unit 1
1. Phonetics
2. Non - verbal communication
3. Vocabulary (word formation, one word substitutes, words often misused & confused, collocations idioms & phrases)

Unit 2
1. Reading Comprehension
2. JAM
3. Distinction between Native and Indian English accent (Speeches by TED and Kalam).

Unit 3
1. Situational dialogues/Giving Directions
2. Describing objects/places/persons

Unit 4
1. Fun – Buzz (Tongue twisters, riddles, puzzles etc)
2 Formal Presentations

Unit 5
1. Debate (Contemporary / Complex topics)
2. Group Discussion

Course Outcomes

1. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
2. Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.
3. Improve words knowledge and apply skills in various language learning activities.
4. Analyze speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
5. Evaluate and exhibit acceptable etiquette essentials in social and professional presentations.

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Communicative English - Lab	CO1										3		
	CO2									3			
	CO3										3		
	CO4										3		
	CO5										3		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

I B.Tech **AK20 Regulations**

Common to I Sem ECE,EEE,AI&DS,AI&ML,CSD& II Sem CSE,CIC

Subject Code:20ABS9907	Subject Name: **Applied Physics Lab**	L T P 003	Credits: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 nanomaterial's 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.

Mapping of course outcomes with program outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1				3										
CO2				3										
CO3				3										
CO4				3										
CO5				3										

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Problem Solving And Programming Lab		L	T	P	C
20AES0503			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - I			

Course Objectives:

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes (CO):

CO1: Assemble and disassembling parts of a Computer
CO2: Identify to control structure to solving the problem
CO3: Analyze different sorting algorithms
CO4: Design solutions for computational problems
CO5: 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.

Textbooks:

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. 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.

Online Learning Resources:

www.nptel.ac.in/cprogramming

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2							2				2	
CO2	2	2	2										2	
CO3	2	2											2	
CO4	2	2	3	2									2	2
CO5	2	2	3	3	2							3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Semester II (First Year)

Sl. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9906	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	Basic Science courses	20ABS9904	Chemistry	3	0	0	3	30	70	100
3	Engineering Science Courses	20AES0101	Basics of Civil and Mechanical Engineering	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0505	Internet of Things(IoT)	3	0	0	3	30	70	100
5	Engineering Science Courses	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
6	Engineering Science Courses (LAB)	20AES0102	Basics of Civil and Mechanical Engineering Lab	0	0	3	1.5	30	70	100
7	Basic Science course(LAB)	20ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses(LAB)	20AES0506	Internet of Things(IoT)Lab	0	0	3	1.5	30	70	100
9	Mandatory course(AICTE suggested)	20AMC9902	Constitution of India	3	0	0	0	30	-	30
			Total Credits				**19.5**	**270**	**560**	**830**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI
AUTONOMOUS
AK 20 Regulations
Year : I B.Tech – II Sem Branch of Study: Common to EEE, CE, ME and ECE

Subject Code	Subject Name: **Differential Equations and Vector Calculus**	**L**	**T**	**P**	Credits	CLC
20ABS9906		**3**	**0**	**0**	3	3

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. Evaluate the work done against a field, circulation and flux using vector calculus .

UNIT I: Linear Differential Equations of Higher Order 9 hrs

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.

UNIT II: Equations Reducible to Linear Differential Equations and Applications 9 hrs

simultaneous linear equations with constant coefficients ,Cauchy's and Legendre's linear equations, Applications to oscillations of a spring, L-C-R Circuit problems and Mass spring system.

UNIT III: Partial Differential Equations of First order and Higher Order 9 hrs

Linear Equations of First order P.D.E: Method of Grouping, Method of Multipliers.
Non-linear Equations of First Order PDE: f (p , q) = 0, f (z, p ,q) = 0, f (x , p) = F (y , q) and z = px +qy + f (p , q) OR Clairaut's Equation.
Homogenous Linear P.D.E with constant coefficients of Higher order: Finding complementary function,Finding Particular Integrals of e^{ax+by}, Sin (ax+by) Or Cos (ax +by), X^mY^n and for any function of F (x, y). Non-Homogenous Linear P.D.E of constant coefficient

UNIT IV:Vector differentiation 9 hrs

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 9 hrs

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.

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Differential Equations & Vector	CO1	3													
	CO2		2												
	CO3	3													
	CO4	3													
	CO5		2												

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

I.B.Tech **AK20 Regulations**

Common to I Sem – CSE, CIC, II Sem CSD, ECE&EEE

Subject Code 20ABS9904	Subject Name CHEMISTRY	L T P 3 0 0	Credits:3	CLC 3

Course Outcomes:

1. Interpret the behaviour and interactions between matter and energy at both the atomic and molecular levels
2. Apply the electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors
3. Outline the preparation, mechanism properties and applications of polymer and conducting polymers.
4. Analyze the separation of gaseous and liquid mixtures using instrumental methods and their applications.
5. Understand the disadvantages of using hard water in domestically and industrially and select suitable treatments.

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, Concept of redox-reactions, 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 conductometry, 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, button cells, Fuel cells- hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondarycells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions.

Unit 3: Polymer Chemistry (10 hrs)

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

Plastics - Thermoplastics and Thermosetting, 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)

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

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.
3. Engineering Chemistry by G V Subba Reddy, K N Jayaveera and C Ramachandraiah, Mc Graw Hill education (India) Private Limited.

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

Correlation of COs with the POs & PSOs

***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Chemistry	CO1	3													
	CO2	3		2		1							1		
	CO3	3		2		1									
	CO4	3													
	CO5	3	2			1									

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

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

Subject Code	Subject Name	L	T	P	Credits
20AES0101	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

CO:6 Understand the working process and manufacturing of robotic applications.

PART – A

UNIT – I:

Basic Definitions of Force – Types of Stress and Strain, Thermal stress and thermal strain – Elasticity, Types of supports, Types of loads - Shear force – Bending Moment – Torsion.

UNIT – II:

Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channel strain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstone bridge, Linear Variable Differential Transformer (LVDT).

UNIT – III:

Characteristics of common building materials – Brick, Steel, Concrete and their applications in Construction Industry, Structural components of building.

PART – B

UNIT – IV: 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 – V: 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 – VI: 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", Tata McGraw 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.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3					3	2	2						
CO 2	3	2		1	3			3						
CO 3	3	2			3				2					
CO 4	3	2			3				2					
CO 5	3	2			3	2			2					
CO 6	3	2			3	2	3		2					

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

B.Tech-I Year **Semester: II** **Branch :Common to EEE,ECE,CE,ME**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0505	Internet of Things(IoT)	3	0	0	3

Course Outcomes:

- CO1: Interpret the vision of IoT from a global context.
- CO2: Determine the Market perspective of IoT.
- CO3: Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
- CO4: Implement state of the art architecture in IoT.
- CO5: Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

Unit-I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case 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

TEXT BOOK:

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)

REFERENCE BOOKS / WEBLINKS:

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)

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2					3			2	1
CO2					2					2	2		1	1
CO3	3		1		3					2			2	
CO4					2					3			2	
CO5	1				3					2			2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(Autonomous)

Year: I Semester: I/II Branch of Study: Common to all Branches

Subject Code	Subject Name	L	T	P	Credits
20AES0301	Engineering Graphics	1	0	4	3

Course Outcomes:

CO: 1 Draw various curves applied in engineering.
CO: 2 Draw the projections of points and lines located in different quadrants.
CO: 3 Draw the projections of planes and solids located in different quadrants.
CO: 4 Draw sectional views and develop surfaces of a given object.
CO: 5 Draw orthographic projections and Isometric projection.

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

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

Unit III: 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 IV: 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.

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:

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 Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill
6.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2	3	1													
CO3	3											1			
CO4	3											2			
CO5	3				3							3			

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

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

Subject Code	Subject Name	L	T	P	Credits
20AES0102	Basics of Civil & Mechanical Engineering Lab	0	0	3	1.5

Course Outcomes:

CO: 1 Impart basic principles of bending test on simply supported beam
CO: 2 Understand principles of strain measurement using electrical strain gauges
CO: 3 Impart concepts of compression and torsion
CO: 4 Apply the AUTOCAD Design process for basic drawings.
CO: 5 Apply the AUTOCAD Design process for editing Modules.
CO:6 Apply the dimensional principles and conventional representations.

PART - A

Laboratory Experiments:

1. Tensile test on mild steel
2. Bending test on (Steel/Wood) simply supported beam
3. Use of electrical resistance strain gauges
4. Compression test on concrete cube/ brick
5. Torsion test on steel.

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.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3					3	2	2						
CO 2	3	2		1	3			3						
CO 3	3	2			3				2					
CO 4	3	2			3				2					
CO 5	3	2			3	2			2					
CO 6	3	2			3	2	3		2					

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(Autonomous)

I. B.Tech **AK20 Regulations**

Common to I Sem – CSE, CIC, II Sem ECE/EEE

Subject Code 20ABS9909	Subject Name CHEMISTRY LAB	L T P 0 0 3	Credits:1.5

Course Outcomes:

CO1: Demonstrate volumetric analysis involved with emphasis on solution preparation, dilution and chemical Calculations.

CO2: Develop knowledge to prepare advanced materials

CO3: Acquire knowledge to measure the strength of an acid present in secondary batteries

CO4: Familiarize with digital and instrumental methods of analysis

CO5: Apply important chemical concepts and principles to analyse mixture of components by chromatographic techniques.

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 TIO2/ZnO nano particles (Precipitation Method)
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

Correlation of COs with the POs & PSOs

***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Chemistry Lab	CO1				3										
	CO2				3										
	CO3				3										
	CO4				3										
	CO5				3										

B.Tech-I Year **Semester: II** **Branch : Common to EEE,ECE,CE,ME**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0506	Internet of Things Lab(IoT Lab)	0	0	3	1.5

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

CO1: Choose the sensors and actuators for an IoT application.
CO2: Select protocols for a specific IoT application.
CO3: Utilize the cloud platform and APIs for IoT application.
CO4: Experiment with embedded boards for creating IoT prototypes.
CO5: Design a solution for a given IoT application.

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 using Bluetooth.
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 things you learned so far and create a prototype to solve it (Mini Project).

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, CRC Press.

Reference sites:
https://www.arduino.cc/
https://www.raspberrypi.org/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1		3								2	2
CO2		2			2					2			1	1
CO3	1	1			3					3			2	1
CO4	1	3	1	1	3					1			1	1
CO5	2	1	3		2					1			2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI
(Autonomous)
AK 20 Regulations

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

MANDATORYCOURSE

Subject Code	Subject Name	L	T	P	Credits: 0
20AMC9902	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, and Judiciary.

5. Discuss the functions of local administration bodies.

Syllabus

Unit: 1 **4hrs**

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

Unit: 2 **8hrs**

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 - Panchayati raj: Introduction, PRI: Zilla Panchayat - 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.

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Constitution of India	CO1						3						
	CO2						3						
	CO3						2						
	CO4						3						
	CO5						3						

Semester III (Second Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9912	Transform Techniques and Complex Variables	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0201	Electrical Circuits-I	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0401	Electronic devices and circuits	3	0	0	3	30	70	100
4	Professional Core Courses	20APC0202	Power Systems-I	3	0	0	3	30	70	100
5	Professional Core Courses	20APC0203	Electrical Machines-I	3	0	0	3	30	70	100
6	Professional Core Courses(LAB)	20APC0204	Electrical Circuits-I Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses(LAB)	20APC0404	Electronic Devices and Circuits Lab	0	0	3	1.5	30	70	100
8	Professional Core Courses (LAB)	20APC0205	Electrical Machines-I Lab	0	0	3	1.5	30	70	100
9	Skill Oriented Course	20AHE9902	Principles of Effective Public Speaking	1	0	2	2	100	-	100
10	Mandatory Course (AICTE suggested)	20AMC9903	Environmental Studies	3	0	0	0	30	-	30
			Total Credits				**21.5**	**370**	**560**	**930**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI
AUTONOMOUS
AK 20 Regulations

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

Subject Code:20ABS9912	Subject Name: Transform Techniques and Complex Variables.	L T P 3 0 0	Credits 3	CLC 2

Course Outcomes:

1) Interpret the Laplace transform for solving differential equations (continuous systems).
2) Evaluate Fourier series of periodic signals.
3) Evaluate and be able to apply integral expressions for Fourier and inverse transforms.
4) Make use of Z -transform techniques for discrete time systems.
5) Analyze the differentiation and integration of complex functions used in engineering problems.

Unit I: Laplace transforms **9 hrs**

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 **9 hrs**

Fourier series, Dirichlet's conditions for the Fourier expansion of a function , Fourier series of functions of any period, odd and even functions - half range series

Unit III: Fourier transforms **10 hrs**

Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem

Unit IV: Z-Transforms **8 hrs**

Definition of Z-transform, elementary properties, linearity property, damping rule, shifting u_n to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z-transform, convolution theorem, formation of difference equations, solution of difference equations using Z-transforms.

Unit V : Complex Variables **9 hrs**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Complex integration, Cauchy theorem (without proof), Cauchy integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series, residues, Cauchy residue theorem (without proof).

Textbooks:

1.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

References:

5. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – II, S.Chand publications.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
7. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
9. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)													
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Transform Techniques & Complex variables	CO1		3												
	CO2	3													
	CO3	3													
	CO4	3													
	CO5	3													

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0201	ELECTRICAL CIRCUITS - I	3	0	0	3

COURSE OUTCOMES:

1. Apply mesh and nodal analysis to determine Voltage, current and power involved through any electrical circuit and its elements.
2. Apply network theorems for analysis of Electrical circuits.
3. Analyze magnetic circuits for their various properties.
4. Analyze single phase AC circuits in steady state domain.
5. Analyze three phase balanced and unbalanced circuits.

UNIT- 1 INTRODUCTION TO ELECTRICAL CIRCUITS

Electrical Circuits: Circuit Concept – Types of elements - Source Transformation-Voltage - Current Relationship for Passive Elements. Current division and voltage division rule Kirchhoff's Laws– Network Reduction Techniques-Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation & Examples

Definitions – Graph – Tree, Basic Cut set and Basic Tie set Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks & Independent Voltage and Current Sources – Duality & Dual Networks.

UNIT- 2 NETWORK THEOREMS

Nodal Analysis, Mesh Analysis, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millmann's, Tellegen's, and Compensation Theorems for D.C and Sinusoidal Excitations.

UNIT- 3 MAGNETIC CIRCUITS

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction-Concept of Self and Mutual Inductance-Dot Convention-Coefficient of Coupling-Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

UNIT- 4 SINGLE PHASE A.C 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- Phasor diagrams - Concept of Power Factor- Concept of Reactance, Impedance, Susceptance and Admittance-Apparent Power, Active and Reactive Power, Examples, Resonance

UNIT- 5 THREE PHASE A.C. CIRCUITS

Introduction - Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits - Loop Method - Star Delta Transformation Technique – for balanced and unbalanced circuits - Measurement of Active and reactive Power – Advantages of Three Phase System.

TEXT BOOKS:

1. Fundamentals of Electric Circuits Charles K. Alexander and Matthew .N.O. Sadiku, Mc Graw Hill, 5th Edition, 2013.

2. Engineering circuit analysis William Hayt and Jack E. Kemmerly, McGrawHillCompany,7th Edition, 2006.

REFERENCE BOOKS:

1. Circuit Theory Analysis & Synthesis A. Chakrabarti Dhanpat Rai & Sons, 7th Revised Edition,2018.

2. Network Analysis M.E Van Valkenburg, Prentice Hall (India), 3rd Edition,1999.

3. Electrical Engineering Fundamentals V.DelToro, Prentice HallInternational,2ndEdition,2019.

4. Electric Circuits- Schaum's Series, McGraw Hill, 5th Edition,2010.

5. ElectricalCircuitTheoryandTechnologyJohnBird,Routledge,Taylor&Francis,5thEdition,2014.

Mapping of course outcomes with program outcomes

	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO2**
CO1	3	2											3	2
CO2	3	2											3	2
CO3	2	3											3	2
CO4	3	2											3	2
CO5	3	2											3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS
B. Tech II Year III Semester (Common to ECE& EEE)

Course Code	Course Title	L	T	P	Credits
20APC0401	ELECTRONIC DEVICES AND CIRCUITS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand the operation of diodes and special electronic devices.
CO2: Know operation of different rectifiers without and filters.
CO3: Understand construction, operation of BJT, FET in different configurations
CO4: Know the need of biasing and design of DC biasing circuits.
CO5: Design of amplifiers with BJTs and FETs by using small signal model

UNIT I:
PN JUNCTION DIODE & SPECIAL DIODE CHARACTERISTICS
Review of semiconductor Physics: 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, Varactor diode, Tunnel diode, SCR, UJT.

UNIT II:
RECTIFIERS & FILTERS
Rectifiers: 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 III:
TRANSISTOR CHARACTERISTICS
BJT: Bi-polar Junction 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 IV:
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.

UNIT V:
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 using approximate 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:

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", 11th Edition, Pearson Education, 2013.

Reference Books:

1. Donald Neamen, "Electronic Circuits: Analysis and Design", 3rd Edition, McGraw-Hill Education, 2011.
2. Muhammad Rashid, "Microelectronic Circuits: Analysis & Design", 2nd Edition, Cengage Learning, 2010.
3. S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, McGraw-Hill Education, 2017.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1										3	1
CO2	3	1	2										3	2
CO3	2	2	3										3	1
CO4	3	3	2										2	3
CO5	2	3	3										3	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 Hig

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0202	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 reactor sand 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: Substations 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 Delhi2004.
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.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3		2										2	
CO2	3		1										2	
CO3	3		1										2	
CO4	3	2				1							2	
CO5	3	2		1		1							2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY &SCIENCES: TIRUPATI
(AUTONOMOUS)

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

Course Code	Course Title	L	T	P	Credits
20APC0203	Electrical Machines-I	3	0	0	3

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: Electromechanical Energy Conversion:
Electromechanical Energy Conversion - Forces and torques in magnetic field system, Energy balance, singly excited and multiple excited magnetic systems, MMF, Flux, Reluctance, Series and Parallel Magnetic Circuits, B-H curve of magnetic materials.

UNIT-II: DC Generators:
Constructional details of a DC machine, principle of operation, armature windings and its types, EMF equation, armature reaction and its effects, commutation, methods of improving commutation, methods of excitation and classification of DC Generators, voltage build-up in a shunt generator, critical field resistance and critical speed, generator characteristics, parallel operation of DC shunt and series generators, applications of DC Generators.

UNIT-III: DC Motors:
Principle of operation, significance of back EMF, torque equations, types of DC Motors, characteristics, speed control of DC Motors, necessity of starter, 3-point and 4- point starters, Losses and efficiency, applications of DC Motors.
Testing of DC machines: Brake test, Swinburne‘s test, Hopkinson's test, Fields test, Separation of iron and frictional losses.

UNIT-IV: Transformers:
Constructional features, principle of operation, EMF equation, ideal transformer, transformer on No load and ON load and its phasor diagrams, equivalent circuit, voltage regulation, losses and efficiency. Testing of transformer - polarity test, open circuit and short circuit tests, Sumpner’s test, and separation losses.

UNIT-V:
Parallel operation of single-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer.
Three-phase transformer– construction, types of connection and their comparative features, Phase conversion - Scott connection, three-phase to six-phase conversion.

TEXT BOOKS:

1. P.S. Bimbhra, Electrical Machinery, Khanna Publishers, 7th Edition, Delhi, 2011.
2. R.K. Rajput, Electrical Machines in S.I. Units, Laxmi Publications (P) Ltd, 6th Edition, New Delhi, 2017.
3. JB Gupta, Theory and performance of Electrical Machines (DC machines, Poly phase Circuits & AC machines) in SI Units, S.K. Kataria& Sons, New Delhi, 15th Edition, 2015.

REFERENCE BOOKS:

1. Electrical Machines by U A Bakshi and M V Bakshi, Technical Publications.
2. B.L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology (in S. I. Units)*, Vol.2, S. Chand & Company Ltd, Multicolor illustrative Edition, New Delhi, 2014.

ADDITIONAL LEARNING RESOURCES:

1. http://www.nptelvideos.in/2012/11/electrical-machines-i.html
2. https://nptel.ac.in/courses/108/102/108102146/
3. https://freevideolectures.com/course/3085/electrical-machines-i
4. https://www.youtube.com/playlist?list=PL9RcWoqXmzaJpnkjoNleyFNgGk9-znOji

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3												2	
CO2	3	2											2	
CO3		3	2										2	
CO4	3			2									2	
CO5	2	2		3									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0204	ELECTRICAL CIRCUITS-I LAB	0	0	3	1.5

COURSE OUTCOMES:

1. Remember, understand and practically verify Ohms's Law, KCL & KVL.
2. Remember, understand and practically verify Mesh and nodal analysis.
3. Remember, understand and practically verify superposition, Thevenin and Norton theorems.
4. Remember, understand and practically verify Maximum Power Transfer, Reciprocity, Compensation and Millmann's Theorems.
5. Understand and analyze active, reactive power measurements in three phase balanced & un balanced circuits.

List of Experiments:

1. Verification of Ohm law.
2. Verification of KVL and KCL.
3. Verification of Mesh and Nodal Analysis.
4. Verification of Thevenin's and Norton's Theorems
5. Verification of Superposition Theorem for average and RMS values.
6. Maximum Power Transfer Theorem for DC circuits.
7. Verification of Reciprocity Theorem for DC circuits.
8. Verification of Compensation Theorem for DC circuits.
9. Verification of, Millmann's Theorems for DC circuits
10. Determination of Self, Mutual Inductances and Coefficient of Coupling.
11. Measurement of Active Power for Star Connected Balanced Loads.
12. Measurement of Reactive Power for Star Connected Balanced Loads.
13. Measurement of Active Power for Delta Connected Balanced Loads.
14. Measurement of Reactive Power for Delta Connected Balanced Loads.

REFERENCE BOOKS:

1. Circuit Theory Analysis & Synthesis A. Chakrabarti, DhanpatRai&Sons,7th Revised Edition,2018.
2. Network Analysis M.E Van Valkenberg, Prentice Hall (India), 3rd Edition,1999.
3. Electrical Engineering Fundamentals V. Del Toro, Prentice Hall International, 2nd Edition, 2019
4. Electric Circuits- Schaum's Series, Mc Graw Hill, 5th Edition,2010.
5. Electrical Circuit Theory and Technology John Bird, Routledge, Taylor & Francis, 5th Edition,2014.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			2									2	
CO2	3			2									2	
CO3	3			2									2	
CO4	3			2									2	
CO5	3			2									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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

B. Tech II Year III Semester (Common to ECE & EEE)

Course Code	Course Title	L	T	P	Credits
20APC0404	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	0	0	3	1.5

Course Outcomes:

Upon completion of the course students will be able to

CO1: Test and operate diodes and special electronic devices.
CO2: Construct and operate rectifiers without and with filters.
CO3: Construct and operate BJT, FET in different configurations.
CO4: Design DC biasing circuits for Transistors.
CO5: Design amplifiers using BJTs and FETs.

LIST OF EXPERIMENTS:

1. PN Junction Diode Characteristics
2. Zener Diode Characteristics and 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 LABORATORYORATORY

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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											3	
CO2	3	2											3	
CO3	2	3											3	
CO4	2		3										3	
CO5	2		3										3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(AUTONOMOUS)

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

Course Code	Course Title	L	T	P	Credits
20APC0205	Electrical Machines-I Lab	0	0	3	1.5

Course Outcomes:

1. Conduct and analyze load test on DC shunt generator.
2. Understand and analyze magnetization characteristics of DC shunt generator.
3. Understand and analyze speed control techniques and efficiency of DC machines.
4. Understand to predetermine efficiency and regulation of single-phase Transformers.
5. Conduct and analyze separation of losses in DC shunt motor.

List of Experiments:

Minimum ten experiments from the following list are required to be conducted

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 on DC shunt motor, Predetermination of efficiency.
5. Speed control of DC shunt motor (Armature control and Field control method).
6. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
7. OC and SC test on single phase transformer.
8. Parallel operation of single phase transformers.
9. Sumpner's test on single phase transformers.
10. Load test on DC long shunt compound generator. Determination of characteristics.
11. Load test on DC short shunt compound generator. Determination of characteristics.
12. Separation of losses in DC shunt motor.
13. Separation of losses of single phase transformer

References:

D. P. Kothari and B. S. Umre, Laboratory Manual for Electrical Machines, I.K International Publishing House Pvt. Ltd., 2017

Online Learning Resources/Virtual Labs:

http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering
http://vlabs.iitb.ac.in/vlabs- dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2		3											2	
CO3	3			2									2	
CO4				3									2	
CO5	3												2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(AUTONOMOUS)
AK20 Regulations

B.Tech **Branch : Common to all**

Subject Code **20AHE9902**	Subject Name **Principles of Effective Public Speaking**	L T P 1 0 2	Credit: 2

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 – Models of Communication, concepts and principles of public speaking - Steps and methods of speech preparation.

Unit -2

Selecting Topic and Knowing your Audience:

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

Unit – 3

Listening with a purpose:

Effective listening, the listening process, and types of listening; Listening barriers; Identifying and improving listening styles.

Unit - 4

Speaking with a purpose:

Methods of speech preparation - Informative, persuasive, and ceremonial speeches

Unit -5

Delivering your speech and using Visual Aids:

The mechanics of verbal and nonverbal communication in speech delivery - Effective delivery techniques - Incorporating presentation aids in presentation.

Course Outcomes:

Students will be able to:

1. Apply knowledge of principles, concepts and skills learned in speech preparation.

2. Develop skills in speech composition.

3. Develop skills in effective listening.

4. Evaluate the delivery of speeches.

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).

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Principles of Effective Public Speaking	CO1										3		
	CO2										3		
	CO3										3		
	CO4										3		
	CO5										3		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(Autonomous)

Year: I &II B.Tech **AK20 Regulations**

Semester: I **Branch: Common to All**

Subject Code	Subject Name	L	T	P	Credits
20AMC9903	Environmental Studies	3	0	0	0

Course Outcomes

1. Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
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.
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.
4. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
5. To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I **(18Hr)**

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 **(20Hr)**

Ecosystems: Concept of an ecosystem. – Structure and functions of an ecosystem – 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 **(10Hr)**

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

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

UNIT – IV **(15Hr)**

Social Issues and the Environment: From Unsustainable to Sustainable 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 **(10Hr)**

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.

REFERENCES:

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.

Correlation of COs with the POs & PSOs
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COS	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Environmental Studies	CO1	3	2					1					1		
	CO2		3					2							
	CO3		3			2							1		
	CO4		2												
	CO5					3		2					1		

Semester IV (Second Year)

Sl. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Engineering Science Courses	20AES0509	Basics of Python Programming	3	0	0	3	30	70	100
2	Basic Science Course/Prof. core course	20APC0206	Electrical Circuits-II	3	0	0	3	30	70	100
3	Professional Core courses	20APC0207	Electrical Machines-II	3	0	0	3	30	70	100
4	Professional Core courses	20APC0208	Engineering Electromagnetics	3	0	0	3	30	70	100
5	Humanities and Social Sciences	20AHSMB01	Managerial Economics and financial analysis	3	0	0	3	30	70	100
6	Humanities and Social Sciences	20AHS9905	Universal Human Values	2	1	0	3	30	70	100
7	Engineering Science Courses/Prof. Core (Interdisciplinary)(LAB)	20AES0510	Basics of Python Programming Lab	0	0	3	1.5	30	70	100
8	Professional Core courses (LAB)	20APC0209	Electrical Circuits-II Lab	0	0	3	1.5	30	70	100
9	Professional Core courses (LAB)	20APC0210	Electrical Machines-II Lab	0	0	3	1.5	30	70	100
10	Skill Oriented Course	20ASC0201	Simulation of circuits using PSPICE	1	0	2	2	100	-	100
						Total Credits	**24.5**	**370**	**630**	**1000**
Community service project [To visit the selected Community to conduct survey (Socio-economic and Domain survey) and conduct sensitization/ awareness program / activities at the end of IV semester and before commencement of V semester and complete immersion program also during V semester and submit report in V semester. Assessment will be done at the end of V semester]										
Honors/Minor courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	**0**	**0**	**4**	**100**		**100**

Course Code	Basics of Python Programming		L	T	P	C
20AES0509			3	0	0	3
Pre-requisite	NILL	Semester	I-II			

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

Course Outcomes (CO):

CO1: Understanding the syntax and semantics of Python programming.
CO2: Apply modularity to programs.
CO3: Select appropriate data structure of Python for solving a problem.
CO4: Implement Mutable and Immutable data types
CO5: Interpret the concepts of object oriented programming as used in Python

UNIT - I		9Hrs

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

UNIT - II		9 Hrs

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

UNIT - III		9 Hrs

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

UNIT - IV		8 Hrs

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

UNIT - V		10Hrs

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 and Implementation **Inheritance**: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Data encapsulation. **The Goodies:** Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, default dict, Named tuples, Gathering keyword Args

Textbooks:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2									
CO2	2			2									2	1
CO3	2	2	2	2									2	1
CO4	2		3		2								2	1
CO5	2	2	3		3				2				2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0206	ELECTRICAL CIRCUITS-II	3	0	0	3

COURSE OUTCOMES

1. Determine the transient response of R-L, R-C & R-L-C circuits for D.C excitation.
2. Determine the transient response of R-L, R-C & R-L-C circuits for A.C excitation.
3. Analyze two port networks.
4. Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources.
5. Design different types of filters.

UNIT- I 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 Equation and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

UNIT- II 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.

UNIT-III TWO PORT NETWORKS

Two Port Networks Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, Cascaded networks

UNIT- IV FOURIER TRANSFORMS

Fourier Theorem- Trigonometric Form and Exponential Form of Fourier Series – Conditions of Symmetry- Line Spectra and Phase Angle Spectra- Analysis of Electrical Circuits to Non-Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

UNIT V: FILTERS & CIRCUITS SIMULATION

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Principle of Equalizers – Series and Shunt Equalizers – L Type, T type and Bridged – T and Lattice Equalizers.

TEXT BOOKS:

1. Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtled / T&F, 2011.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI, .
3. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,6th edition.

REFERENCE:

1. Circuit Theory (Analysis & Synthesis) 6th Edition, A. Chakrabarti, DhanpatRai& Sons, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications
3. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
4. Electric Circuits by David A. Bell, Oxford publications

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3												1	
CO2	3												1	
CO3		3		2									1	
CO4	3												1	
CO5				3									1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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

Year: II **Semester: IV** **Branch: EEE**

Course Code	Course Title	L	T	P	Credits
20APC0207	Electrical Machines-II	3	0	0	3

COURSE OUTCOMES:

CO1: Analyze the phasor diagrams of Salient & Non- Salient Alternators, parallel operation of alternators, synchronization and load division of Alternators.
CO2: Apply the concepts to determine V and inverted V curves and power circles of synchronous motor.
CO3: Understand construction, principle of working, equivalent circuit of 3-Phase Induction motors and analyze the testing of 3-Phase Induction motors.
CO4: Analyze the various methods of starting and speed control of 3-phase induction motor.
CO5: Analyze the principle operations of single-phase induction motors and special motors.

UNIT-I: ALTERNATORS

Construction details, types of rotors, EMF Equation, harmonics, armature reaction, phasor diagram of non-salient pole synchronous generator, voltage regulation, direct load, EMF, MMF and ZPF methods, two reaction theory of salient pole machine, phasor diagram, slip test, synchronizing and parallel operation, synchronizing torque, change of excitation and mechanical input.

UNIT-II: SYNCHRONOUS MOTOR

Principle of operation – Operation on infinite bus bars – V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – damper windings- synchronous condenser.

UNIT-III: THREE PHASE INDUCTION MOTOR

Constructional details – Types of rotors – Production of rotating magnetic field –Principle of operation – Slip – Equivalent circuit – Torque-Slip characteristics – Condition for maximum torque – Loses and efficiency – Load test – No load and blocked rotor tests – Circle diagram – Separation of loses – Double cage induction motors –Induction generators.

UNIT-IV: STARTING AND SPEED CONTROL OF 3-ø INDUCTION MOTOR

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking. Cogging and crawling.

UNIT-V: SINGLE PHASE AND SPECIAL MOTORS

Single Phase Induction Motors - Constructional Features – Double Revolving Field Theory-Elementary Idea of Cross Field Theory – Split Phase Motors – Capacitor Start and Run Motors – Shaded Pole Motor. Principle and Performance of A.C Series Motor - Universal Motor – Single Phase Synchronous Motors – Reluctance Motor – Hysteresis Motor – Stepper Motor.

TEXT BOOKS:

1. Electrical Machinery, P.S. Bimbhra, Khanna Publishers, 7th Edition, 2011.
2. Electric Machinery Fundamentals, Stephen J Chapman, Mc Graw Hill Series in Electrical and Computer Engineering, 4th Edition, 2010, 10th Reprint 2015.
3. M G Say, The performance and Design of Alternating Current Machines, 3rd edition, CBS Publishers & Distributors, New Delhi, 2002.

REFERENCE BOOKS:

1. Electric Machines 4th edition, D.P.Kothari and I.J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 4th Edition, 2010, 16th Reprint 2015.
2. Electric Machinery, A.E.Fitzgerald, C.Kingsley and S. Umans, Mc Graw Hill Education (India) Pvt. Ltd., 6th Edition, 2005.
3. Electrical Machines, S K Bhattacharya, Mc Graw Hill Education (India) Pvt. Ltd., 4th Edition, 2014, 3rd Reprint 2015.

WEB REFERENCES:

1. https://www.electrical4u.com
2. https://www.freevideolectures.com

E-TEXT BOOKS:

1. https://www.freeengineeringbooks.com
2. https://www.pdfdrive.com/textbook-of-electrical-technology-ac-and-dc-machines-d184089760.html

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												2	
CO2	3												2	
CO3		3		2									2	
CO4	3												2	
CO5				3									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

Year: II Semester: IV Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0208	ENGINEERING ELECTROMAGNETICS	3	0	0	3

1. Analyze the different aspects related to Static Electric Fields equations.
2. Understand the concept of Conductors, Dipole, Dielectric& Capacitance.
3. Learns the fundamental laws related to Magneto statics.
4. Understand the concepts of Magnetic forces and Magnetic potential.
5. Learns the fundamentals of Time Varying Fields.

UNIT – I

Electrostatics:

Electrostatic Fields -Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge –Electric flux density – Gauss's law – Application of Gauss's Law –Work done in moving a point charge in an electric field – Electric Potential – Potential gradient – Energy density in electric field - Related Problems. Maxwell's First Law – Numerical Problems-

UNIT – II

Conductors, Dipole, Dielectric & Capacitance:

Laplace's and Poison's equations – electric dipole – Conduction current and Convection current density – Continuity Equation and Relaxation **Time** - Ohm's law in point form – Conductors and Insulators - Electric field inside a dielectric material – Polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions - Capacitance – Capacitance of parallel plate , co-axial and spherical capacitors - Related Problems.

UNIT – III

Magneto Statics:

Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0. 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 - Related Problems.

UNIT – IV

Magnetic Forces:

Forces due to magnetic field – force on a charged particle – force on a current element – Force between two Parallel Current Carrying Conductors– magnetic torque and moment – Magnetic Dipole - Related Problems.

Magnetic Potential:

Scalar magnetic potential and vector magnetic potential – classification of magnetic materials – Self and Mutual inductances – Self inductances of a coaxial cable, solenoid, toroid and two wire transmission line – Mutual inductance between two co-axial solenoids and two coils wound on the same magnetic circuit – Energy stored in a magnetic field - Related Problems.

UNIT – V

Time Varying Fields

Faraday's law in integral form and in differential form –Maxwell's fourth equation.Statically and Dynamically Induced E.M.F'S-simple problems–Modification of Maxwell's equations for time varying fields – Displacement current- Poynting Theorem and Poynting vector - Related Problems.

TEXT BOOKS:

1. Elements of Electromagnetics – by Matthew N O Sadiku, Oxford University Press, 3rd Edition 2004.
2. Engineering Electromagnetic – by W H hayt and J A Buck, TATA Mc-graw-hill Education – 7th Edition 2006.

REFERENCE BOOKS:

1 Engineering Electromagnetics – by Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd Edition 2005

2 Introduction to Electro Dynamics - by D.J. Griffiths, PHI.

3 Electromagnetics – Theory and problems by Joseph A. Edminister, 2nd edition.,1993, Schaum's outline series, Mc-Graw Hill

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	3	2	1										3	
CO2	3	1	2										3	
CO3	2	3	1										3	
CO4	3	1	2										3	
CO5	3	1	2										3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	C
20AHSMB01		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 Is costs, 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.

Course Title	Course Outcomes (COs)	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)													
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**
Managerial Economics and Financial Analysis	CO1	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
	CO2	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CO3	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CO4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**
	CO5	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(AUTONOMOUS)

AK20 Regulations

II B.Tech **II SEM** **Branch: Common to all**

Subject Code	Subject Name	L T P	Credit: 3
20AHS9905	Universal Human Values	2 1 0	

Course Objectives

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

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

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

COURSE CONTENT:

UNIT – 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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

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

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

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

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

UNIT III: **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**.

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

- Understanding the meaning of Trust; Difference between intention and competence

- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

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

UNIT IV: **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

- Understanding the harmony in the Nature

- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space

- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

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

UNIT- V: Implications of the above Holistic Understanding of Harmony on Professional Ethics.

- Natural acceptance of human values

- Definitiveness of Ethical Human Conduct

- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

- Case studies of typical holistic technologies, management models and production systems

- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

- Sum up.

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

Course Outcomes:

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

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)

2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

3. They would have better critical ability.

4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

TEXT BOOKS

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

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

REFERENCE BOOKS

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

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
*3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated

Course Title	Course Outcomes COs	Programme Outcomes(POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Universal Human Values	CO1								3				
	CO2								3				
	CO3								3				
	CO4								3				
	CO5								3				

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(AUTONOMOUS)

AK20 Regulations

Course Code	Basics of Python Programming Lab		L	T	P	C
20AES0510			0	0	3	1.5
Pre-requisite	NIL	Semester	I-II			

Course Objectives:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

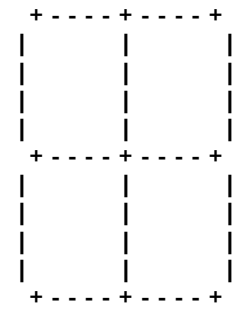
Course Outcomes (CO):

CO1: Write, Test and Debug Python Programs
CO2: Implement Conditionals and Loops for Python Programs
CO3: Use functions and represent Compound data using Lists, Tuples and Dictionaries
CO4: Read and write data from & to files in Python and develop Application using Python
CO5: Implement the problem in terms of real world object using OOPs concepts

List of Experiments:

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

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



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

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

   Up to 15 hashes at the bottom
4. Using turtles concept draw a wheel of your choice

5. Write a program that draws Archimedean Spiral

6. The letters of the alphabet can be constructed from a moderate number of basic elements, like

   vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean

   Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 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 which computes

minimum value of r that satisfies the above.

9. Write a program that evaluates Ackermann function

10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a

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

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

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

11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.

12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.

13. Given a word which is a string of characters. Given an integer say 'n', Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.

14. Given rows of text, write it in the form of columns.

15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same

16. Write program which performs the following operations on list's. Don't use built-in functions

    a) Updating elements of a list

    b) Concatenation of list's

    c) Check for member in the list

    d) Insert into the list

    e) Sum the elements of the list

    f) Push and pop element of list

    g) Sorting of list

    h) Finding biggest and smallest elements in the list

    i) Finding common elements in the list

17. Write a program to count the number of vowels in a word.

18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.

19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.

20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.

21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.

22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.

23. Write a program illustrating the object oriented features supported by Python.

24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.

25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

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

References:

1. Allen B. Downey , " Think Python: How to Think Like a Computer Scientist", Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.

2. Shroff "Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.

3. David M.Baezly "Python Essential Reference". Addison-Wesley Professional; Fourth edition, 2009.

4. David M. Baezly "Python Cookbook" O'Reilly Media; Third edition (June 1, 2013)

Online Learning Resources/Virtual Labs:

http://www.edx.org

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	2								1	1
CO2	2	1	3		2								1	2
CO3	2	1	3		2								2	2
CO4	2	1	3		2								2	2
CO5	3	2	2		2				2			3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moder

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0209	ELECTRICAL CIRCUITS-II LAB	0	0	3	1.5

COURCE OUTCOMES:

1. Able to understand simulation programs for DC circuit analysis using PSPICE.
2. Understand and compare basic electric circuit theorems with actual working circuits.
3. Design and understand RLC series and parallel circuits and its resonance condition.
4. Able to measure power in three phase circuits in day to day life.
5. Characterize and model the network in terms of all network parameters.

List of Experiments

1. Simulation of DC Circuits
2. DC Transient Response
3. Mesh Analysis in p-spice
4. Nodal Analysis in p-spice
5. Measure and calculate RC time constant for a given RCcircuit.
6. Measure and calculate RL time constant for a given RL circuit.
7. Frequency response of RLC Series Circuits
8. Analysis of RL and RC Series circuits for DC Excitation
9. Analysis of RL and RC Series circuits for AC Excitation
10. Verification of the maximum power dissipation (plot the power dissipated versus the load).
11. Measure and calculate Z, Y parameters of two-port network.
12. Measure and calculate ABCD & h parameters of two-port network.

REFERENCES:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel 3. PSPICE A/D user's manual – Microsim, USA. 4. PSPICE reference guide – Microsim, USA.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												1	
CO2	3												1	
CO3		3		2									1	
CO4	3												1	
CO5				3									1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(AUTONOMOUS)

Year: II **Semester: IV** **Branch: EEE**

Course Code	Course Title	L	T	P	Credits
20APC0210	Electrical Machines-II Lab	0	0	3	1.5

Course Outcomes:

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

List of Experiments:

All the following ten experiments are required to be conducted:

1. No-load & Blocked-rotor tests on 3-ø Induction motor.
2. Brake Test on Three Phase Induction Motor.
3. Speed control of three phase induction motor.
4. Separation of no-load losses of three phase induction motor.
5. Determination of Equivalent circuit of a single phase induction motor.
6. Load test on 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 Xd and Xq of a salient pole synchronous machine by slip test.
10. V and inverted V curves of a 3-phase synchronous motor.

References:

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.

Online Learning Resources/Virtual Labs:

http://vem-iitg.vlabs.ac.in/

http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering

http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3												2	
CO3		3		3									2	
CO4				3									2	
CO4		3											2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
SKILL ORIENTED COURSE

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

COURSE CODE	COURSE TITLE	L		P	CREDITS
20ASC0201	SIMULATION OF CIRCUITS USING PSPICE	1	0	2	2

COURSE OUTCOMES:

1. Able to understand features and programming basics of PSPICE.
2. Understand the procedures for simulation of AC circuits using PSPICE.
3. Understand the procedures for simulation of DC circuits using PSPICE.
4. Design and understand nodal analysis of circuits.
5. Design and understand frequency response analysis of circuits.

List of Experiments

1. Introduction to the use of P-Spice.
2. Procedure to use of P-Spice.
3. Design a circuit for 3-node system using following data.
   Voltage=20V, R1= 3Ω & R2= 2Ω
4. Design an RC circuit with a suitable switch for DC transient analysis.
   Voltage=20V, R=10 Ω, C=0.1F
5. Perform the nodal analysis for a 4-node circuit.
   Voltage=10V, R1=10 Ω, R2=5 Ω, R3= 3 Ω, R4=10 Ω
6. Perform the frequency response of an RC network. Vrms=100V, R=10Ω, C=50μF
7. Perform the analysis of an RL series circuit for DC Excitation.
   Voltage= 20V, R= 500Ω, L=2mH

REFERENCES:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel 3. PSPICE A/D user's manual – Microsim, USA. 4. PSPICE reference guide – Microsim, USA.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					3									1
CO2					3									1
CO3					3									1
CO4					3									1
CO5					3									1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Semester V (Third Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Core Courses	20APC0211	Electrical Machines-III	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0212	Power Electronics	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0213	Control Systems	3	0	0	3	30	70	100
4	Open Elective Course/Job Oriented Elective	20APC0425	Analog and Digital IC Applications	3	1	0	3	30	70	100
5	Professional Elective Courses	20APE0201	Power Systems-II	3	0	0	3	30	70	100
		20APC0403	Signals and Systems	3	0	0	3	30	70	100
		20APC0426	Linear System Analysis	3	0	0	3	30	70	100
6	Professional Core Courses Lab	20APC0214	Control Systems Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses Lab	20APC0215	Power Electronics Lab	0	0	3	1.5	30	70	100
8	Skill advanced course/soft skill course	20ASC0202	Introduction to Programming with MATLAB	1	0	2	2	100	-	100
9	Mandatory Course (AICTE suggested)	20AMC9901	Biology for Engineers	3	0	0	0	30	-	30
10	Community Service Project	20CSP0201	Community service project	0	0	0	1.5	100	-	100
Total Credits							**21.5**	**440**	**490**	**930**
Honors/Minor courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	**0**	**0**	**4**	**100**		**100**

S. No	Open Elective	Professional Elective
1	An Introduction to Artificial Intelligence	Solar Energy Technology
2	Joy Of Computing Using Python	Design of photovoltaic systems
3	Ethical Hacking	Sustainable Power Generation Systems
4	Cyber security and Privacy	Sustainable transportation systems
5	Air pollution and control	Solar Energy Engineering and Technology
6	Remote sensing essentials	Fundamentals of Electrical Engineering
7	Environment & Development	Smart Grid Basics to advanced Technologies
8	Physics of Renewable Energy Systems	Analog Electronic Circuit
9	Introduction To Semiconductors	Economic Operations and Control of Power Systems
10	Modern Digital Communication Techniques	Introduction To Photonics

***Student shall register any number of MOOC courses listed by the department as approved by the BOS. But student is required to submit the pass certificate on NPTEL platform for at least one program within the Course duration (Before IV-II examination notification).**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0211	ELECTRICAL MACHINES - III	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Acquire knowledge on construction and operation of brushless D.C motor.
2. Understand construction and operation of PMSM.
3. Acquire knowledge on synchronous reluctance motors.
4. Acquire knowledge on switched reluctance motors.
5. Acquire knowledge of other modern special machines.

UNIT I PERMANENT MAGNET BRUSHLESS D.C. MOTORS **9**

Fundamentals of Permanent Magnets -Construction-Principle of operation – Magnetic circuit analysis – EMF and torque equations – Performance characteristics - Closed loop control– Applications

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS **9**

Principle of operation – EMF and Torque equations – Phasor diagram – Performance characteristics – Closed loop control– Applications.

UNIT III SYNCHRONOUS RELUCTANCE MOTORS **9**

Constructional features – Types – Axial and Radial flux motors – Operating principles – Phasor diagram- Voltage and Torque Equations - Performance Characteristics – Applications.

UNIT IV SWITCHED RELUCTANCE MOTORS **9**

Constructional features – Principle of operation – Torque production - Power Converters and their controllers – Performance Characteristics – Closed loop control – Applications.

UNIT V OTHER SPECIAL MACHINES **9**

Constructional features – Principle of operation and characteristics of: Stepper Motor, Hysteresis motor, AC series motors, Linear motor, Hybrid motor, Polyphase induction motors, premium efficiency motors.

TEXT BOOKS:

1. K. Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.

2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

3. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES:

1. R. Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T. J. E. Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. Energy-Efficient Electric Motors, Revised and Expanded by Ali Emadi, 3rd Edition, ISBN 9780824757359, Published August 30, 2004 by CRC Press.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3											1		
CO2	3											1		
CO3	3											1		
CO4	3											1		
CO5	3											1		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0212	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 converters and their control.
3. Analyze the operation of DC-DC converters and their control.
4. Analyze the operation of DC-AC converters and their control.
5. Analyze the operation of AC-AC converters

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 and full wave-controlled converters with R, RL, RL+FWD, RLE Loads - Operation of three phase half wave-controlled converters and full wave-controlled converters with R, RL loads - Effect of source inductance on single phase and three phase-controlled converters - Operation of dual converters.

UNIT-III
DC-DC CONVERTERS

Analysis and design of DC-to-DC converters- Control of DC-DC converters- Buck Converters-Boost converters- Buck-Boost converters- Cuk converters – Principles of chopper- Classification and operation of Choppers (A, B, C, D and E).

UNIT-IV
DC-AC CONVERTERS

Single phase and Three phase inverters - Voltage source and Current source inverters-120° and 180° mode operation of 3 phase inverter – Single Pulse Modulation- Multiple Pulse Width Modulation- SPWM- Space Vector Modulation- Harmonic Elimination Techniques.

UNIT-V
AC-AC CONVERTERS

AC to AC power conversion using voltage controllers. Single phase AC Voltage Controller using R and RL load– single phase step up, step down cycloconverters – Mid point Type and Bridge type Cycloconverters

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.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												2	
CO2		3		2								1	2	
CO3		3		2								1	2	
CO4		3		2								1	2	
CO5		3		2								1	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0213	CONTROL SYSTEMS	3	0	0	3

Course Outcomes:

1. Formulate mathematical model and transfer function of the physical systems.
2. Analyze Time response analysis, error constants and controllers.
3. Perform Time domain analysis Routh's Hurwitz and Root Locus
4. Perform frequency domain analysis using bode and Nyquist plot.
5. Formulate and design state-space analysis.

UNIT - I
CONTROL SYSTEMS CONCEPTS
Basic elements of control systems- open and close loop systems - Transfer function – Modelling of Electrical systems and 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
Stability - concept and definition, Characteristic equation – Location of poles – Routh Hurwitz criterion - Limitations of Routh's stability - The Root locus concept - construction of root loci-

UNIT- IV
FREQUENCY RESPONSE ANALYSIS
Bode plot - Correlation between frequency domain and time domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots -Nyquist Plots- Phase margin and Gain Margin–Stability Analysis.

UNIT- V
STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS
Concepts of state, state variables and state models - differential equations & Transfer function models - 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.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1											2	
CO2	3	1											2	
CO3		3		2									2	
CO4		3		2									2	
CO5				3									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
AK20 Regulations

B.Tech III Year **V Semester** **Branch of Study: EEE**

Course Code	Course Title	L	T	P	Credits
20APC0425	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 – Ramakanth A.Gayakwad, PHI, 1987.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2												3	
CO2	2		3										2	
CO3	3												1	2
CO4	2		3										3	
CO5	1		3	2									3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0201	**POWER SYSTEMS - II**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

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

UNIT-I: TRANSMISSION LINE PARAMETER

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 and3wiresystems,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 TRANSMISSIONLINES

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, DhanpatRai& 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.PKothari,TMH.
6. Power System Analysis and Design, Dr. B. R. Gupta, S. Chand & CompanyLimited.
7. Power System Analysis, Operation and control, AbhijitChakrpabarti, SunithaHalder, PHI, 3/e,2010
8. Electrical Power Transmission system engineering Analysis and design by TuranGonen, CRCPress(Taylor&FrancisGroup)Special IndianEdition,2/e.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2											2	
CO2	3	2											2	
CO3		3											2	
CO4	3												2	
CO5	3												2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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

B. Tech II Year III Semester (ECE) / III Year V Semester(EEE)

Course Code	Course Title	L	T	P	Credits
20APC0403	SIGNALS AND SYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course 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
CO4: Understand the properties of systems, response of LTI systems and filters.
CO5: Able to analyz**e** CT LTI systems and DTLTI systems busing 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, Sinc and Gaussian 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

UNIT II: FOURIER SERIES SERIES AND FOURIER TRANSFORMS
Fourier series: Representation of signals using Fourier Series, Trigonometric Fourier series (TFS) and complex exponential Fourier series (CEFS). Illustrative problems. 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 Band pass 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 TRANSFORMS
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, constraints on ROC for various classes of signals, properties of Z-Transforms. Analysis of DT-LTI systems using Z- Transforms: causality and stability. Illustrative 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

Reference Books:

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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2	2	1
CO2	3	3	2									2	2	1
CO3	2	2			2							2	2	2
CO4	2	3	1		2							3	3	2
CO5	2	3	2		3							3	3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

Course Code	Course Title	L	T	P	Credits
20APC0426	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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2										2	
CO2	2		2											2
CO3	2		3										3	
CO4	2		3										2	
CO5	3												2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0214	Control Systems Lab	0	0	3	1.5

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 – Math works, USA.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												1	
CO2	3	2											1	
CO3	3			2									1	
CO4	3												1	
CO5					3								1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

Year: III Semester: V Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0215	Power Electronics Lab	0	0	3	1.5

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.
4. Analyze the operation of cyclo- converters with different loads.
5. 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, and 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.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												2	
CO2	3	2											2	
CO3	3			2									2	
CO4					3								2	
CO5	3												2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC0202 (Skill oriented course)	INTRODUCTION TO PROGRAMMING WITH MATLAB	1	0	2	2

COURSE OUTCOMES:

1. Learn fundamental computer programming concepts such as variables, control structures, functions and many others.
2. Learn about various data types and how to handle them in MATLAB.
3. Learn the powerful support MATLAB provides for working with matrices.
4. Learn about file input/output.
5. Learn about data types.

MODULE-1
Introduction – Running MATLAB – The MATLAB Desktop – MATLAB as a Calculator – Syntax and Semantics – Help – Plotting

MODULE-2
Introduction to Matrices and Operators – The Colon Operator – Accessing Parts of a Matrix – Combining and Transforming Matrices – Arithmetic

MODULE-3
Introduction to Functions – Function I/O – Formal Definition of Functions – Subfunctions – Scope – Advantages of Functions – Scripts

MODULE-4
Introduction to Programmer's Toolbox – Matrix Building – Input / Output – Plotting – Debugging

MODULE-5
Selection – If-Statements, Continued – Relational and Logical Operators – Nested If-Statements – Variable Number of Function Arguments – Robustness – Persistent Variables

MODULE-6
Loops – For-Loops – While-Loops – Break Statements – Logical Indexing – Preallocation

MODULE-7
Introduction to Data Types – Character Arrays – Structs – Cells – The String Type (Introduced in 2017a) – The Datetime and Duration Types (Introduced in 2014b)

MODULE-8
File Input/Output – Excel Files – Text Files – Binary Files

REFERENCE & TRAINING RSOURCE: Coursera course "INTRODUCTION TO PROGRAMMING WITH MATLAB"

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2				3							1	1	
CO2	2				3							1	1	
CO3	2				3							1	1	
CO4	2				3							1	1	
CO5	2				3							1	1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(Autonomous)

II & III.B.Tech **AK20 Regulations**
Branch: Common to ALL

Subject Code	Subject Name	L	T	P	Credits
20AMC9901	BIOLOGY FOR ENGINEERS	3	0	0	0

Course Outcomes:

1. Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
2. Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
3. Brief about human physiology.
4. Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
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: Introduction to Basic Biology (10 hrs)

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: Introduction to Biomolecules (10 hrs)

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

Unit III: Human Physiology (08 hrs)

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

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology (08 hrs)

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

Unit V: Application of Biology **(10 hrs)**

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 (COVID-2019), 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 Life

Correlation of COs with the POs & PSOs
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Biology for Engineers	CO1	3	2										1		
	CO2	3	2										1		
	CO3	3	2										1		
	CO4	3	2										1		
	CO5	3	2										1		

Semester VI (Third Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Core Courses	20APC0216	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
2	Professional Core Courses	20APC0217	Power System Analysis	3	0	0	3	30	70	100
3	Professional Core Courses	20APC0218	Switch Gear and Protection	3	0	0	3	30	70	100
4	Professional Elective Courses	20APE0202	Power Semi-conductor Drives	3	0	0	3	30	70	100
		20APC0418	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
		20APE0205	Power Quality	3	0	0	3	30	70	100
5	Professional Core Courses Lab	20APC0219	Electrical Measurements Lab	0	0	3	1.5	30	70	100
6	Professional Core Courses Lab	20APC0220	Power System Analysis Lab	0	0	3	1.5	30	70	100
7	Professional Core Courses Lab	20APC0221	Switch Gear and Protection Lab	0	0	3	1.5	30	70	100
8	Skill advanced course/soft skill course	20ASC0203	Numerical techniques using MATLAB	1	0	2	2	100	-	100
9	Mandatory Course (AICTE)	20AMC9904	Professional Ethics and Human Values	3	0	0	0	30	-	30
Total Credits							**18.5**	**340**	**490**	**830**
Honors/Minor Courses (Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	0	0	**4**	**100**		**100**
Industrial/Research Internship (Mandatory)2Months during summer vacation										

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0216	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	3	0	0	3

Course outcomes:

1. Understand different types of measuring instruments, their construction and operation.
2. Identify the instruments suitable for measurement of unknown resistance, capacitance, Inductance, Voltage and current.
3. Understand different types of measuring instruments, their construction and operation for measurement of Power and Energy.
4. Identify the Bridges suitable for measurement of unknown resistance, capacitance and Inductance
5. Transducers and their measurement of electrical and non-electrical quantities.

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.

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 – 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, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes, Velocity, Angular Velocity, Acceleration, Force, Torque, 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.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												1	
CO2	3												1	
CO3		3											1	
CO4	3												1	
CO5	3												1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0217	POWER SYSTEM ANALYSIS	3	0	0	3

COURSE OUTCOMES:

The student should be able to do the following:

1. Remember and understand the concepts of per unit values, formation Y_{Bus} for given power system network.
2. Form the Z_{bus} for given power system network.
3. Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution.
4. Analyse the symmetrical faults and unsymmetrical faults and carry out the fault calculations.
5. Design and select efficient Circuit Breakers to improve system stability.

UNIT-I P.U. SYSTEM AND Y_{bus} FORMATION

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - 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 (Numerical 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 – Comparison of Different Methods.

UNIT – IV SHORT CIRCUIT ANALYSIS

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components: Positive, Negative and Zero sequence Networks. 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. Hadi Saadat, “Power System Analysis”, McGraw Hill, 1998.
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. G.W.Stagg and A.H.El “Computer Methods in Power System Analysis”, Abiad, Mc Graw-Hill, 2006.
3. B.R.Gupta, “Power System Analysis and Design”, S. Chand & Company, 2005.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3												2	
CO2	3												2	
CO3	3	2											2	
CO4	3			2									2	
CO5	3												2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0218	SWITCHGEAR AND PROTECTION	3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to:

1. Acquire knowledge on various types of fuses, breakers used for power system protection.
2. Acquire knowledge on various types of Relays used for power system protection.
3. Design protection system for generators and transformers.
4. Identify various types of the relays in protecting feeders, lines and bus bars.
5. Demonstrate the protection of a power system from over voltages.

UNIT – I SWITCHGEAR FOR PROTECTION

Fuses: Definitions, characteristics, types, HRC fuses.
Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Maximum RRRV, Current Chopping and Resistance Switching - CB Ratings and Specifications – Auto Reclosures - Types of Circuit Breakers: Air blast, Air Break, Oil, SF6, Vacuum circuit breakers, Minimum Oil Circuit Breakers and Earth leakage circuit breakers - Difference between circuit breakers and isolators– making and breaking capacity.

UNIT – II RELAYS

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays.

UNIT – III PROTECTION OF GENERATORS & TRANSFORMERS

Principles and need for protective schemes – Equipment earthing and neutral grounding - Protection of Generators against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection – calculation of percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholz Relay Protection, Numerical Problems.

UNIT – IV PROTECTION OF FEEDERS & LINES

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

UNIT – V OVER VOLTAGES IN POWER SYSTEMS

Generation of Over Voltages in Power Systems - Protection against Lightning over Voltages Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination – Surge arresters – Special earthing for lightning arresters.

TEXT BOOKS:

1. Badri Ram, D.N Viswakarma, “Power System Protection and Switchgear”, TMH Publications, 2011.
2. Sunil S Rao, “Switchgear and Protection”, Khanna Publishers, 1992.

REFERENCE BOOKS:

1. C.L.Wadhwa, “Electrical Power Systems”, New Age international (P) Limited, Publishers, 2012.
2. Y.G. Paithankar , “Transmission network Protection”, Taylor and Francis,2009.
3. Bhuvanesh Oza, “Power system protection and switch gear”, TMH, 2010.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PS O 2**
CO1	3		2										1	
CO2	3												1	
CO3	3										2		1	
CO4	3		2										1	
CO5	3												1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0202	Power Semi-Conductor Drives	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Identify the choice of the electric drive system based on their applications.
2. Explain the operation of single and multi-quadrant electric drives.
3. Analyze single phase and three phase rectifiers fed DC motors as well as chopper fed DC motors.
4. Evaluate the motor and power converter for a specific application.
5. Explain the speed control methods for AC-AC & DC-AC converters fed to Induction motors and Synchronous motors with closed loop, and open loop operations.

UNIT – I CONVERTER FED DC MOTORS

Classification of Electric Drives, Basic elements of Electric Drive, Dynamic Control of a Drive system, Stability analysis, Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics- Problems.

UNIT – II FOUR QUADRANT OPERATION OF DC DRIVES

Introduction to Four Quadrant Operation – Motoring Operations, Electric Braking – Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters – Closed Loop Operation of DC Motor (Block Diagram Only).

UNIT – III CHOPPER FED DC MOTORS

Single Quadrant, Two Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors.

UNIT – IV CONTROL OF INDUCTION MOTOR

Induction Motor Stator Voltage Control and Characteristics – AC Voltage Controllers – Waveforms – Speed Torque Characteristics – Stator Frequency Control and Characteristics. Voltage Source and Current Source Inverter – PWM Control – Comparison of VSI and CSI Operations – Closed Loop Operation of Induction Motor Drives (Block Diagram Only) – Principles of Vector Control Static Rotor Resistance Control – Slip Power Recovery – V/f control of Induction Motor.

UNIT – V CONTROL OF SYNCHRONOUS MOTORS

Separate Control & Self Control of Synchronous Motors – Operation of Self Controlled Synchronous Motors by VSI and CSI Cycloconverters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Introduction to variable frequency control.

TEXT BOOKS:

1. Power semiconductor controlled drives, G K Dubey, Prentice Hall, 1995.
2. Modern Power Electronics and AC Drives, B.K.Bose, PHI, 2002.

REFERENCE BOOKS:

1. Power Electronics, MD Singh and K B Khanchandani, Tata McGraw-Hill Publishing company, 2008.
2. Power Electronic Circuits, Devices and applications, M.H.Rashid, PHI, 2005.
3. Electric drives Concepts and Applications, Vedam Subramanyam, Tata McGraw Hill Publications, 2nd Edition, 2011.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											2	
CO2	3	2											2	
CO3	3	2											2	
CO4	3			1									2	
CO5	3	2											2	3

(Levels of Correlation, viz., 1.Low, 2.Moderate, 3.High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS
B. Tech III Year VI Semester (Common to ECE& EEE)

Course Code	Course Title	L	T	P	Credits
20APC0418	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand architecture details of 8085
CO2: Review and analyze details of 8085 and 8086 architecture
CO3: Illustrate brief details of 8086 operations
CO4: Determine Importance of low power MSP 430 and its advancements
CO5: Analyze Inbuilt peripherals of MSP 430 also Power management features.

UNIT-1
OVERVIEW OF 8085 MICROPROCESSOR
Overview of microcomputer systems and their building blocks, Introduction to 8-bit microprocessor (8085) Architecture, Addressing modes, Instruction set, Machine cycles, instruction cycle and timing states.

UNIT-II
INTRODUCTION TO 8086
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-III
PROGRAMMING OF 8086
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-IV
INTRODUCTION TO LOW POWER RISC MSP 430
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-V
PERIPHERAL DEVICES OF MSP 430
I/O ports pull up/down resistors concepts, Interrupts, Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active Vs Standby current consumption. Timer & Real Time Clock (RTC), timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

Text Books:
1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996.
2. Douglas V. Hall, “Microprocessors and interfacing: Programming and hardware”, 2nd Edition. Tata McGraw Hill, 1991.

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

Reference Books:

1. Carl Hamacher, ZvonksVranesic, SafwatZaky, “Computer Organization” 5th Edition, McGraw Hill, 2002.
2. Andrew S.Tanenbaum, “Structured Computer Organization”,4th Edition PHI/Pearson
3. John L.Hennessy and David A.Patterson, “Computer Architecture a quantitative approach”, Fourth Edition Elsevier
4. Joseph D. Dumas II, “Computer Architecture: Fundamentals and Principals of Computer Design”, BS Publication.

Mapping of course outcomes with program outcomes

Course Title	Course Outcomes COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Microprocessors and Microcontrollers	CO1	3	1	2	2									2	2
	CO2	3	2	3	1	3								2	2
	CO3	2	2	1	2									1	3
	CO4	3	1	2	2	3								1	2
	CO5	3	2	3	2	3								3	3

(Levels of Correlation, viz., 1.Low, 2.Moderate, 3.High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0205	Power Quality	3	0	0	3

Course Outcomes:

1. Understand the basic concepts of different power quality issues and to mitigate them,
2. Understand the principles of regulation of long duration voltage variations.
3. Analyze voltage disturbances and power transients that are occurring in power systems.
4. Understand the concept of harmonics in the system and their effect on different power system equipment.
5. Apply the knowledge about different power quality measuring and monitoring concepts.

UNIT I POWER QUALITY ISSUES

Power quality, voltage quality, The power quality Evaluation procedure, Terms and Definitions, Transients, Long-duration voltage variations, short-duration voltage variations, voltage imbalance, wave form distortion, voltage fluctuation, power frequency variations, power quality terms CBEMA and ITI curves.

UNIT IIVOLTAGE SAGS AND TRANSIENT OVER VOLTAGES

Sources of sags and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags and utility system fault-clearing issues, sources of over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor-switching transients, utility system lightning protection.

UNIT IIIFUNDAMENTALS OF HARMONICS

Harmonic sources from commercial and industrial loads, locating harmonic sources, Power system response characteristics, Harmonics Vs transients, Effect of harmonics, harmonic distortion, voltage and current distortion, harmonic indices, inter harmonics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive and active filters, IEEE and IEC Standards.

UNIT IVLONG-DURATION VOLTAGE VARIATIONS

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitors for voltage regulation, End user capacitor applications, flicker.

UNIT VPOWER QUALITY BENCH MARKING AND MONITORING

Benchmarking process, RMS Voltage variation Indices, Harmonic indices Power Quality Contracts, Monitoring considerations, power quality measurement equipment, Power quality Monitoring standards.

Textbooks:

1. Electrical Power Systems Quality by Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ltd, 2012
2. Power quality by C. Sankaran, CRC Press, 2017

Reference Books:

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson, S. Chen, John Wiley & Sons, 2000. 2. Understanding Power quality problems by Math H. J. Bollen, Wiley-IEEE Press, 2000

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	
CO2	3												2	
CO3		3											2	
CO4	3												2	
CO5	3		2										2	3

(Levels of Correlation, viz., 1.Low, 2.Moderate, 3.High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0219	ELECTRICAL MEASUREMENTS LAB	0	0	3	1.5

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.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3												1	
CO2	3	2											1	
CO3	3			2									1	
CO4	3			2									1	
CO5	3	2											1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0220	POWER SYSTEM ANALYSIS LAB	0	0	3	1.5

Course Outcomes:

1. Acquire practical knowledge on calculation of sequence impedance, fault currents, voltages and sub transient reactances.
2. Get the practical knowledge on how to draw the equivalent circuit of three winding transformer.
3. Acquire knowledge on development of MATLAB program for formation of Y and Z buses.
4. Acquire knowledge on development of MATLAB programs for Gauss-Seidel and Fast Decouple Load Flow studies.
5. 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 usingMATLAB
9. Z_{Bus} formation usingMATLAB
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.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	3												2	
CO3	3	2											2	
CO4	3			1									2	
CO5					3								2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0221	SWITCHGEAR AND PROTECTION LAB	0	0	3	1.5

COURSE OUTCOMES:

1. Understand the operation and characteristics of switch gear used in protection of power systems.
2. Analyze Over Voltage and over current relays
3. Analyze the ABCD parameters of Transmission lines.
4. Analyze the protection of parallel, radial feeders & over voltage induction relay.
5. Analyze the functioning of various protection schemes using MATLAB.

Conduct any 10 from the following:

1. Study the characteristics of miniature circuit breaker.
2. Study the characteristics of fuse and thermal overload protection.
3. Study the operation and characteristics of over voltage, over current relays.
4. Obtain the ABCD parameters of a given power system.
5. Modeling of Differential Relay using MATLAB.
6. Radial Feeder Protections.
7. Parallel Feeder Protections.
8. Principle of Reverse Power Protection.
9. Differential Protection of Transformer.
10. To the study time Vs voltage characteristics of over voltage induction relay.
11. Characteristics of single, combined and lightning earth pits.
12. Study of efficiency and regulation of a transmission line.
13. Study of string efficiency of insultors.

Text books:

1. A.G. Phadkeand J.S.Thorp, “Computer Relaying for Power Systems”, Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, “Digital Protection of Power Systems”, IEEE Press, 1999

Reference Books:

1. Gerhard Zeigler, “Numerical Distance Protection”, Siemens Publicis Corporate Publishing, 2006
2.S.R. Bhide “Digital Power System Protection” PHI Learning Pvt. Ltd. 2014

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2											1	
CO2	3			2									1	
CO3					3								1	
CO4					3								1	
CO5					3								1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY ANDSCIENCES, TIRUPATI
(AUTONOMOUS)

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC0203 (Skill advanced course)	NUMERICAL TECHNIQUES USING MATLAB	1	0	2	2

COURSE OUTCOMES:

1. Learn fundamental computer programming concepts used for numerical analysis.
2. Solve linear equations, difference equations and differential equations in MATLAB.
3. Determination of roots for polynomials.
4. Determination of polynomials using Euler, Runge-Kutta and LSC fitting methods.
5. Analyze the time response of an RLC circuit using Matlab.

LIST OF EXPERIMENTS:

1. Study of Introduction to numerical techniques.

2. Study of basic matrix operations.

3. Solve linear equation using MATLAB.

4. Solution of Linear equations for Underdetermined and Overdetermined cases.

5. Determination of Eigen values and Eigen vectors of a square matrix.

6. Solution of Difference Equations.

7. Solution of Difference Equations using Euler Method.

8. Solution of differential equation using 4th order Runge- Kutta method.

9. Determination of roots of a polynomial.

10. Determination of polynomial using method of Least Square Curve Fitting.

11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.

12. Determination of time response of an R-L-C circuit.

Text Books:

1. Grewal, B.S., and Grewal, J.S., Numerical Methods in Engineering and Science, Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., Miller and Freundâ Probability and Statistics for Engineers, Pearson Education, Asia, 8th Edition, 2015.

References:

2. Burden, R.L and Faires, J.D, Numerical Analysis, 9th Edition, Cengage Learning, 2016.
3. Gerald. C.F. and Wheatley. P.O. Applied Numerical Analysis Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 12th Edition, 2020.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1				3								2	
CO2	1				3								2	
CO3	1				3								2	
CO4	1				3								2	
CO5	1				3								2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI
(Autonomous)
AK20 Regulations

B.Tech **Semester:** **Branch : Common to all**
MANDATORY COURSE

Subject Code 20AMC9904	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.

Correlation of COs with the POs & PSOs for B.Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Professional Ethics and Human values	CO1								3				
	CO2								3				
	CO3								3				
	CO4								3				
	CO5								3				

Semester VII (Fourth Year)

S. No	Category	Code	Course Title	Hours			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
1	Professional Elective courses	20APE0204	Flexible AC Transmission Systems	3	0	0	3	30	70	100
		20APE0207	Advanced Control Systems	3	0	0	3	30	70	100
		20APE0208	Power System Operation and Control	3	0	0	3	30	70	100
2	Professional Elective courses	20APE0203	Neural networks and fuzzy logic	3	0	0	3	30	70	100
		20APC0419	Digital Signal Processing	3	0	0	3	30	70	100
		20APE0306	Renewable energy technologies	3	0	0	3	30	70	100
3	Professional Elective courses - Choice Based Credit System (CBCS)	20AHSMB02	Entrepreneurship Development	3	0	0	3	30	70	100
		20APE0411	Embedded systems	3	0	0	3	30	70	100
		20AOE0501	Air pollution and control (MOOCS-NPTEL)	-	-	-	3	25	75	100
4	Open Elective Courses/Job oriented elective	20AHSMB03	Principles of Management	3	0	0	3	30	70	100
5	Professional Elective Courses	20APE0206	Electrical Distribution System Automation	3	0	0	3	30	70	100
		20APE0209	High Voltage Engineering	3	0	0	3	30	70	100
		20APE0210	Electric Vehicle Technologies	3	0	0	3	30	70	100
6	Humanities and Social Science Elective	20AHE9903	Professional Communication	3	0	0	3	30	70	100
7	Skill advanced course/soft skill course	20ASC0204	Fundamentals of using AI tools	1	0	2	2	100	-	100
Industrial/ResearchInternship2Months (Mandatory)after third year (to be evaluated during VII semester)				0	0	0	3	100	-	100
				Total Credits			**23**	**380**	**420**	**800**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**		**0**	**4**	**100**		**100**

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

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0204	FLEXIBLE AC TRANSMISSION SYSTEMS	3	0	0	3

COURSE OUTCOMES:
On the completion of this course the student will be able to:
1. Understand various control issues, for the purpose of identifying the scope and for selection of specific FACTS controllers.
2. Apply the concepts in solving problems of simple power systems with FACTS controllers.
3. Design simple FACTS controllers and converters for better transmission of electric power.
4. Understand to deal with problems in Power System as Power System Engineer.
5. Understand the different power flow controllers.

UNIT-I: CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS
Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

UNIT-II: VOLTAGE AND CURRENT SOURCED CONVERTERS
Single Phase Full Wave Bridge Converter, Three Phase Full Wave Bridge Converter, Transformer Connections for 12-Pulse Operation, 24 and 48-Pulse Operation, Three Level Voltage Sourced Converter, Pulse Width Modulation (PWM) Converter, Converter Rating, Concept of Current Sourced Converters, Thyristor based converters, Current Sourced Converter with Turn off Devices, Comparison of Current Sourced and Voltage Sourced Converters.

UNIT-III: STATIC SHUNT COMPENSATORS
Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability, Power Oscillation Damping, Methods of Controllable VAR Generation, Variable Impedance Type Static VAR Generators, Switching Converter Type VAR Generators, Hybrid VAR Generators, SVC and STATCOM, Transient Stability Enhancement and Power Oscillation Damping, Comparison Between STATCOM and SVC, V-I, V-Q Characteristics, Response Time.

UNIT-IV: STATIC SERIES COMPENSATORS
Objectives of Series Compensation, Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Sub-synchronous Oscillation Damping, Variable Impedance Type Series Compensators, GTO Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor(TCSC), Basic Operating Control Schemes for GCSC, TSSC, and TCSC, Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor(SSSC), Transmitted Power Versus Transmission Angle Characteristic, Control Range and VA Rating, Capability to Provide Real Power Compensation.

UNIT-V: POWER FLOW CONTROLLERS
The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control, Dynamic Performance, The Interline Power Flow Controller (IPFC), Basic Operating Principles and Characteristics, Generalized and Multifunctional FACTS Controllers.

TEXT BOOKS:

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.
2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1st Edition, 2007.

REFERENCE BOOKS:

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.
2. FACTS – Modelling and Simulation in Power Networks, Enrigue Acha,Claudio R. Fuerte – Esquival, Huge Ambriz – perez, Cesar Angeles – Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

Mapping of course outcomes with program outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2											1	3
CO2	3	2											1	3
CO3	3	2											1	3
CO4	3	2											1	3
CO5	3	2											1	3

(Levels of Correlation, viz., 1. Low, 2.Moderate, 3.High)

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

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0207	Advanced Control Systems	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:

1. Design state feedback controller and state observer.
2. Understand and analyse linear and nonlinear systems using phase plane method.
3. Understand and analyse nonlinear systems using describing function method.
4. Understand and design optimal controller.
5. Understand optimal estimator including Kalman Filter.

UNIT I STATE VARIABLE ANALYSIS

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS

Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS

Introduction, common physical nonlinearites, The phase plane method: concepts, singular points, stability of non-linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL

Introduction: Classical control and optimization, formulation of optimal control problem, typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

TEXT BOOKS:

1. M.Gopal, “Digital Control and State Variable Methods”, 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, ‘Modern Control Engineering’, 5th Edition, Pearson, 2012.
3. K. P. Mohandas, “Modern Control Engineering”, Sanguine Technical Publishers, 2006.

REFERENCES:

1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, “Control System Fundamentals,” The Control Handbook, CRC Press, Tayler and Francies Group, 2011.
3. Ashish Tewari, ‘Modern Control Design with Matlab and Simulink’, John Wiley, New Delhi, 2002.

4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.
5. D.S.Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	2										1	1
CO2	3	2	1										1	1
CO3	3		2										1	1
CO4	3	2	1										1	1
CO5	3		2										1	1

(Levels of Correlation, viz., 1.Low, 2.Moderate, 3.High)

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

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0208	Power System Operation and Control	3	0	0	3

COURSE OUTCOMES:
On the completion of this course the student will be able to:

1. Understand to deal with problems in Power System as Power System Engineer.
2. Understand to deal with AGC problems in Power System.
3. Understand to deal the problems in hydroelectric and hydro thermal problems.
4. Understand the complexity of reactive power control problems and to deal with them.
5. Understand the necessity of deregulation aspects and demand side management problems in the modern power system era.

UNIT-I: ECONOMIC OPERATION OF POWER SYSTEMS
Brief description about electrical power systems, introduction to power system operation and control, Characteristics of various steam units, combined cycle plants, cogeneration plants, Steam units economic dispatch problem with & without considering losses and its solutions, B Matrix loss formula – Numerical problems.

UNIT-II: HYDRO-THERMAL COORDINATION AND OPTIMAL POWER FLOW
Hydro-thermal Coordination: Characteristics of various types of hydro-electric plants and their models, Introduction to hydro-thermal Coordination, Scheduling energy with hydro-thermal coordination, Short-term hydro-thermal scheduling. Optimal Power Flow: Optimal power flow problem formulation for loss and cost minimisation, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems.

UNIT-III: AUTOMATIC GENERATION CONTROL
Speed governing mechanism, modelling of speed governing mechanism, models of various types of thermal plants (first order), definitions of control area, Block diagram representation of an isolated power system, Automatic Load Frequency control of single area system with and without control, Steady state and dynamic responses of single area ALFC loop, Automatic Load-frequency control of two area system, Tie-line bias control of two area and multi-area system, Static response of two-area system – Numerical examples.

UNIT-IV: REACTIVE POWER CONTROL
Requirements in ac power transmission, factors affecting stability & voltage control, fundamental transmission line equation, surge impedance, Natural loading, uncompensated line on open circuit, uncompensated line under load, types of compensations on compensated transmission lines, passive and active compensators, uniformly distributed fixed and regulated shunt compensation, series compensation, compensation by sectioning – Numerical problems.

UNIT-V: OPERATION OF MODERN POWER SYSTEMS
Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

TEXT BOOKS:

1. Allen J. Wood and Bruce F. Wollenberg, "Power Generation, Operation and Control", 2nd edition, John Wiley & Sons, Inc., New York, 1996.
2. D P Kothari and I J Nagrath, "Power System Engineering", McGraw Hill Education India Pvt. Limited, Chennai, 3e, 2019.

REFERENCES:

1. Olle I. Elgerd, "Electric Energy Systems Theory: An Introduction", TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.
2. T J E Miller, "Reactive Power Control in Electric Systems", John Wiley & Sons, New York, 1982.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											2	2
CO2	3	2											2	2
CO3	3	2											2	2
CO4	3	2											2	2
CO5	3	2											2	2

(Levels of Correlation, viz., 1. Low, 2.Moderate, 3.High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0203	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, unsupervisedlearning.

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 FUZZYLOGIC
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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	1
CO2	3	2											2	1
CO3	1	2											2	1
CO4	3	1											2	1
CO5	3												2	1

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS
B. Tech III Year VI Semester (ECE)/IV Year VII Semester (EEE)

Course Code	Course Title	L	T	P	Credits
20APC0419	DIGITAL SIGNAL PROCESSING	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Analyze discrete signals and systems in time and frequency domains.

CO2: Apply FFT algorithms to efficient computation of DFT.

CO3: Implement and realize various structures of IIR and FIR systems.

CO4: Design & analyze various Analog Filters and Digital Filters.

CO5: Understand and apply the basics of multi rate digital signal processing.

UNIT I: Introduction to DSP

Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Frequency analysis of signals using the DFT.

UNIT II: Fast Fourier Transform

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, Quantization errors in the computation of DFT.

UNIT III: Analog & Digital Filters

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT IV: Realization of Filters

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Linear Phase Realization and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, lattice – Ladder structure.

UNIT V: Multirate DSP

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of band pass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.

2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.

REFERENCES:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.

2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.

3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

Mapping of course outcomes with program outcomes

Course Title	Course Outcomes COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Digital Signal Processing	CO1	1	1											2	
	CO2	2	2		1										2
	CO3	1	2	3	1								1	2	2
	CO4		1	1											1
	CO5		2											2	

(Levels of Correlation, viz., 1.Low, 2.Moderate, 3.High)

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

Year: IV **Semester**: VII **Branch of Study : EEE**

Subject Code	Subject Name	L	T	P	Credits
20APE0306	Renewable Energy Technologies	3	0	0	3

Course Outcomes:

1 Explain the current energy scenario and requirement of migration to renewable energy sources
2 To understand role significance of solar energy
3 To provide importance of Wind Energy
4 To understand the role of ocean energy in the Energy Generation
5 To understand role of hydrogen in non-conventional energy

UNIT I

Classification of Energy:

Energy chain and common forms of usable energy- Present energy scenario- World energy status- Energy scenario in India- Introduction to renewable energy resources- Introduction to solar Energy- Energy from sun- Spectral distribution of Solar radiation- Instruments for measurement of solar radiation.

UNIT II

Solar Energy

Solar Radiation, Measurements of Solar Radiation, Flat Plate and Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications.

UNIT III

Bio Energy Sources:

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gasdigesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

Wind Energy:

Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator.

UNIT IV

Ocean Energy:

Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants.

Geothermal Energy:

Resources, types of wells, methods of harnessing the energy, scope in India.

Unit – V:

Hydrogen Energy:

Properties of hydrogen as fuel, Hydrogen pathways introduction-current uses, general introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and hydrogen production plants.

Textbooks:

1. Non-Conventional Energy Sources /G.D. Rai.
2. Reneweble energy resources: Tiwari and ghosal, Narosa publication.
3. Non conventional Energy Sources, Khanna Publication.

References:

1. Non-Conventional Energy Resources, B.H. Khan, McGrawHIll, 2015.
2. Principles of Solar Energy/ Frank Krieth & John F Kreider.
3. Fang Lin You, Hong ye (2012), Renewable Energy Systems, Advanced conversion technologies and applications, CRC Press
4. John.A.Duffie, William A.Beckman (2013), Solar Engineering of Thermal processes, Wiley
5. Godfrey Boyle (2012), Renewable Energy, power for a sustainable future, Oxford University Press.

Mapping of course outcomes with program outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2			3		1		3								
CO3	2							3				1			
CO4				3	1		3								
CO5		2										1			

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Course Code	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
20AHSMB02		3	0	0	3
	(Common to All-branches of Engineering)				

Course Outcomes (CO):

- Understand the concept of Entrepreneurship and challenges in the world of Competition.
- Apply the Knowledge in generating ideas for New Ventures and design business plan structure.
- Analyze various sources of finance and subsidies to entrepreneurs.
- Evaluate the role of central government and state government in promoting women Entrepreneurship.
- Study the role of incubations in fostering startups.

UNIT - I	**Introduction to Entrepreneurship**

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT - II	**Formulation of Business Idea**

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT - III	**Financial Aspects of Promotion**

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development.

UNIT - IV	**Women Entrepreneurship**

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurshipin India - Issues & Challenges - Entrepreneurial motivations.

UNIT - V	**Startups and Incubation**

Startups – Definition, Role of startups in India, Governmental initiatives to foster entrepreneurship across sectors. Funding opportunities for startups. Business Incubation and its benefits, Pre-Incubation and Post - Incubation process.

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship**"** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)

2 . Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013.

Reference Books:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.

2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.

3. B.Janakiram and M.Rizwana‖ "Entrepreneurship Development: Text &Cases", Excel Books, 2011.

4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

Online Learning Resources:

1. Entrepreneurship-Through-the-Lens-of-venture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurship/50

Mapping of course outcomes with program outcomes

Course Title	Course Outcomes (COs)	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)													
		PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**
Entrepreneurship Development	CO1	3	0	0	0	0	0	0	1	0	0	0	0	0	0
	CO2	0	0	3	0	0	0	0	0	0	0	1	0	0	1
	CO3	0	0	0	0	0	0	0	0	0	2	3	0	0	0
	CO4	0	0	0	0	0	3	0	0	0	1	0	0	0	1
	CO5	0	0	3	0	0	0	0	0	0	2	0	0	0	1

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)

B. Tech IV Year I Semester **(Branch: EEE and CSE)**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0411	EMBEDDED SYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Understand the fundamental concepts of Embedded systems.
CO2: Analyze TM4C Architecture, Instruction Set, addressing modes to develop programs for various applications using Assembly and Embedded C.
CO3: Develop an embedded system by interfacing the microcontrollers and IDE tools.
CO4: Figure out problems using TM4C On chip Resources such as Timer, Clock System, Low Power Modes/techniques and Interrupt Structure.
CO5: Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.

UNIT-I
INTRODUCTION TO EMBEDDED SYSTEMS:
Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design

UNIT-II
EMBEDDED PROCESSOR ARCHITECTURE:
CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, addressing modes and instruction set basics.

UNIT- III
OVERVIEW OF MICROCONTROLLER AND EMBEDDED SYSTEMS:
Embedded hardware and various building blocks, Processor Selection for an Embedded System, Interfacing Processor, Memories and I/O Devices, I/O Devices and I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices. Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, Uses of Target System or its Emulator and In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System Design metrics of embedded systems - low power, high performance, engineering cost, time-to-market.

UNIT-IV
MICROCONTROLLER FUNDAMENTALS FOR BASIC PROGRAMMING:
I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT-V
EMBEDDED COMMUNICATIONS PROTOCOLS AND INTERNET OF THINGS:
Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C.Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub Booster Pack” Embedded Networking fundamentals, IoT overview and architecture, Overview of wireless sensor networks and

design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API. Case Study: Tiva based Embedded Networking Application: "Smart Plug with Remote Disconnect and Wi-Fi Connectivity"

Text Books:

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, Create space publications ISBN: 978-1463590154.

2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition Jonathan W Valvano, Create space publications ISBN-13: 978-1477508992

3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

Reference Books:

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors

2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop

3. http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html

4. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3		2										1	2
CO2			3										2	2
CO3	1		3										1	3
CO4			2	3										2
CO5				2	3								1	2

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

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

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

Subject Code:	**Subject Name: PRINCIPLES OF MANAGEMENT**	**L**	**T**	**P**	**Credits**
20AHSMB03		3	-	-	03

Course Outcomes

CO1: Understand the importance of management concepts.
CO2: Able to understand the planning and decision making process.
CO3: Know the basic concepts of organizing.
CO4: understand the importance of directing
CO5: know various types of controlling and their usage in organizations.

UNIT I : Introduction to Management: Definition – Science or Art – Types of Management – Functions of Management - Roles and Skills of Manager – Evolution of Management – Schools of Management Thought: Scientific Management – Administrative Management – Human relations, Systems and Contingency Approaches.

UNIT II: Planning: Nature and Purpose – Process - Types of Plans, Management by Objectives. **Decision Making:** Process -- Types of Decisions -- Decision making Techniques.

UNIT III: Organizing: Nature and Purpose – Formal and Informal Organizations - Process – Organizational Structure – Line and Staff Authority – Departmentalization – delegation of Authority – Centralization and Decentralization - Span of Control.

UNIT IV: Directing: Meaning – Need – Motivation: Motivation Theories – Leadership: Leadership Theories – Types of leadership – Communication: Types - Process – Barriers to communication – Effective Communication.

UNIT V: Controlling: Meaning, Control Process, Characteristics of an Effective Control System, Types of Controlling – Techniques of controlling – Reporting.

Text Books:

- Organizational Behavior, Stephen P. Robbins, Pearson Education.
- Management and Organizational Behavior, Subbarao P, Himalaya Publishing House
- Principles of Management, Koonz, Weihrich and Aryasri, Tata McGraw Hill.
- Principles of Management, PC Tripathi and PN Reddy, Tata McGraw Hill.

References:

- Management and Organizational behavior, Pierce Gordner, Cengage.
- Principles of Management, Murugesan, Laxmi Publications

Mapping of course outcomes with program outcomes

Course Title	Course Outcomes (COs)	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)													
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO1**	**PSO 2**
PRINCIPLES OF MANAGEMENT	CO1	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CO2	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CO3	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CO4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**
	CO5	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

Year: IV Semester: VII Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0206	ELECTRICAL DISTRIBUTION SYSTEM AUTOMATION	3	0	0	3

Course Outcomes:

1. Understand basics of distribution systems fundamentals.
2. Understand basics of substations, modeling of various loads
3. Analyze of load flow solutions in distribution system
4. Evaluation of power loss and feeder cost.
5. Apply the concepts of SCADA, Automation distribution system and management in real time problems.

UNIT – I: DISTRIBUTION SYSTEM FUNDAMENTALS

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT – II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation service area, K constant, radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations.

Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substation layout showing the location of all the substation equipment – Gas Insulated Substation (GIS).

Loads: Various types of loads, Definitions of various terms related to system loading, detailed description of distribution transformer loading, feeder loading, modeling of star and delta connected loads, two-phase and single-phase loads shunt capacitors.

UNIT – III: DISTRIBUTION SYSTEM LOAD FLOW

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT – IV: **VOLTAGE DROP AND POWER LOSS CALCULATION**

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, types of three-phase capacitor-bank connections, Economic justification for capacitors – Numerical problems

UNIT – V: DISTRIBUTION AUTOMATION

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, outage management, decision support applications, substation automation, control feeder automation, database structures and interfaces. Standards: IEEE 1344, IEEE C37.118 (2005), IEEE Standard C37.111-1999 (COMTRADE), IEC61850 GOOSE.

TEXT BOOKS:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986

REFERENCE BOOKS:

1. Control and automation of electrical power distribution systems, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
2. Biswarup Das, Power distribution Automation, IET publication, 2016.
3. Dr. M. K. Khedkar, Dr. G.M. Dhole, Electric Power Distribution Automation, Laxmi Publications, First edition, 2017

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**3**												**2**	**1**
CO2	**3**												**2**	**1**
CO3	**2**	**3**	**1**										**1**	**1**
CO4	**2**	**3**	**1**		**1**	**1**							**1**	**2**
CO5	**2**	**3**											**2**	**1**

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0209	HIGH VOLTAGE ENGINEERING	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:
1. Discuss and analyze the various types of electrical stress control techniques in gas and vacuum insulation systems
2. Derive and analyze the expression of current growth and breakdown voltage due to various mechanisms of gaseous breakdown in dielectrics/ insulation
3. Derive and analyze the various mechanisms of breakdown in liquid and solid dielectrics breakdown
4. Acquire knowledge on generation and measurement of high voltage and high current.
5. Acquire knowledge on over voltage and insulation coordination in electric power systems.

UNIT-I High voltages in electrical systems and electric stress
Levels of High voltage – Electrical insulation and Dielectrics – importance of electric field intensity in the dielectrics – Electric field stresses – gas / vacuum as insulator - estimation and control of electric stress – Surge voltage their distribution and control.

UNIT-II Conduction and breakdown in gases
Gases as insulating media - Collision Processes – Ionization Processes – Townsend's current growth equation – Current growth in the presence of secondary processes - Townsend's criterion for breakdown - the experimental determination of coefficients α and γ – breakdown in electro negative gases.

UNIT-III Conduction and breakdown in Liquid, solid dielectrics
Liquids as insulator – conduction and breakdown in pure liquids – conduction and breakdown in commercial liquids – testing of insulating oils – breakdown in solid dielectrics – intrinsic, electromechanical and thermal - breakdown in composite dielectrics.

UNIT-IV Generations and measurements of high voltages and currents
Generations of high direct current and alternating voltages – generation of impulse voltages and currents – Measurement of high Voltage and current: direct, alternating and impulse – measurement of dielectric constant and loss factor - partial discharge measurement.

UNIT-V Over voltage and insulation coordination in electric power system
Natural causes for over voltages – lightning switching and temporary over voltage – Protection against over voltage – Bewley's lattice diagram – principles of insulation coordination on high voltage and extra high voltage power system.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 5rd Edition,2013.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Extra High Voltage AC Transmission Engineering , Rakosh Das Begamudre, New Age International (P) Ltd., New Delhi – 2007.
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 2010.
3. High Voltage Engineering:, E. Kuffel, W. S. Zaengl, J. Kuffel, Cbs Publishers New Delhi, 2nd Edition, 2005.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											1	
CO2	3		1										1	
CO3	3		1										1	
CO4	3												1	
CO5	3												1	

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

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

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0210	Electric Vehicle Technologies	3	0	0	3

Course Outcomes:

1. Understand the basic concepts of electric vehicles, and their impact on environment.
2. Understand the hybrid electric vehicles Classification, Operating principle and architectures.
3. Analyze the drive-train topologies and advanced propulsion techniques.
4. Analyze hybrid energy storage methodologies.
5. Design suitable power converter topologies for motor control and hybrid energy storage

UNIT I INTRODUCTION

Conventional vehicle, basics of vehicle performance, History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC VEHICLES

Micro hybrid vehicles, mild hybrid vehicles, full hybrid vehicles, Parallel hybrid vehicles, series Hybrid Vehicles, Series-Parallel Hybrid vehicles, plug-in hybrid vehicles, power flow diagrams for various operating modes. Plug-in Hybrid Vehicles: Operating principle, architectures: series-parallel-series-parallel, challenges related to grid connection. Range-extended Electric Vehicles: Classification and configurations, Fuel Cell Electric Vehicles, Solar electric Vehicles, Electric Bicycles and their propulsion systems, Vehicle-to-grid, vehicle to-home concepts, Concept of Hybrid Electric Vehicles.

UNIT III ELECTRIC DRIVE-TRAINS & PROPULSION UNIT

Electric drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis Electric propulsion unit: Electric components used in electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, Switch Reluctance Motor drives, Drive system efficiency.

UNIT IV ENERGY STORAGE

Storage requirements for Electric Vehicles, Battery based energy storage, Fuel Cell based energy storage, and Super Capacitor based energy storage and their analysis. Power pack management systems, Cell balancing techniques, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices, compressed air storage systems, super conducting magnetic storage systems and Energy management systems.

UNIT V CONVERTERS FOR HYBRID ENERGY STORAGE SYSTEMS

Converter configurations for hybrid energy systems based on Battery and Ultra Capacitors-cascaded converter, multiple parallel-connected converter, dual-active-bridge converter, multiple-input converter,-multiple modes single converter, interleaved converter, switched capacitor converter, converters for coupled inductor based hybridization. Fundamentals of Chargers: Charger classifications and standards, selection of AC charging systems, DC charging systems, Converter topologies for charging, wireless chargers.

Textbooks:

1. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, Taylor & Francis Group 2015.
2. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003, 2nd Edition.

Reference Books:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, CRC Press, 2005.
2. Electric Vehicle Technology Explained, James Larminie, John Lowry, Wiley, 2003. Online **Learning Resources:**

1. https://nptel.ac.in/courses/108/106/108106170/
2. https://nptel.ac.in/courses/108/102/108102121/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						1						3	
CO2	3												3	
CO3		3											1	1
CO4		3											1	1
CO5			3										3	1

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI
(Autonomous)
AK20 Regulations

IV B. Tech **Semester: I** **Branch: Common to all**

Subject Code 20AHE9903	Subject Name Professional Communication	L 3	T 0	P 0	Credits: 3

Course Objectives

1. To develop confidence in the students to use English in everyday situations.

2. To enable the students to read different discourses so that they appreciate English for science and technologies.

3. To improve familiarity with a variety of technical writings.

4. To enable the students to acquire structure and written expressions required for their profession.

5. To develop the listening skills of the students.

Syllabus:

Unit: 1- Grammar & Vocabulary

Parts of Speech - Articles - Prepositions - Subject-Verb agreement - Tenses - Active and Passive Voice - Direct & Indirect Speech - Degrees of Comparison - Punctuation -Vocabulary.

Unit: 2 - Communication Skills

Importance of Communication - Non-verbal Communication - Introduction to Kinesics, Proxemics, Chronemics - Basics of Technical Communication - Group Discussion, Interviews and Conversations.

Unit:3 – Telephone Skills:

Understanding Telephone Communication - Types of calls - Handling calls - Leaving a message - Making requests - Asking for and giving information - Giving Instructions - Making or changing appointments.

Unit:4 – Interpersonal Skills

Team management - Problem solving and Decision Making - Managing Time and Stress - Technology @ work - Etiquette.

Unit:5 – Written Communication

Email writing - Professional Letters - Letters of application, Business letters, Using Salutations, Routine letters, Request letters, Persuasive letters - Report writing - Note making - Notice, Agenda and Minutes of Meetings.

Course Outcomes:

Students will be able to:

1. Identify and apply communication skills effectively for professional success.

2. Speak clearly and concisely in formal and in informal conversations.

3. Compose and communicate the information through drafting, editing and presentation.

4. Applying interpersonal skills in appropriate manner towards the growth of best career.

5. Construct sentence structures using correct vocabulary and without any grammatical errors.

Suggested books for reading:

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication – Principles and Practice, 3rd Edition, Oxford University Press, 2015.

2.Professional Communication Skills, Er A.K. Jain, Dr. Pravin S.R. Bhatia, Dr. A.M. Sheikh, S. Chand & Company Ltd, New Delhi, 2011.

3. Soft Skills for everyone, Jeff Butterfield, Cengage Learning India Private Ltd, New Delhi, 2014.

4. Basic communication Skills P. Kiranmai Dutt, Geetha Rajeevan, Cambridge University Press India Pvt. Ltd, New Delhi, 2010.

5. A Course in Communication Skils, P.Kiranmai Dutt, Geetha Rajeevan, CLN Prakash, Cambridge University Press India Pvt Ltd, New Delhi, 2013

Correlation of COs with the POs & PSOs for B. Tech
AK-20 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Professional Communication	CO1										3		
	CO2										2		
	CO3										3		
	CO4						3						
	CO5										3		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: IV **Semester: VII** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC0204	Fundamentals of using AI tools	1	0	2	2

COURCE OUTCOMES:

1. Able to understand AI powered features for MS Office tools.
2. Understand the procedures for installation of AI tools.
3. Familiarize the operation of ChatGPT tools for documentation applications.
4. Familiarize the operation of AI Tools for research article drafting.
5. Familiarize the operation of AI tools for generation of programming codes for MATLAB and Python.

List of Experiments

1. Introduction to the use AI tools for MS Office applications.
2. Installation of ChatGPT and Monica plugins and activate accounts.
3. Generate 2 pages curriculum vitae using ChatGPT.
4. Generate a research article for any one experiment of Machines-1 lab course.
5. Draft a research article using a base paper to suit the needs for Project work of next semester.
6. Generate python codes for Fibonacci series.
7. Generate MATLAB program for speed control of Induction motor.

REFERENCES:

1. Microsoft Office AI: This online training program by Microsoft covers a range of AI topics such as data analytics, machine learning, and natural language processing. The program is free to access and offers a self-paced curriculum that allows individuals to learn at their own pace.

2. Office 365 AI: This LinkedIn Learning Course focuses on how to utilize AI tools within the Microsoft Office Suite, such as Excel's Power Query add-in or PowerPoint's Designer tool. The course is designed for beginners and helps individuals learn how to leverage important AI-powered features in MS Office applications.

3. AI in Office Hours: This is a YouTube playlist by Microsoft Office that features short videos demonstrating how to use AI-powered features in Microsoft Office for business, education, and personal use. It is a great resource for individuals who want to see practical examples of how AI tools work in Microsoft Office.

4. Office Insiders: This community-based program is for dedicated Microsoft Office users that offers early access to new features, priority support and the ability to provide feedback to the Office team, among other benefits. Members of the program can access AI-powered features before they are made available to the general public and can provide valuable feedback to improve these tools.

5. MS Office AI Blog: The official Microsoft Office blog shares updates on AI development tools, as well as real-world examples showing how its AI services are making an impact. This is a useful resource for staying up-to-date on the latest developments in AI for Microsoft Office.

6. Microsoft AI School: This is an online resource that provides learning materials about AI, including modules specifically designed for MS Office. The modules cover a range of AI topics and are designed to be accessible for individuals with different backgrounds.

7. AI4AXLS: This YouTube channel features practical applications of Excel and other Office tools combined with AI. The channel shares tutorials and examples of how individuals can use AI to enhance their Excel experience.

8. Neural Networks Demystified (Python version): A YouTube series that teaches the of neural networks and deep learning using Python. The videos are beginner-friendly and cover topics such as gradient descent, backpropagation, and convolutional neural networks.

9. Python for Data Science Handbook: This book by Jake Vanderplas covers the basics of Python programming and its application in data science. The book includes examples and exercises and covers important topics such as NumPy, Pandas, and machine learning libraries such as Scikit-learn.

10. Basics of MATLAB and Beyond: This LinkedIn Learning course provides an introduction to MATLAB and its application in engineering and sciences. The course covers topics such as data analysis, visualization, and control design.

11. MATLAB Onramp: This is a free interactive course offered by MathWorks that teaches the basics of MATLAB. The course covers the basics of MATLAB syntax, visualization, and programming. It is a great starting point for anyone looking to learn MATLAB.

12. Hands-On Machine Learning with Scikit-learn and TensorFlow: This book by Aurélien Géron provides a practical guide to machine learning using Python. The book includes examples and exercises and covers important topics such as clustering, classification, and regression.

13. Applied Data Science with Python Specialization: A Coursera course offered by the University of Michigan that covers the application of Python in data science. The course covers topics such as data visualization, machine learning, and text analysis.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3				2								2	1
CO2			1		3								2	1
CO3	3				2								2	1
CO4	3				2								2	1
CO5	3				2								2	1

(Levels of Correlation, viz., 1. Low, 2. Moderate, 3. High)