ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS
ELECTRONICS and COMMUNICATION ENGINEERING (ECE)
(Effective for the batches admitted in 2020-21)

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

I Semester (B.Tech –I year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	BSC	20ABS9902	Applied Physics	3	0	0	3	30	70	100
3	HSMC	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	*ESC	20AES0304	Engineering Workshop Practice	1	0	4	3	30	70	100
5	ESC	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	HSMC	20AHS9902	Communicative English Laboratory	0	0	3	1.5	30	70	100
7	BSC	20ABS9907	Applied Physics Laboratory	0	0	3	1.5	30	70	100
8	ESC	20AES0503	Problem Solving and Programming Laboratory	0	0	3	1.5	30	70	100
TOTAL							**19.5**	**240**	**560**	**800**

II Semester (B.Tech –I year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9906	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	BSC	20ABS9904	Chemistry	3	0	0	3	30	70	100
3	ESC	20AES0201	Network Theory	3	0	0	3	30	70	100
4	ESC	20AES0502	Data Structures	3	0	0	3	30	70	100
5	ESC	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
6	ESC	20AES0203	Network Theory Laboratory	0	0	3	1.5	30	70	100
7	BSC	20ABS9909	Chemistry Laboratory	0	0	3	1.5	30	70	100
8	ESC	20AES0504	Data Structures Laboratory	0	0	3	1.5	30	70	100
9	MC	20AMC9902	Constitution of India`	3	0	0	0	30		30
						TOTAL	**19.5**	**270**	**560**	**830**

III Semester (B.Tech –II year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9912	Transform Techniques and Complex Variables	3	0	0	3	30	70	100
2	PCC	20APC0401	Electronic Devices and Circuits	3	0	0	3	30	70	100
3	PCC	20APC0402	Switching Theory and Logic Design	3	0	0	3	30	70	100
4	PCC	20APC0403	Signals and Systems	3	0	0	3	30	70	100
5	HSMC	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	PCC	20APC0404	Electronic Devices and Circuits Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0405	Signals and Systems Laboratory	0	0	3	1.5	30	70	100
8	PCC	20APC0406	Switching Theory and Logic Design Laboratory	0	0	3	1.5	30	70	100
9	SOC	20ASC0401	Electronic Circuit Design	1	0	2	2	100	-	100
10	MC	20AMC9901	Biology for Engineers	3	0	0	0	30		30
TOTAL							**21.5**	**370**	**560**	**930**

IV Semester (B.Tech –II year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	ESC	20AES0509	Basics of Python Programming	3	0	0	3	30	70	100
2	PCC	20APC0407	Probability Theory and Stochastic Process	3	0	0	3	30	70	100
3	PCC	20APC0408	Electromagnetic Theory and Transmission Lines	3	0	0	3	30	70	100
4	PCC	20APC0409	Analog Communication Systems	3	0	0	3	30	70	100
5	PCC	20APC0410	Electronic Circuit Analysis	3	0	0	3	30	70	100
6	ESC	20AES0510	Basics of Python Programming Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0411	Analog Communication Systems Laboratory	0	0	3	1.5	30	70	100
8	PCC	20APC0412	Electronic Circuit Analysis Laboratory	0	0	3	1.5	30	70	100
9	SOC	20ASC0402	Internet of Things	1	0	2	2	100	-	100
10	HSC	20AHS9905	Universal Human Values	2	1	0	3	30	70	100
TOTAL							**24.5**	**370**	**630**	**1000**

Community service Project with credits

(To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester)

V Semester (B.Tech –III year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PCC	20APC0413	Antennas and Wave Propagation	3	0	0	3	30	70	100
2	PCC	20APC0414	Digital Communication Systems	3	0	0	3	30	70	100
3	PCC	20APC0415	Integrated Circuits and Applications	3	0	0	3	30	70	100
4	OEC	20APC0515	Operating Systems	3	0	0	3	30	70	100
		20AOE0202	Programmable Logic Controllers							
		20APC0213	Control Systems							
5	PEC	20APE0401	VLSI Design	3	0	0	3	30	70	100
		20APE0402	Computer Organization							
		20APE0403	Digital System Design							
6	PCC	20APC0416	Digital Communication Systems Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0417	Integrated Circuits and Applications Laboratory	0	0	3	1.5	30	70	100
8	SOC	20AHE9902	Principles of Effective Public Speaking	1	0	2	2	100	-	100
9	MC	20AMC9904	Professional Ethics and Human Values	3	0	0	0	30	-	30
10	CSP	20CSP0401	Community Service Project	0	0	0	1.5	100	-	100
TOTAL							**21.5**	**440**	**490**	**930**

S.	Professional Elective*	Open Elective*
1	Electronic Systems for Cancer Diagnosis	The Joy of Computing Using Python
2	Microelectronics: Devices to Circuits	Computer Architecture
3	Nanobiophotonics: Touching Our Daily	An Introduction to Artificial
4	Fabrication Techniques for MEMS-Based	Environment and Development
5	Transducers for Instrumentation	Soft Skills
6	Design of Photovoltaic System	Public Speaking
7	Modern Digital Communication	Ethical Hacking
8	Introduction to Photonics	Cloud Computing
9	Introduction To Wireless and Cellular	Remote Sensing Essentials
10	Stochastic Control and Communication.	Sustainable Transportation Systems

*Student shall register any number of MOOC courses listed above (Professional/Open) by the department as approved by the BOS from III year. But student is required to submit the pass certificate on NPTEL platform for at least one course with in the Programme duration (Before IV-II examination notification released).

VI Semester (B.Tech –III year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PCC	20APC0418	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
2	PCC	20APC0419	Digital Signal Processing	3	0	0	3	30	70	100
3	PCC	20APC0420	Microwave and Optical Communications	3	0	0	3	30	70	100
4	PEC	20APE0404	Low Power VLSI Circuits and Systems	3	0	0	3	30	70	100
		20APE0405	MEMS and Microsystems							
		20APE0406	Industrial Electronics							
5	PCC	20APC0421	Microprocessors and Microcontrollers Laboratory	0	0	3	1.5	30	70	100
6	PCC	20APC0422	Digital Signal Processing Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0423	Microwave and Optical Communications Laboratory	0	0	3	1.5	30	70	100
8	SOC	20ASA0501	Basics of Cloud Computing	1	0	2	2	100	-	100
9	MC	20AMC9903	Environmental Studies	3	0	0	0	30	-	30
TOTAL							**18.5**	**340**	**490**	**830**
Internship 2 Months (Mandatory) during summer vacation										

VII Semester (B.Tech –IV year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PC	20APC0424	Pattern Recognition and Applications	3	0	0	3	30	70	100
2	PEC	20APE0407	Digital Image Processing	3	0	0	3	30	70	100
		20APE0408	Adaptive Signal Processing							
		20APE0409	Television Engineering							
3	PEC	20APE0410	Electronic Measurements and Instrumentation	3	0	0	3	30	70	100
		20APE0417	Sensors and IOT							
		20APE0412	RF Integrated Circuits							
4	PEC	20APE0413	Radar Systems	3	0	0	3	30	70	100
		20APE0414	Satellite Communications							
		20APE0415	Wireless Communications							
5	OEC	20APC0516	Computer Networks	3	0	0	3	30	70	100
		20APE0203	Neural Networks and Fuzzy Logic							
		20AOE0402	Bio Medical Instrumentation							
6	OEC	20APC0502	Data Base Management Systems	3	0	0	3	30	70	100
		20APE0416	Computer System Architecture							
		20AOE0301	Robotics							
7	SOC	20ASA0401	Embedded Systems and Unmanned Aerial Vehicle	1	0	2	2	100	-	100
8	PR	20APR0401	Evaluation of Industry Internship (III-II Summer Internship)	0	0	0	3	100	-	100
TOTAL							**23**	**380**	**420**	**800**

VIII Semester (B.Tech –IV year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	MOOCS	OE/PE	MOOC-NPTEL	0	0	0	3	25	75	100
2	PR	20APR0402	Internship	0	0	0	3	100	-	100
3	PR	20APR0403	Project work	0	0	0	9	60	140	200
TOTAL							**15**	185	215	400
Grand Total							**163**	2595	3925	6520

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

LIST OF COURSES FOR HONOURS in B.Tech -ECE

Note: Students can choose a few courses from the following list approved by BOS 4 credit courses based on the availability in SWYAM-NPTEL portal, and secure minimum of 20 credits on passing the selected courses.

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AHN0401	Automotive Electronics	12 Weeks	4
2	20AHN0402	Detection and Estimation of Signals	12 Weeks	4
3	20AHN0403	Probability Foundations for Electrical Engineers	12 Weeks	4
4	20AHN0404	Micro Electromechanical Systems	12 Weeks	4
5	20AHN0405	VLSI Testing and Testability	12 Weeks	4
6	20AHN0406	Scripting Languages	12 Weeks	4
7	20AHN0407	Artificial Neural networks	12 Weeks	4
8	20AHN0408	System on Chip Architecture	12 Weeks	4
9	20AHN0409	Machine learning	12 Weeks	4
10	20AHN0410	Data Analysis	12 Weeks	4
		TOTAL		**20**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

MINOR DEGREE IN ECE FOR CSE, AIDS, AIML, CE & ME

Note: Students of other programmes to get "minor in ECE" shall pass a few SWAYAM-NPTEL courses listed below which are approved by BOS and obtain 15 credits and submitting a minor discipline project in AIDS for scoring 5 credits is compulsory and all together total credits requirement count to be minimum of 20.

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AMN0401	Signals and Systems	12 Weeks	4
2	20AMN0402	Electronics Devices and Circuits	12 Weeks	4
3	20AMN0403	Digital Electronics and Logic Design	12 Weeks	4
4	20AMN0404	Digital Communications	12 Weeks	4
5	20AMN0405	Digital Signal Processing	12 Weeks	4
6	20AMN0406	Microprocessors and Micro Controllers	12 Weeks	4
7	20AMN0407	Sensors and IOT	12 Weeks	4
8	20AMN0408	Industrial Electronics	12 Weeks	4
9	20AMN0409	Internet of Things	12 Weeks	4
10	20AMN0410	**MINOR DISCIPLINE PROJECT IN ECE (COMPULSORY)**	-	4
		TOTAL		**20**

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❖ Visits to local Areas
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I B. Tech – I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	BSC	20ABS9902	Applied Physics	3	0	0	3	30	70	100
3	HSMC	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	*ESC	20AES0304	Engineering Workshop Practice	1	0	4	3	30	70	100
5	ESC	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	HSMC	20AHS9902	Communicative English Laboratory	0	0	2	1.5	30	70	100
7	BSCL	20ABS9907	Applied Physics Laboratory	0	0	3	1.5	30	70	100
8	ESC	20AES0503	Problem Solving and Programming Laboratory	0	0	3	1.5	30	70	100
TOTAL							**19.5**	**240**	**560**	**800**

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9901	ALGEBRA AND CALCULUS	3	0	0	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												

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B. Tech I Year I Semester

Course Code	Course Title	L	T	P	Credits
20ABS9902	APPLIED PHYSICS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Analyze the intensity variation of light due to interference, diffraction and polarization
CO2: Analyze and apply the concepts of LASERs and optical fibers.
CO3: Infer the properties of dielectric and magnetic materials.
CO4: Apply the fundamentals of semiconductors for device applications.
CO5: Implement the behavior of superconductors in diverse fields & interpret the properties of nanomaterials for multiple applications.

UNIT I:
OPTICS
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 FIBRE OPTICS
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
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
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
Superconductors-Properties-Meissner'seffect-BCSTheoryQualitative) -Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.
Nanomaterials–Significance of nanoscale - 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.

Text Books:

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.

Reference Books:

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)

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CLC	CREDITS
20AHS9901	COMMUNICATIVE ENGLISH	3	0	0	2	3

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

Reference Books

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

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

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

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

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

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

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		

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0304	ENGINEERING WORKSHOP PRACTICE	1	0	4	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Apply wood working skills in real world applications.

CO2: Build different parts with metal sheets in real world applications.

CO3: Apply fitting operations in various applications.

CO4: Apply different types of basic electric circuit connections

CO5: 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

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
ENGINEERING WORKSHOP PRACTICE	CO1	3					2			3			
	CO2			2									
	CO3		3			3							
	CO4				2								
	CO5	2		2						3			

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0501	PROBLEM SOLVING AND PROGRAMMING	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

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 1:

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

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

UNIT 2:

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

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

UNIT 3:

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

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

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

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

UNIT 4:

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

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

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

UNIT 5:

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

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

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

Text Books:

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

Reference Books:

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

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	**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)

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CLC	CREDITS
20AHS9902	COMMUNICATIVE ENGLISH LABORATORY	0	0	2	1	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO 1: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

CO 2: Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.

CO 3: Improve words knowledge and apply skills in various language learning activities.

CO 4: Analyze speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO 5: Evaluate and exhibit acceptable etiquette essentials in social and professional presentations.

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

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		

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9907	APPLIED PHYSICS LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: Analyze the wave properties of light and the interaction of energy with the matter.
CO2: Apply electromagnetic wave propagation in different guided media.
CO3: Asses the electromagnetic wave propagation and its power in different media.
CO4: Analyze the conductivity of semiconductors
CO5: Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

List of Experiments:

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

References:

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

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

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B. Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0503	PROBLEM SOLVING AND PROGRAMMING LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

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 linkedlist.
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.

References:

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

	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)

II Semester (B.Tech –I year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9906	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	BSC	20ABS9904	Chemistry	3	0	0	3	30	70	100
3	ESC	20AES0201	Network Theory	3	0	0	3	30	70	100
4	ESC	20AES0502	Data Structures	3	0	0	3	30	70	100
5	ESC	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
6	ESC	20AES0203	Network Theory Laboratory	0	0	3	1.5	30	70	100
7	BSC	20ABS9909	Chemistry Laboratory	0	0	3	1.5	30	70	100
8	ESC	20AES0504	Data Structures Laboratory	0	0	3	1.5	30	70	100
9	MC	20AMC9902	Constitution of India`	3	0	0	0	30		30
						TOTAL	**19.5**	**270**	**560**	**830**

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9906	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Apply the mathematical concepts of ordinary differential equations of higher order.
CO2: Solve the differential equations related to various engineering fields.
CO3: Identify solution methods for partial differential equations that model physical processes.
CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence
CO5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I:
LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER

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

UNIT II:
EQUATIONS REDUCIBLE TO LINEAR DIFFERENTIAL EQUATIONS AND APPLICATIONS

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

UNIT III:
PARTIAL DIFFERENTIAL EQUATIONS – FIRST ORDER

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

UNIT IV:
VECTOR DIFFERENTIATION

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

UNIT V:
VECTOR INTEGRATION

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

Text Books :

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

References:

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

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												

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9904	CHEMISTRY	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Interpret the behavior of, and interactions between matter and energy at both the atomic and molecular levels.

CO2: Apply the electrochemical principles to the construction of batteries, fuel cells and electro chemical sensors .

CO3: Outline the preparation, mechanism properties and applications of polymer and conducting polymers

CO4: Analyze the separation of gaseous and liquid mixtures using Instrumental methods and their applications

CO5: Understand the disadvantages of using hard water in domestically and industrially and select suitable treatments.

UNIT 1:
STRUCTURE AND BONDING MODELS

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

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 conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

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

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

UNIT 3:
POLYMER CHEMISTRY

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

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

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

UNIT 4:
INSTRUMENTAL METHODS AND APPLICATIONS

Principle and applications of Colorimetry, AAS, AES, UV-Viscible spectrophotometry (Beer-Lambert‘s law, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC),

separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

UNIT 5:
WATER TECHNOLOGY

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

Text books:

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

Reference books:

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

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									

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0201	NETWORK THEORY	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Solve network problems using mesh and nodal analysis techniques.

CO2: Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition and Millman theorems.

CO3: Compute responses of first order and second order networks using time & frequency domain analysis.

CO4: Design resonant circuits for given bandwidth

CO5: Utilize Z, Y, ABCD and h parameters for analyzing two port circuit behaviors.

UNIT I:

INTRODUCTION TO ELECTRICAL CIRCUITS

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff's laws, Star–to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations

UNIT II:

NETWORK THEOREMS

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Tellegan's Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

UNIT III:

TRANSIENTS

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non- homogenous, problem solving using R-L-C elements with DC excitation. Solutions using Laplace transform method.

UNIT IV:

RESONANCE AND COUPLED CIRCUITS

Self-inductance, Mutual inductance, dot rule, coefficient of coupling, Analysis of multi-windingcoupled circuits, series & parallel connection of coupled inductors.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance,

Parallel resonance, Condition for maximum impedance, current in anti-resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti-resonance at all frequencies.

UNIT V:

TWO PORT NETWORKS & NETWORK FUNCTIONS

Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship betweenparameters, interconnection of two port networks.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of networkfunction

Text Books:

1. W. H. Hayt and J. E. Kemmerly, —Engineering Circuit Analysis¦, McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, —Network Analysis¦, Prentice Hall, 2006.

References:

1. D. Roy Choudhury, —Networks and Systems¦, New Age InternationalPublications,1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Bhise, Chadda, Kulshreshtha, —Engineering network analysis and filter design¦ UmeshPublication, 2000.
4. Joseph Edminister and Mahmood Nahvi, —Electric Circuits¦, Schaum‘s Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

Mapping of course outcomes with program outcomes

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

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0502	DATA STRUCTURES	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Analyze and evaluate the efficiency of an algorithm
CO2: Implement linear data structures
CO3: Implement non -linear data structures
CO4: Solve the problem of efficiently using graphs and Hashing techniques
CO5: Implement advanced sorting and organizing the file

UNIT 1:
INTRODUCTION

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

UNIT 2:
STACK, QUEUE AND LINKED LISTS

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

UNIT 3:
TREES

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

UNIT 4 :
GRAPHS AND HASHING

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

UNIT 5:
FILES AND ADVANCED SORTING

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

Text Books:

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

Reference Books:

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

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	3	3										2	2	
CO2	3	2	2		2							1	2	1
CO3	3	2	2		2							1	2	1
CO4	3	2	2	2								1	2	2
CO5	3	2	2	2	2							1	2	2

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0301	ENGINEERING GRAPHICS	1	0	4	3

Course Outcomes: At the end of the course, the learners will be able to

CO: 1 Draw various curves applied in engineering.
CO: 2 Draw the projection of points and lines located in different quadrants
CO: 3 Draw the projection 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
c) Involutes

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.

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 and Reference Books:

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

Additional Sources

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

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			

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0203	NETWORK THEORY LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: Verify Kirchhoff's laws and network theorems.

CO2: Measure time constants of RL & RC circuits.

CO3: Analyze behavior of RLC circuit for different cases.

CO4: Design resonant circuit for given specifications

CO5: Characterize and model the network in terms of all network parameters.

List of Experiments:

Any 10 of the following experiments are to be conducted in Hardware & Simulation(Multisim/Open source software):

1. Verification of Kirchoff's Laws
2. Apply Mesh & Nodal Analysis techniques for solving electrical circuits (problems with dependentsources also)
3. Verification of Superposition & Reciprocity Theorem
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Measure and calculate RC time constant for a given RC circuit
7. Measure and calculate RL time constant for a given RL circuit
8. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a givenseries RLC circuit for following cases:
   a) =1 (critically damped system)
   b) >1(over damped system)
   c) <1 (under damped system)
9. Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
10. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency ,Bandwidth , Q – factor.
11. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency, Bandwidth, Q – factor.
12. Measure and calculate Z, Y parameters of two-port network.
13. Measure and calculate ABCD & h parameters of two-port network.

Mapping of course outcomes with program outcomes

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

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9909	CHEMISTRY LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

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 TIO_2/ZnO nano particles
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										

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0504	DATA STRUCTURES LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: Select the data structure appropriate for solving the problem
CO2: Implement searching and sorting algorithms
CO3: Derive new data types
CO4: Illustrate the working of linear and non linear data structures
CO5: Organize the data using files structures

Laboratory Experiments

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

row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

Textbooks:

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

Reference Books:

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

Online Learning Resources:

https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F

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	2	
CO2	3	2	2	2	2							1	2	2
CO3	3	2	2	2								1	2	1
CO4	3	2	2	2	2							1	2	
CO5	3	2	2	2								1	2	

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B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9902	CONSTITUTION OF INDIA	**3**	**0**	**0**	**0**

Course Outcomes: At the end of the course, the learners will be able to

CO 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.

CO 2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO 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.

CO 4: Discuss the Powers and functions of Governor, President, and Judiciary.

CO 5: Discuss the functions of local administration bodies.

UNIT:1

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

UNIT:2

Philosophy of the Indian Constitution - Preamble Salient Features

UNIT:3

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

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

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

Suggested books for reading:

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

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						

III Semester (B.Tech –II year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	BSC	20ABS9912	Transform Techniques and Complex Variables	3	0	0	3	30	70	100
2	PCC	20APC0401	Electronic Devices and Circuits	3	0	0	3	30	70	100
3	PCC	20APC0402	Switching Theory and Logic Design	3	0	0	3	30	70	100
4	PCC	20APC0403	Signals and Systems	3	0	0	3	30	70	100
5	HSMC	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	PCC	20APC0404	Electronic Devices and Circuits Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0405	Signals and Systems Laboratory	0	0	3	1.5	30	70	100
8	PCC	20APC0406	Switching Theory and Logic Design Laboratory	0	0	3	1.5	30	70	100
9	SOC	20ASC0401	Electronic Circuit Design	1	0	2	2	100	-	100
10	MC	20AMC9901	Biology for Engineers	2	0	0	0	30		30
TOTAL							**21.5**	**370**	**560**	**930**

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20ABS9912	**TRANSFORM TECHNIQUES AND COMPLEX VARIABLES**	3	0	0	3

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:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – II, S.Chand publications.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
5. 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													

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B. Tech II Year III Semester

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 High)

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0402	SWITCHING THEORY AND LOGIC DESIGN	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: To introduce basic postulates of Boolean algebra.
CO2: To introduce basic methods for simplifying Boolean expressions.
CO3: To illustrate the concepts and study the procedures for the analysis and design of combinational circuits.
CO4: To illustrate the concepts and study the procedures for the analysis and design of sequential circuits.
CO5: To introduce the concepts of programmable logic devices.

UNIT I:
NUMBER SYSTEM AND BOOLEAN ALGEBRA
Number System: Digital Systems, Binary Numbers, Number base conversions, complements of numbers, Signed binary numbers, Binary codes.
Boolean Algebra: Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.
UNIT II:
GATE LEVEL MINIMIZATION:
The map method, four variable & Five variable K-map, POS & SOP Simplification, don't care conditions, NAND & NOR Implementation, Other two-level Implementation, Ex-or Function.
Tabular Method- Simplification of Boolean function using tabulation Method.
UNIT III:
COMBINATIONAL LOGIC CIRCUITS
Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.
UNIT IV:
SEQUENTIAL LOGIC CIRCUITS
Sequential Circuits: Latches, Flips-Flops - RS, JK, Master-Slave JK, D & T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters.
Asynchronous sequential circuits: Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.
UNIT V:
PROGRAMMABLE DEVICES:
Memory organization, classification of semiconductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD, Flash memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

Text Books:

1. M.Morris Mano & Michel D. Ciletti,"Digital Design", 5th Edition Pearson.
2. Zvi Kohavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", 3rd Edition Cambridge.

Reference Books:

1. Subratha Goshal, "Digital Electronics", Cambridge
2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD

Mapping of course outcomes with program outcomes

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

(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

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
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AK20-REGULATIONS

B. Tech II Year III Semester

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 AND SCIENCES, TIRUPATI
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B. Tech II Year III Semester

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 LABORATORY

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

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 AND SCIENCES, TIRUPATI
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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0405	SIGNALS AND SYSTEMS LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand basics of MATLABORATORY syntax, functions and programming.
CO2: Generate and characterize various signals and perform the basic operations
CO3: Design and analyze linear time-invariant (LTI) systems and compute its response
CO4: Analyze the spectral characteristics of signals using Fourier analysis.
CO5: Analyze the systems using Laplace transforms and Z-transforms.

LIST OF EXPERIMENTS

1. Write program to generate Standard Signals/Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings. Plot the discrete spectrum of the signal.
4. Write program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write program to convolve two discrete time sequences. Plot all the sequences.
6. Write program to find autocorrelation and cross correlation of sequences.
7. Write program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write program for removal of noise by Autocorrelation / Cross correlation
12. Write a program for waveform Synthesis using Laplace Transform and to plot pole-zero diagram in S-plane / Z-plane of given signal/sequence

Note: All the experiments are to be simulated using MATLABORATORY or equivalent software

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	2
CO2	3	2											2	2
CO3		3	3		1								2	3
CO4		3	2										1	3
CO5	2	3	3		3								1	3

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

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0406	SWITCHING THEORY AND LOGIC DESIGN LABORATORY	0	0	3	1.5

Course Outcomes:

Upon completion of the course students will be able to

CO1: Ability to verify all logic gates.
CO2: Ability to Design combinational circuits.
CO3: Ability to design flip flops.
CO4: Ability to design counters.
CO5: Ability to design sequence generator.

LIST OF EXPERIMENTS:

1. Verification of Basic Logic Gates
2. Realization of basic gates using Universal Gates
3. Half adder and Full Adder
4. Half Subtractor and Full Subtractor
5. Parallel Adder/Subtractor
6. Code Converters
7. Encoder/Decoder
8. Flip-Flops
9. Shift Registers
10. Counters
11. Johnson/Ring Counters
12. Sequence Generator

Mapping of course outcomes with program outcomes

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

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

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
Skill Oriented Course					
20ASC0401	ELECTRONIC CIRCUIT DESIGN	1	0	2	2

Course Outcomes:
Upon completion of the course students will be able to:
CO1: Identify basic Electronic Components
CO2: Understand Fundamentals of Circuit Design.
CO3: Construct different Power Supply circuits.
CO4: Analyze Printed Circuit Boards.
CO5: Design a Electronic circuit as a mini project.

List of Contents

1. IDENTIFICATION OF ELECTRONIC COMPONENTS:
Samples of Wire, Coaxial Cable, Capacitors, Diodes, Fuses, Integrated Circuits, Light Emitting Diodes (LED), Transistors, Resistors, Rectifiers, Zener Diodes, Solder, Transformers, Potentiometer, Photo Resistors.

2. FUNDAMENTALS OF CIRCUIT DESIGN:
Diode applications, Clipping and Clamping Circuits with Diodes, Rectifier Circuits, Transistors, Selection and analysis of Components, sensing devices and display devices.

3. POWER SUPPLY DESIGN:
Introduction to various types of power supplies. Estimation of power supply requirements and power loss in electronic products. Selection of appropriate power supplies for the given primary power sources (230VAC/Battery).

4. EVOLUTION AND CLASSIFICATION OF PRINTED CIRCUIT BOARDS:
Challenges in Modern PCB, Design and Manufacturing, PCB fabrication, PCB design considerations/ design rules for analog, digital and power applications.

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

Mapping of course outcomes with program outcomes

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

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

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

Course Code	Course Title	L	T	P	Credits
20AMC9901	BIOLOGY FOR ENGINEERS	2	0	0	0

Course Outcomes:

Upon completion of the course students will be able to

CO1: Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.

CO2: Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.

CO3: Brief about human physiology.

CO4: Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.

CO5: 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

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

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

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

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

UNIT V:

APPLICATION OF BIOLOGY

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

Text Books:

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

Reference Books:

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

IV Semester (B.Tech –II year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	ESC	20AES0509	Basics of Python Programming	3	0	0	3	30	70	100
2	PCC	20APC0407	Probability Theory and Stochastic Process	3	0	0	3	30	70	100
3	PCC	20APC0408	Electromagnetic Theory and Transmission Lines	3	0	0	3	30	70	100
4	PCC	20APC0409	Analog Communication Systems	3	0	0	3	30	70	100
5	PCC	20APC0410	Electronic Circuit Analysis	3	0	0	3	30	70	100
6	ESC	20AES0510	Basics of Python Programming Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0411	Analog Communication Systems Laboratory	0	0	3	1.5	30	70	100
8	PCC	20APC0412	Electronic Circuit Analysis Laboratory	0	0	3	1.5	30	70	100
9	SOC	20ASC0402	Internet of Things	1	0	2	2	100	-	100
10	HSC	20AHS9905	Universal Human Values	2	1	0	3	30	70	100
TOTAL							**24.5**	**370**	**630**	**1000**

Community service Project with credits

(To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester)

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B. Tech II Year IV Semester

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

Course Outcomes:

Student should be able to

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:

INTRODUCTION: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

FUNCTIONS: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

UNIT II:

CASE STUDY: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

CONDITIONALS AND RECURSION: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

FRUITFUL FUNCTIONS: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

UNIT III:

ITERATION: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms. Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

CASE STUDY: Reading word lists, Search, Looping with indices.

LISTS: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

UNIT IV:

DICTIONARIES: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

TUPLES: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

FILES: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

CLASSES AND OBJECTS: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

UNIT V:

CLASSES AND FUNCTIONS: Time, Pure functions, Modifiers, Prototyping versus Planning

CLASSES AND METHODS: Object oriented features, Printing objects, The init method, Thestrmethod, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

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

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

Text Books:

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".

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 AND SCIENCES, TIRUPATI
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B. Tech II Year IV Semester

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

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand the concepts of probability and random variables.

CO2: Understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.

CO3: Understand the concepts of Random Process and its Temporal Characteristics.

CO4: Understand the concepts of Random Process and its Spectral Characteristics.

CO5: Understand the Spectral characteristics of response of an LTI system.

UNIT I:

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

UNIT II:

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

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

UNIT III:

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

Correlation- Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT IV:

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

UNIT V:

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross- Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

B. Tech II Year IV Semester

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

Course Outcomes:

Upon completion of the course students will be able to

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

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

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

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

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

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.
3. John D. Krauss, "Electromagnetics", McGraw- Hill publications.

Reference Books:

1. Electromagnetics, Schaum's outline series, Second Edition, Tata McGraw-Hill publications, 2006.
2. E.C.Jordan and K.G.Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 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	2	1									2	1
CO2	3	2	2	1									2	1
CO3	3	3	2	2									2	1
CO4	2	2	1	2									2	2
CO5	2	2	2	1									2	1

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

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

B. Tech II Year IV Semester

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

Course Outcomes:
This course provides the foundational education in Analog Communication systems, and applications. The students are provided the learning experience through class room teaching and solving assignment & tutorial problems. At the end of course, students should be able to:
CO-1: Acquire knowledge on the basic concepts of Analog Communication Systems.
CO-2: Analyze the analog modulated and demodulated systems.
CO-3: Analyze the performance of the communication system in presence of noise
CO-4: know the working of various transmitters and receivers
CO-5: Know the fundamental concepts of information and capacity.

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

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

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

UNIT IV:

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

RADIO RECEIVER MEASUREMENTS: Sensitivity, Selectivity, and fidelity.

UNIT V:

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

Text Books:

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

Reference Books:

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

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	1
CO2	3	2	1										3	2
CO3	3	1	2										3	2
CO4	3	3	2										3	1
CO5	3	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 IV Semester

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

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

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

UNIT II:
HIGH FREQUENCY TRANSISTOR AMPLIFIERS- BJT
Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, Single Stage CE Amplifier frequency response with short circuit load and resistive load, gain cutoff frequencies, Gain- Bandwidth Product, Emitter follower at higher frequencies, Illustrative design problems.
FET: FET at High Frequencies, High Frequencies FET Model, Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

UNIT III:
FEEDBACK AMPLIFIERS AND OSCILLATORS
FEEDBACK AMPLIFIERS: Concepts of Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics: Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.
OSCILLATORS: Introduction, Classification of Oscillators, Conditions for Oscillations, RC and LC Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitt's Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

UNIT IV:

POWER AMPLIFIERS

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

UNIT V:

TUNED AMPLIFIERS

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

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

Course Outcomes:

Student should be able to

CO1: 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

LABORATORY EXPERIMENTS

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. .Write a function that draws a grid like the following**:**

```
+ - - - - + - - - +

|    |         |
|    |         |
|    |         |
|    |         |
+ - - - - + - - -- +

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

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

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

   Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral

6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January1970.

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

   Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.
8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function.
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of 1/ π: Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

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

    It should use a while loop to compute terms of the summation until the last term is smaller than $1e^{-15}$

    (Which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.
11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
12. Given a text of characters, write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say „n", Rotate each character by „n" positions and print it. Note that „n" can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. Write program which performs the following operations on list's. Don't use built-in functions
    a) Updating elements of a list
    b) Concatenation of list's
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list
    g) Sorting of list
    h) Finding biggest and smallest elements in the list
    i) Finding common elements in the list

17. Write a program to count the number of vowels in a word.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lower case.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <=59)

Reference Books:

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-Moderate, 3 High)

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

B. Tech II Year IV Semester

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

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

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

EQUIPMENT REQUIRED FOR THE LABORATORY

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

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

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

Mapping of course outcomes with program outcomes

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

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

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

B. Tech II Year IV Semester

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

Course Outcomes:

CO1: The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.

CO2: Designing and analyzing the transistor at high frequencies.

CO3: Determine the efficiencies of power amplifiers.

CO4: Determine Frequency response and design of tuned amplifiers.

CO5: Able to Analyze all the circuits using simulation software and Hardware.

LIST OF EXPERIMENTS:

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

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

SOFTWARE REQUIRED FOR LABORATORY

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

EQUIPMENT REQUIRED FOR LABORATORY

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

12. CRO Probes etc.

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	1
CO2	1	2	3										2	
CO3		3	2										3	
CO4		2	3										3	1
CO5		2	3										2	3

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech II Year IV Semester

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

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

List of Contents

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

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

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

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

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

Mapping of course outcomes with program outcomes

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

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

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

UNIT 1:

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

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

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

UNIT II:

Understanding Harmony in the Human Being - Harmony in Myself!

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

Include practice sessions to discuss the role others have played in making material goods

avaiLaboratoryle to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III:

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

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

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

UNIT IV:

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

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

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

UNIT- V:

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

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

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

Course Outcomes:

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

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

TEXT BOOKS

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

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

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)**

V Semester (B.Tech –III year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PCC	20APC0413	Antennas and Wave Propagation	3	0	0	3	30	70	100
2	PCC	20APC0414	Digital Communication Systems	3	0	0	3	30	70	100
3	PCC	20APC0415	Integrated Circuits and Applications	3	0	0	3	30	70	100
4	OEC	20APC0515	Operating Systems	3	0	0	3	30	70	100
		20AOE0202	Programmable Logic Controllers							
		20APC0213	Control Systems							
5	PEC	20APE0401	VLSI Design	3	0	0	3	30	70	100
		20APE0402	Computer Organization							
		20APE0403	Digital System Design							
6	PCC	20APC0416	Digital Communication Systems Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0417	Integrated Circuits and Applications Laboratory	0	0	3	1.5	30	70	100
8	SOC	20AHE9902	Principles of Effective Public Speaking	1	0	2	2	100	-	100
9	MC	20AMC9904	Professional Ethics and Human Values	3	0	0	0	30	-	30
10	CSP	20CSP0401	Community Service Project	0	0	0	1.5	100	-	100
TOTAL							**21.5**	**440**	**490**	**930**

S.	Professional Elective*	Open Elective*
1	Electronic Systems for Cancer Diagnosis	The Joy of Computing Using Python
2	Microelectronics: Devices to Circuits	Computer Architecture
3	Nanobiophotonics: Touching Our Daily	An Introduction to Artificial
4	Fabrication Techniques for MEMS-Based	Environment and Development
5	Transducers for Instrumentation	Soft Skills
6	Design of Photovoltaic System	Public Speaking
7	Modern Digital Communication	Ethical Hacking
8	Introduction to Photonics	Cloud Computing
9	Introduction To Wireless and Cellular	Remote Sensing Essentials
10	Stochastic Control and Communication.	Sustainable Transportation Systems

*Student shall register any number of MOOC courses listed above (Professional/Open) by the department as approved by the BOS from III year. But student is required to submit the pass certificate on NPTEL platform for at least one course with in the Programme duration (Before IV-II examination notification released).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0413	ANTENNAS AND WAVE PROPAGATION	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Apply parametric equations for the calculation of antenna parameters in far field region.
CO2: Identify Loop antenna, helical antenna, horn antenna and its parameters.
CO3: Compute Micro-strip antenna, Reflector and Lens antennas and its parameters.
CO4: Analyze principle of pattern multiplication for antenna arrays.
CO5: Illustrate different modes of Wave propagation in atmospheric layers.

UNIT I:

ANTENNA BASICS

Introduction, Basic antenna parameters - patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain, Antenna Apertures, Effective height, Polarization - Linear, Elliptical, & Circular polarizations, Antenna impedance, Front–to-back ratio, Antenna theorems.

DIPOLE ANTENNAS

Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, Fields from oscillating dipole, Illustrative problems.

UNIT II:

VHF, UHF AND MICROWAVE ANTENNAS-I

Loop Antennas: Introduction, Small Loop, Comparison of far fields of small loop and short dipole. **Arrays with Parasitic Elements:** Yagi - Uda Arrays, Folded Dipoles & their characteristics. **Helical Antennas:** Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. **Horn Antennas:** Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT III:

VHF, UHF AND MICROWAVE ANTENNAS-II

Micro strip Antennas: Introduction, features, advantages and limitations, rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics. **Reflector antennas:** Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features. **Lens Antennas:** Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications, Illustrative Problems.

UNIT IV:

ANTENNA ARRAYS

Definition, Patterns, arrays of 2 Isotropic sources different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays.

ANTENNA MEASUREMENTS

Introduction, Near and Far Fields, Pattern Measurement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT V:

WAVE PROPAGATION

Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts.

Ground wave propagation: Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections.

Space wave propagation: Introduction, Super refraction, duct propagation, fading and path loss calculations.

Sky wave propagation: Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi - HOP propagation, Illustrative problems.

Text Books:

1. John D. Kraus and Ronald J. Marhefka and Ahmad S. Khan, "Antennas and wave propagation," TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems," PHI, 2ndEdn, 2000.

Reference Books:

1. C.A. Balanis, "Antenna Theory- Analysis and Design," John Wiley & Sons, 2nd Edn., 2001.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation," Tech. India Publications, New Delhi, 2001.

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
Antennas and Wave Propagation	CO1	3	3	2	3									3	
	CO2	1	3	1	3								2	2	1
	CO3	1	3	2	3								2	2	1
	CO4		3	2	3									3	
	CO5	1	3	2	3									3	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0414	DIGITAL COMMUNICATION SYSTEMS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand the various pulse code modulation techniques.

CO2: Analyze and compute performance parameters in baseband pulse transmission.

CO3: Apply the knowledge of signal representations and describe their error probabilities in Digital Communication Systems.

CO4: Understand and analyze systems based on digital modulation techniques..

CO5: Analyze various Error detection and Error correction codes in Digital Communication Systems.

UNIT I:
SOURCE CODING SYSTEMS

Introduction, sampling process, quantization, quantization noise, Pulse-Code Modulation (PCM), Line codes-Types, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.

UNIT II:
BASEBAND PULSE TRANSMISSION

Introduction, optimum filter, Matched filter, Properties of Matched filter, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Eye diagrams.

UNIT III:
SIGNAL SPACE ANALYSIS

Introduction, Geometric representation of signals, Gram Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

UNIT IV:
PASS BAND DATA TRANSMISSION

Introduction, Pass band transmission model, Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals

UNIT V:

CHANNEL CODING

Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Code tree, state diagram, code trellis, Decoding Methods-Viterbi algorithm.

Text Books:

1. Simon Hakin, "Communication Systems," Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, "Modern Digital & Analog Communication Systems", Oxford University Press, International 4th edition, 2010.

Reference Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley,2005
2. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010
3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009. 5. J. G. Proakis, M Salehi, Gerhard Bauch, "Modern Communication Systems Using MATLABORATORY," CENGAGE, 3rd 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 Communication systems	CO1	3	2	2	1									2	1
	CO2	3	2	3	2									3	1
	CO3	3	1	1	2									2	2
	CO4	3	2	2	1									3	2
	CO5	3	3	2	2									2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0415	INTEGRATED CIRCUITS AND APPLICATIONS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand the basic building blocks of linear integrated circuits and its characteristics.
CO2: Analyze different feedback amplifiers and its frequency response.
CO3: Compare linear and non-linear applications of operational amplifiers.
CO4: Illustrate the importance of specialized applications of Operational Amplifier by using specialized ICs.
CO5: Describe the different types of A/D and D/A converters.

UNIT I:
DIFFERENTIAL AMPLIFIERS: Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.
OPERATIONAL AMPLIFIERS: Introduction, Block diagram, Ideal op-amp, Equivalent Circuit, VoltageTransfer curve, open loop op-amp configurations. Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

UNIT II:
FEED BACK AMPLIFIERS: Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.
FREQUENCY RESPONSE: Introduction, compensating networks, frequency response of internally compensated op-amps and non-compensated op-amps, High frequency op-amp equivalent circuit, open loop gainVs frequency, closed loop frequency response, circuit stability, slew rate.

UNIT III:
OP-AMP APPLICATIONS-1: DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First and Second order Butterworth filter and its frequency response.

UNIT IV:
OP-AMP APPLICATIONS -2: Oscillators, Phase shift and Wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.
SPECIALIZED APPLICATIONS: 555 timer IC (monostable & astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and

phase detection.

UNIT V:

A/D AND D/A CONVERTERS: Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample- and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type –Counter type ADC– Dual Slope type ADC.

Text Books:

1) D. Roy Chowdhury, "Linear Integrated Circuits", New Age Int. (P) Ltd, 2nd Edition, 2003.

2) K. LalKishore,"Operational Amplifiers & Linear Integrated Circuits", Pearson Education, 2007.

Reference Books:

1) Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 4th Edition, 1987.

2) R.F.Coughlin & Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits", 6th Edition, PHI.

3) David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd Edition, 2010.

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	PSO1	PSO 2
Integrated Circuits and Applications	CO1	3	2	3										1	2
	CO2	3	2	3										1	2
	CO3	3	2	3										1	2
	CO4	2	2	3		3								1	2
	CO5	2	2	3		3								1	2

NNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0515	OPERATING SYSTEMS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Distinguish between the different types of operating system environments.
CO2: Apply the concepts of process synchronization & CPU scheduling.
CO3: Develop solutions to deadlock and memory management.
CO4: Analyze various disk scheduling algorithms and file system interfaces.
CO5: Analyze the various security issues and goals of protection.

UNIT I:

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT II:

Threads: overview, Multi-core Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

Process Synchronization: The critical-section problem, Peterson‘s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

UNIT III:

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT IV:

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File

system mounting, File sharing, Protection.

File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

UNIT V:

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.

Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability-Based systems, Language – Based Protection

Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

Text Books:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley, Eight Edition, 2018

Reference Books:

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Operating Systems, A.S.Godbole, Second Edition, TMH.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
6. Operating Systems, R.Elmasri, A,G.Carrick and D.Levine, Mc Graw Hill.
7. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
8. Operating System Desgin, Douglas Comer, CRC Press, 2nd Edition.
9. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/ http://peterindia.net/OperatingSystems.html

Mapping of Course OutComes With Program Outcomes:

Mapping of course outcomes with program outcomes

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

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

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

Course Code	Course Title	L	T	P	Credits
20AOE0202	PROGRAMMABLE LOGIC CONTROLLERS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand the purpose, functions, and operations of a PLC and Identify the basic components of the PLC and how they function.

CO2: View a directory of processor files using PLC software and Ability to gain knowledge on Programmable Logic Controllers.

CO3: Will understand different types of Devices to which PLC input and output modules are Connected and To provide the knowledge about understand various types of PLC registers.

CO4: Able to create ladder diagrams from process control descriptions.

CO5: Ability to apply PLC timers and counters for the control of industrial processes. Able to use different types PLC functions, Data Handling Function.

UNIT - I

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT - II

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT - III

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT - IV

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT - V

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

Text Books:

1. "John W Webb and Ronald A Reiss", Programmable Logic Controllers – Principle and Applications, PHI, 5th Edition 2003.
2. "JR Hackworth and F. D Hackworth Jr", Programmable Logic Controllers – Programming Method and Applications by - Pearson, 2004

Reference Books:

1. "W. Bolton", Programmable Logic Controllers, Newnes, 4th Edition 2000.

Mapping of Course OutComes With Program Outcomes:

	PO1	PO2	PO 3	PO4	PO5	PO 6	PO7	PO8	PO9	PO1 0	PO11	PO12	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
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AK20-REGULATIONS

B.Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0213	CONTROL SYSTEMS	3	0	0	3

Course Outcomes:

Upon the completion of the course, students will be able to

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 - The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT- IV
FREQUENCY RESPONSE ANALYSIS

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 - Polar 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 - Block diagrams. Diagonalization, Transfer function from state model-State

Transition Matrix and it's Properties-System response through State Space models-The concepts of controlLaboratoryility and observability, Duality between controlLaboratoryility 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
4. Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
5. Graham C. Goodwin, "Control System Design" Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
6. 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

Course Code	Course Title	L	T	P	Credits
20APE0401	VLSI DESIGN	3	0	0	3

Course Outcomes:

Upon the completion of the course, students will be able to

CO1: Understand the IC fabrication process of MOS Transistors and Their Electrical Properties.
CO2: Understand and analyze the basic Integrated circuits.
CO3: Design VLSI circuits at Gate-level using stick diagrams and layouts.
CO4: Implement VLSI circuits at Physical-level through various design styles
CO5**:** Testing of integrated circuits using VHDL synthesis and VLSI circuits.

UNIT-I

IC Fabrication: MOS transistors – working, MOS switches, Basic steps of IC fabrication-PMOS, NMOS, CMOS & BiCMOS, and SOI process technologies.

Basic Electrical Properties of MOS and BiCMOS Circuits: MOS design equations: Ids–Vds relationship, Threshold Voltage, Body effect, Channel length modulation ,gm, gds, figure of merit ω0; Pass transistor, NMOS Inverter, CMOS Inverter analysis and design, Various pull-ups loads, BiCMOS Inverters.

UNIT-II

Basic Circuit Concepts: Capacitance, resistance estimations- Sheet Resistance Rs, MOS Device Capacitances, routing Capacitance, Analytic Inverter Delays, Driving large Capacitive Loads, Fan-in and fan-out.

UNIT-III

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Gate-level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits: Psuedo NMOS Logic, Dynamic CMOS Logic.

UNIT-IV

Physical Design: Floor Planning Methods, Global Interconnect, Floor Plan Design.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.

UNIT-V

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

Test and Testability: Fault-modeling and simulation, test generation, design for testability: Built-in-self-test.

TEXT BOOKS:

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, ‖Essentials of VLSI circuits and systems‖, PHI, 2013 Edition.
2. K. Lal Kishore and V.S.V. Prabhakar,‖VLSI Design‖, IK Publishers

REFERENCES:

1. Weste and Eshraghian,–Principles of CMOS VLSI Design‖, Pearson Education,1999.
2. Wayne Wolf, –Modern VLSI Design‖, Pearson Education, 3rd Edition, 1997.
3. John P. Uyemura, –Chip Design for Submicron VLSI: CMOS layout and Simulation‖, Thomson Learning.
4. Fault Tolerant and Fault Testable Hardware Design, ParagK.Lala

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
VLSI Design	CO 1	3	2										2	1	
	CO 2	3	2	3	1	1							2	3	3
	CO 3	1	2	3	2	2							3	3	3
	CO 4	3	2	3	3	3							3	3	3
	CO 5	2	1	2	3	3							3	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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AK20-REGULATIONS

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APE0402	COMPUTER ORGANIZATION	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Remember basic operations about computer

CO2: Illustrate various configurations avaiLaboratoryle in processor operations

CO3: Compute different arithmetic operations done by a computer

CO4: Analyze peripheral devices and its internal interfacing with computer

CO5: Implement parallel processing techniques in computer operations.

UNIT-I

BASICS RELATED TO COMPUTER

Computer types, Functional units, basic operational concepts, Bus structures, Data types, Software: Languages and Translators, Loaders, Linkers, Operating systems. Memory locations – addresses and encoding of information – main memory operations – Instruction formats and instruction sequences – Addressing modes and instructions – Simple input programming – pushdown stacks – subroutines.

UNIT-II

COMPUTER CONFIGURATION PROCESSING

Register transfer Language, Register transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, shift Micro operations, Arithmetic Logic Shift Unit. Stack organization, instruction formats, Addressing modes, Data transfer and manipulation, Execution of a complete instruction, Sequencing of control signals, Program Control.

UNIT-III

ARITHMETIC OPERATIONS

Control Memory, address Sequencing, Micro Program Example, Design of Control Unit. Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT-IV

PERIPHERAL DEVICES AND ITS INTERFACING

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication. Memory hierarchy, main memory, auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

UNIT-V

PARALLEL PROCESSING

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors. Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.

Text Books:

1.M. Morris Mano, “Computer system Architecture”, Prentice Hall of India (PHI), Third edition.

2. William Stallings,"Computer organization and programming", Prentice Hall of India(PHI) Seventh Edition, Pearson Education(PE) Third edition, 2006.

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	PSO1	PSO 2
Computer Organization	CO1	3	1										1	1	2
	CO2	3		3	1								2	1	2
	CO3	2	3	3	2								2	2	3
	CO4	3	1	3									1	1	2
	CO5	3	2	2	1								2	2	3

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AK20-REGULATIONS

B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APE0403	DIGITAL SYSTEM DESIGN	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand and analyze different Logic families and its interfacing

CO2: Design different applications by understanding VHDL

CO3: Analyze different combinational circuits and its logic

CO4: Design logical analysis of different sequential circuits.

CO5: Apply logical synthesis on designing applications.

UNIT-I

CMOS LOGIC:

Introduction to logic families, CMOS logic, CMOS logic families; BIPOLAR LOGIC AND INTERFACING: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families.

UNIT-II

HARDWARE DESCRIPTION LANGUAGES:

HDL Based Digital Design, The VHDL Hardware Description Language–Program Structure, Types, Constants and Arrays, Functions and procedures, Libraries and Packages, Structural design elements, Dataflow design elements, Behavioral design elements, The Time Dimension, Simulation, Test Benches, VHDL Features for Sequential Logic Design, Synthesis.

UNIT-III

COMBINATIONAL LOGIC DESIGN PRACTICES:

Description of basic structures like Decoders, Encoders, Comparators, Multiplexers (74 –series MSI); Design of complex Combinational circuits using the basic structures; Designing Using combinational PLDs like PLAs, PALs ,PROMs CMOS PLDs; Adders & subtractors, ALUs, Combinational multipliers; VHDL models for the above standard building block ICs.

UNIT-IV

SEQUENTIAL MACHINE DESIGN PRACTICES:

Review of design of State machines; Standard building block ICs for Shift registers, parallel / serial conversion , shift register counters, Ring counters; Johnson counters, LFSR counter ; VHDL models for the above standard building block ICs. Synchronous Design example using standard ICs

UNIT –V

DESIGN EXAMPLES (USING VHDL):

Barrel shifter, comparators, floating-point encoder, and dual parity encoder. Sequential logic Design: Latches & flip flops, PLDs and their VHDL models.

Text Books:

1.John F.Wakerly ,“Digital Design Principles and Practices” 4th edition, Pearson Education., 2009

2.Charles H.Roth,Jr., “Fundamentals of Logic Design” 5th edition , CENGAGE Learning 2012.

Reference Books:

1. M.Morris Mano and Michael D. Cilleti., “Digital Logic Design” 4th edition Pearson

Education., 2013
2. Stephen Brown and ZvonkoVranesic, “Fundamentals of digital logic with VHDL design” 2nd edition McGraw Hill Higher Education.
3. J. Bhasker, “A VHDL PRIMER” 3rd edition Eastern Economy Edition, PHI Learning,2010

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	PSO1	PSO2
Digital System Design	CO1	2		3	2									2	
	CO2	3		3										2	
	CO3	3		3										1	1
	CO4	2		3										1	1
	CO5	2	2	3	3										1

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B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0416	DIGITAL COMMUNICATION SYSTEMS LABORATORY	0	0	3	1.5

Course Outcomes:

Upon completion of the course students will be able to

CO1: Capable of Applying Digital communication Concepts using modulation schemes.
CO2: Analyze real time behavior of modulation schemes using line codes.
CO3: Visualize spectra of different digital modulation schemes.
CO4: Simulate Digital communication concepts using digital modulation schemes
CO5: Simulate Digital Modulation Techniques

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

HARDWARE EXPERIMENTS (PART – A)

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

SOFTWARE EXPERIMENTS (PART-B)

Modeling of Digital Communications using MATLABORATORY

1. Pulse code modulation.
2. Differential pulse code modulation.
3. Frequency shift keying.
4. Phase shift keying.
5. Differential phase shift keying.
6. QPSK modulation and demodulation.

Equipment required for Laboratory:

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.) 0 – 1000 M Hz.
5. Multimeters
6. Laboratory Experimental kit for Pulse Code Modulation (Experiment No.3 of part – A)
7. Required Electronic Components (Active and Passive) which include required ICs

8.Arbitrary Wave form generators/ PNS generators – 2 Nos. (to generate digital data at required data rates) 9. Licensed MATLABORATORY software for 30 users with required tool boxes.

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	PSO1	PSO 2
Digital Communication Systems Laboratory	CO1	2	3											3	
	CO2	2			3									2	3
	CO3	2			3									2	2
	CO4			3										3	2
	CO5	2			3									3	

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B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20APC0417	INTEGRATED CIRCUITS AND APPLICATIONS LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand and perform various linear application of op-amp.
CO2: Understand and perform various non-linear application of op-amp.
CO3: Design and analyze oscillators and multivibrator circuits using op-amp
CO4: Design and test filter circuits using op-amp
CO5: Design and study various application of TL082IC.

Minimum of Ten experiments to be conducted
All experiments are based upon 741 / TL 082/ASLK Kits.

1. Study the characteristics of negative feedback amplifier
2. Summing and Subtractor Amplifier
3. Design of an instrumentation amplifier
4. Study the characteristics of regenerative feedback system with extension to design an Astable multi vibrator
5. Study the characteristics of integrator circuit
6. Design of Analog filters – I
7. Design of Analog filters – II
8. DC-DC Converter
9. Design of a function generator
10. Design of a Voltage Controlled Oscillator
11. Design of a Phase Locked Loop (PLL)
12. Design of a low drop out regulator

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	PS O1	PSO 2
Integrated Circuits and Applications Laboratory	CO1	3	1											3	
	CO2	3	1											3	
	CO3		3											2	
	CO4			3										2	
	CO5		3	3										3	

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B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20AHE9902	Principles of Effective Public Speaking	1	0	2	2

Course Outcomes:

Students will be able to:

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

CO 2: Develop skills in speech composition.

CO 3: Develop skills in effective listening.

CO 4: Evaluate the delivery of speeches.

CO 5: Use supporting materials and presentation aids in speech preparation.

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.

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).

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		

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B. Tech III Year V Semester

Course Code	Course Title	L	T	P	Credits
20AMC9904	PROFESSIONAL ETHICS AND HUMAN VALUES	3	0	0	0

Course Outcomes:

Upon completion of the course students will be able to

CO1: It ensures students sustained happiness through identifying the essentials of human values and skills

CO2: The students will understand the importance of Values and Ethics in their personal lives and professional careers

CO3: The students will learn the rights and responsibilities as an employee, team member and a global citizen.

CO4: Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.

CO5: Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

UNIT - I:

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:

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:

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:

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:

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 Whit beck, 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 Harper Collins, USA
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritcha Michael J Rabins, 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				

VI Semester (B.Tech –III year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PCC	20APC0418	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
2	PCC	20APC0419	Digital Signal Processing	3	0	0	3	30	70	100
3	PCC	20APC0420	Microwave and Optical Communications	3	0	0	3	30	70	100
4	PEC	20APE0404	Low Power VLSI Circuits and Systems	3	0	0	3	30	70	100
		20APE0405	MEMS and Microsystems							
		20APE0406	Industrial Electronics							
5	PCC	20APC0421	Microprocessors and Microcontrollers Laboratory	0	0	3	1.5	30	70	100
6	PCC	20APC0422	Digital Signal Processing Laboratory	0	0	3	1.5	30	70	100
7	PCC	20APC0423	Microwave and Optical Communications Laboratory	0	0	3	1.5	30	70	100
8	SOC	20ASA0501	Basics of Cloud Computing	1	0	2	2	100	-	100
9	MC	20AMC9903	Environmental Studies	3	0	0	0	30	-	30
TOTAL							**18.5**	**340**	**490**	**830**
Internship 2 Months (Mandatory) during summer vacation										

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B. Tech III Year VI Semester

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

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B. Tech III Year VI Semester

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	

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0420	MICROWAVE AND OPTICAL COMMUNICATIONS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Review different fields in rectangular waveguides and performance of Gunn diode.

CO2: Understand working of different waveguide components and analyze S parameters of waveguide junctions.

CO3: Analyze the operation of O type tubes and measure different parameters of microwave test bench setup.

CO4: Compare different optical fiber modes.

CO5: Exemplify Optical sources, detectors and their working principles.

UNIT I:

RECTANGULAR WAVE GUIDE

Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, dominant and degenerate modes, Mode characteristics- Phase and Group velocities, wavelengths and impedance relations, Gunn diode-principles, RWH theory.

UNIT II:

WAVEGUIDE COMPONENTS AND APPLICATIONS

Coupling mechanisms- probe, loop. Wave guide discontinuities-waveguide Windows, tuning screws and posts, matched loads. Waveguide attenuators-resistive card, rotary vane Attenuators; waveguide phase shifters-dielectric, rotary vane phase shifters. Wave guide multiport junctions and scattering parameters-E plane and H plane Tees, Magic Tee, Directional couplers-2-hole, Bothe hole types.

UNIT III:

MICROWAVE TUBES

Limitations and losses of conventional tubes at microwave frequencies. O type tubes: 2 cavity klystrons-structure, Applegate diagram, velocity modulation process, bunching process. Reflex Klystrons-structure, Applegate diagram, Velocity Modulation, mathematical theory of bunching.

MICROWAVE MEASUREMENTS

Description of Microwave bench-different blocks and their features, errors and precautions, Measurement of attenuation, Power, low and high VSWR, impedance.

UNIT IV:

INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system, element of an Optical Fiber Transmission link, Ray Optics, optical Fiber Modes and Configurations, Mode theory of Circular Wave guides, Single Mode and Multimode Mode Fiber structures.

UNIT V:

OPTICAL FIBER SOURCES AND RECEIVERS

Direct and indirect bandgap structures, Light Emitting Diode (LED) Structures, Laser Diode

structures, PIN and APD, Fiber to Fiber Joints, Fiber Splicing, Fiber Connectors. Optical Isolators and Circulators.

Text Books:

1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave principles-Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss, CBS publishers and distributors, New Delhi,2004.
3. Gerd Keiser,"Optical Fiber Communication"McGraw–Hill International,Singapore,3rd ed., 2000.
4. J. Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

Reference Books:

1. Foundations for microwave engineering-R. E. Collin, IEEE press, John Wiley, 2ndedition, 2002.
2. Microwave circuits and passive devices-M. L. Sisodia and G. S. Raghuvanshi, Wiley Eastern Ltd., New age international publishers Ltd., 1995.
3. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
4. S. C. Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
5. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

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
Microwave and Optical Communications	CO1	2	3	1	3		1							2	1
	CO2	1	3	2	3		1							2	1
	CO3	1	3	2	3		1							2	1
	CO4	3	2		1		1							2	1
	CO5	3	3	2	1		1							2	1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0404	LOW POWER VLSI CIRCUITS AND SYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Remember concepts of MOS transistor logic and various sources of power dissipation.
CO2: Analyze different sources of power dissipation and supply voltage scaling for low power.
CO3: Estimate Low power design approaches for various circuit level measures.
CO4: Verify various switched capacitance minimization methods.
CO5: Illustrate various Leakage power minimization techniques.

UNIT I:
Introduction: Historical background, why low power, sources of power dissipations, low power designmethodologies**.**
MOS Transistors: Introduction, the structure of MOS Transistor, the Fluid model, Modes of operation of MOS Transistor, Electrical characteristics of MOS Transistors, MOS Transistors as a switch.

UNIT II:
MOS Inverters: Introduction, inverter and its characteristics, configurations, inverter ratio in different situations, switching characteristics, delay parameters, driving parameters, driving large capacitive loads.
MOS Combinational Circuits: Introduction, Pass-Transistor logic, Gate logic, MOS Dynamic Circuits**.**

UNIT III:
Sources of Power Dissipation: Introduction, short-circuit power dissipation, switching power dissipation, glitching power dissipation, leakage power dissipation.
Supply voltage scaling for low power: Introduction, device features size scaling, architecture-level approaches, voltage scaling, multilevel voltage scaling, challenges, dynamic voltage and frequency scaling, adaptive voltage scaling.

UNIT IV:
Minimizing Switched Capacitance: Introduction, system-level approaches, transmeta's Crusoe processor, bus encoding, clock gating, gated-clock FSMs, FSM state encoding,FSM Partitioning, operand isolation, precomputation, logic styles for low power.

UNIT V:
Minimizing Leakage Power: Introduction, fabrication of multiple threshold voltages, approaches for minimizing leakage power, Adiabatic Logic Circuits, Battery-Driven System, CAD Tools for Low Power VLSI Circuits.

TEXT BOOKS:

1.Ajit. Pal, Low power VLSI Circuits and systems,springer.

2. Sung Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata McgraHill.

3. Neil H.E.Weste and K. Ehraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley.

4. A. Bellamour, and M. I. Elmasri, Low Power VLSI CMOS Circuit Design, Kluwer Academic Press, 1995.

5. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic.

REFERENCES:

1. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley Interscience, 2000.

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
Low power VLSI circuits and Systems	CO1	3	2		1								2	1	1
	CO2		3	1	2								2	2	2
	CO3	1	2	3	3								2	2	2
	CO4	2		3	3								2	2	3
	CO5	2				3							2	2	3

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0405	MEMS AND MICROSYSTEMS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Understand the Micro sensors and different material properties
CO2: Illustrate micro machine process for different techniques
CO3: Compare various characteristics in different types of Micro sensors
CO4: Analyze MEMS accelerometers functionality and know its applications.
CO5: Determine the use of MEMS devices in various applications.

UNIT I:

Introduction: Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

UNIT II:

Microelectronic Technology for MEMS: Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micro machined Microstructure, Micro stereo lithography.

UNIT III:

Micro Sensors: MEMS Microsensors, Thermal Microsensors, Mechanical Micro machined Microsensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micro machined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor.

UNIT IV:

MEMS Accelerometers: Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezo resistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

UNIT V:

MEMS Applications: Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Introduction to Bio MEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS).

Text Books:

1. Nadim Maluf Kirt Williams “An Introduction to Micro electro mechanical Systems Engineering”, Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V KandVaradan “Microsensors, actuators, MEMS, and electronics for smart structures” Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Micro fabrication, SPIE Optical Engineering Press

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	PSO1	PSO 2
MEMS and Micro systems	CO1	3	2	3											
	CO2		2	3											
	CO3			3											
	CO4			3											
	CO5			3											

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0406	INDUSTRIAL ELECTRONICS	3	0	0	3

Course Outcomes:

Upon completion course students will be able to

CO1: Review of semi-conductors and understand the operation of Diodes
CO2: Analyze the operation of Semiconductor Devices.
CO3: Illustrate the characteristics of AC to DC converters.
CO4: Identify the techniques of Heating and Welding methods.
CO5: Implement various applications in Ultrasonics.

UNIT I: Review of Semiconductors & Diodes

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open-circuited p-n junction, Diode resistance, Zener diode, Photoconductors and junction photo diodes, Light emitting diodes (LED)

UNIT II: Transistor Characteristics

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor-α, Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

UNIT III: Rectifier, Filter & Regulators

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

UNIT IV: Welding & Heating

Resistance welding controls: Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. Induction heating: Principle of induction heating, Theory of Induction heating, merits of induction heating. Dielectric heating: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric

heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating.

UNIT V: Ultrasonics

Ultrasonics: Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, separation of mixtures by ultrasoni8c waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Thermal effects of Ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying.

Text Books:

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. J. Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, "Industrial Electronics", Anuradha Publications, 2011.

Reference Books:

1. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.
2. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.

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	PSO1	PSO 2
Industrial Electronics	CO1	3	2	3										3	
	CO2	3	2	2										3	
	CO3	3	3	2										2	
	CO4	3		3										3	
	CO5	3		3										2	

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0421	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	0	0	3	1.5

Course Outcomes:

After completion of this subject the students will be able to:

CO1: Apply Assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.

CO2: Demonstrate the steps in executing an assembly language program using an assembler.

CO3:Implement some specific real time applications Using MSP 430 low power microcontroller.

CO4: Program MSP 430 for designing any basic Embedded System

CO5: Examine concepts of Power management in MSP 430 Controllers

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

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

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

Part B: Embedded C Experiments using MSP430 Microcontroller

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

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

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	PSO1	PSO 2
Microprocessors and Microcontrollers Laboratory	CO1	2		3										3	
	CO2				3									3	
	CO3					3								2	3
	CO4					3								1	3
	CO5					3								2	2

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Course Code	Course Title	L	T	P	Credits
20APC0422	DIGITAL SIGNAL PROCESSING LABORATORY	0	0	3	1.5

Course Outcomes (COs): Student will be able to

CO1: Analyze Power or Energy of a discrete time sequence.
CO2: Compute convolution & Correlation of discrete time sequences
CO3: Compute Fourier Transform of discrete time sequence
CO4: Design and analyze various Analog Filters
CO5: Design and analyze various Digital Filters

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)

Software Experiments

(Part – A)

1. Power or Energy of a discrete time sequence.
2. Convolution & Correlation of discrete time sequences
3. DTFT of a discrete time signal/sequence
4. N – Point Fast Fourier Transform Algorithm
5. Design of Analog filters and verify the frequency response
6. Design of Digital IIR filters and verify the frequency response
7. Design of Digital FIR filters using Windowing Technique

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS)

(Part – B)

1. Power or Energy of a discrete time sequence.
2. Convolution & Correlation of discrete time sequences
3. DTFT of a discrete time signal/sequence
4. N – Point Fast Fourier Transform Algorithm
5. Design of Analog filters and verify the frequency response
6. Design of Digital IIR filters and verify the frequency response
7. Design of Digital FIR filters using Windowing Technique

Equipment/Software Required:

1. Licensed MATLABORATORY software with required toolboxes for 30users.
2. DSP floating Processor Kits with Code Composure Studio (8nos.)
3. Function Generators
4. CROs
5. Regulated Power Supplies.

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	PSO1	PSO 2
Digital Signal Processing Laboratory	CO1	2			3	2								3	2
	CO2	2	3			2								2	3
	CO3			3										2	3
	CO4			3										2	1
	CO5			3										3	2

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0423	MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Apply and test Microwave Concepts/ Microwave components.
CO2: Analyze Microwave Active Devices by conducting experiments and measuring various parameters.
CO3: Perform and measure various parameters of an Antenna.
CO4: Design and analyze an optical fiber communication link.
CO5: Analyze the characteristics of Optical Sources and Optical fiber by conducting experiments and measuring various parameters.

Microwave Laboratory (PART – A) --- Any Six (6) Experiments
1. Reflex Klystron Mode Characteristics.
2. Reflex Klystron Voltage Characteristics.
3. Gunn Diode Characteristics.
4. Fixed Attenuation Measurement.
5. Variable attenuation measurement
6. Directional Coupler Characteristics.
7. Frequency and Wavelength measurements using slotted section.

Optical Fiber Laboratory (PART – B) --- Any four (4) Experiments
1. Characterization of LED.
2. Characterization of Laser Diode.
3. Measurement of Numerical Aperture of the given fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of losses for Analog Optical link.

Equipment required for Laboratory:
1. Regulated Klystron Power Supply 6 nos.
2. VSWR Meter 6 nos.
3. Milli/Micro Ammeters 10 nos.
4. Multi meters 10 nos.
5. CROs 8 nos.
6. GUNN Power Supply, Pin Moderator4 nos.
7. Relevant Microwave components--
8. Fiber Optic Analog Trainer based LED3 nos.
9. Fiber Optic Analog Trainer based laser2nos.
10. Fiber Optic Digital Trainer 1 no.

11. Fiber cables - (Plastic, Glass)

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	PSO1	PSO 2
Microwave and Optical Communications Laboratory	CO1	2			3									3	
	CO2				3									3	
	CO3				3									3	
	CO4			3	3									2	
	CO5			3	3									2	

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20ASA0501	BASICS OF CLOUD COMPUTING	1	0	2	2

Course Outcomes:

Upon completion of the course students will be able to

CO1: Ability to understand various service delivery models of a cloud computing architecture.
CO2: Understanding cloud service providers.
CO3: Configure various virtualization tools such as Virtual Box, VMware workstation.
CO4: Analyze authentication, confidentiality and privacy issues in cloud computing.
CO5: Analyze authentication, confidentiality and privacy issues in disaster management.

UNIT I:

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, a Service Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models, Challenges Ahead, and Historical Developments.

1. To study in detail about cloud computing.
2. Working of Google Drive to make spreadsheet and notes.
3. Installation and Configuration of Just cloud.
4. Working in Cloud9 to demonstrate different language.

UNIT II:

Cloud Architecture, programming model: NIST reference architecture, architectural styles of cloud applications, deployment models-public, private, hybrid, community; Types of cloud computing: utility computing, cluster; computing Cloud services: Amazon, Google, Azure, online services Applications of cloud computing

1. Install Google App Engine. Create hello world app and other simple web applications using Python/java.
2. Deployment and Configuration options in Google Cloud
3. Deployment and Configuration options in Microsoft Azure

UNIT III:

Cloud Service Models: Defining Clouds for the Enterprise- Storage-as-a-Service, Databases-as-Service, Platform-as-a-Service, Pros and Cons of PaaS, Infrastructure-as-a-Service. Pros and Cons of IaaS, Software as a Service, Pros and Cons of SaaS, Other Cloud Service Models.

Programs on SaaS

1. Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com anddocs.google.com)
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF

BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 (

3. use www.zoho.com and docs.google.com) NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX
4. Prepare a ppt on cloud computing –introduction, models, services, and architecture PPT should contain explanations, images and at least 20 pages (use www.zoho.com and docs.google.com)
5. Create your resume in a neat format using Google and zoho cloud

Programs on PaaS

1. Write a Google app engine program to generate n even numbers and deploy it to google cloud
2. Google app engine program multiply two matrices
3. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into Google cloud

UNIT IV:

Cloud resource virtualization: Basics of virtualization, types of virtualization techniques, merits and demerits of virtualization, Full vs. Para - virtualization, virtual machine monitor/hypervisor. Virtual machine basics, taxonomy of virtual machines, process vs. system virtual machines.

1. Install Virtual box/VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and executes Simple Programs

UNIT V:

Security: Disaster Recovery, Privacy Design, Data Security, Network Security, Compromise Response Disaster Recovery, Disaster Recovery, Planning, Cloud Disaster Management.

Case Study: PAAS (Face book, Google App Engine), AWS Case Study: Amazon.com

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Cloud Computing – Web Based Applications That Change the way you Work and ColLaboratoryorate Online – Michael Miller, Pearson Education.
3. Cloud Application Architectures, 1st Edition by George Reese O'Reilly Media.

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

Online Learning Resources:

https://nptel.ac.in/courses/106105167

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 AND SCIENCES, TIRUPATI (AUTONOMOUS)

B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20AMC9903	ENVIRONMENTAL STUDIES	3	0	0	0

Course Outcomes:

Upon completion of the course students will be able to

CO1: Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

CO2: 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.

CO3: 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.

CO4: Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage.

CO5: To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I

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

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

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

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

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

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

Energy resources: Renewable and non-renewable energy resources.

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and functions of 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

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

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

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	PSO1	PSO 2
Environmental Studies	CO1	3	2					1					1		
	CO2		3					2							
	CO3		3			2							1		
	CO4		2												
	CO5					3		2					1		

VII Semester (B.Tech –IV year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	PC	20APC0424	Pattern Recognition and Applications	3	0	0	3	30	70	100
2	PEC	20APE0407	Digital Image Processing	3	0	0	3	30	70	100
		20APE0408	Adaptive Signal Processing							
		20APE0409	Television Engineering							
3	PEC	20APE0410	Electronic Measurements and Instrumentation	3	0	0	3	30	70	100
		20APE0417	Sensors and IOT							
		20APE0412	RF Integrated Circuits							
4	PEC	20APE0413	Radar Systems	3	0	0	3	30	70	100
		20APE0414	Satellite Communications							
		20APE0415	Wireless Communications							
5	OEC	20APC0516	Computer Networks	3	0	0	3	30	70	100
		20APE0203	**Neural Networks and Fuzzy Logic**							
		20AOE0402	Bio Medical Instrumentation							
6	OEC	20APC0502	Data Base Management Systems	3	0	0	3	30	70	100
		20APE0416	Computer System Architecture							
		20AOE0301	Robotics							
7	SOC	20ASA0401	Embedded Systems and Unmanned Aerial Vehicle	1	0	2	2	100	-	100
8	PR	20APR0401	Evaluation of Industry Internship (III-II Summer Internship)	0	0	0	3	100	-	100
TOTAL							**23**	**380**	**420**	**800**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC0424	PATTERN RECOGNITION AND APPLICATIONS	3	0	0	3

Course Outcome:
Upon completion of the course, students will be able to
CO1: Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM)
CO2: Analyze classification problems probabilistically and estimate classifier performance
CO3: Understand and analyze methods for automatic training of classification systems
CO4: Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models
CO5: Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models

UNIT I
PATTERN RECOGNITION OVERVIEW:
Typical Pattern Recognition System, Patterns and Features Extraction, Training and Learning in Pattern Recognition system, Different types of Pattern Recognition Approaches – Statistical, Syntactic, Neural. Discriminant functions.
UNIT II
STATISTICAL PATTERN RECOGNITION:
Parametric estimation and supervised learning, Maximum likelihood estimation, Bayesian parameter estimation, Non-parametric approaches - Parzen window, k-NN estimation, Unsupervised Learning – Clustering Concepts.
UNIT III
SYNTACTIC PATTERN RECOGNITION:
Grammar Based Approaches, Elements of Formal Grammars, Parsing Concepts – Parsing Algorithm, Transition Networks in Parsing, Higher Dimensional Grammars, Stochastic Grammars, Graphical Approaches – Graph Isomorphism, Attributed Graphs.
UNIT IV
PATTERN PREPROCESSING AND FEATURE SELECTION:
Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.
UNIT V
APPLICATION OF PATTERN RECOGNITION:
Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints, etc.,

Text Books:
1. Gose. Johnsonbaugh.Jost.“ Pattern recognition and Image Analysis”,PHI. Tou. Rafael. Gonzalez. “Pattern Recognition Principle”, PearsonEducation
Reference Books:
1. Richard duda, Hart., David Strok, “Pattern Classification”, John Wiley

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**											**3**	
CO2	**2**	**1**	**3**										**3**	
CO3	**1**	**3**	**2**										**2**	**1**
CO4	**1**	**2**	**3**										**2**	**2**
CO5	**1**	**3**		**2**	**2**	**1**							**1**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester
(Branch: ECE and CSE)

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0407	DIGITAL IMAGE PROCESSING	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Review the fundamental concepts of a digital image processing system.
CO2: Analyze images in the frequency domain using various transforms.
CO3: Learn different techniques employed for the enhancement of images.
CO4: Apply the techniques for image restoration and segmentation
CO5: Analyze and apply various spatial and frequency domain techniques of image compression.

UNIT I
IMAGE PROCESSING FUNDAMENTALS:
Introduction to Digital Image processing – Example fields of its usage- Fundamental steps in Image Processing, Components of general image processing system, Image sensing and Acquisition–image Modeling - Sampling, Quantization and Digital Image representation - Basic relationships between pixels, - Mathematicaltools/ operations applied on images-imaging geometry.
UNIT II
IMAGE TRANSFORMS:
Discrete Fourier Transform- Discrete Cosine Transforms- Discrete Sine Transform,Walsh-Hadamard Transforms- Haar Transform-Hotelling Transform, Comparison of properties of the above.
UNIT III
IMAGE ENHANCEMENT TECHNIQUES:
Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency Domain, Image smoothing, Image sharpening, Color image enhancement
UNIT IV
IMAGE RESTORATION:
Degradation model, Algebraic approach to restoration–Inverse filtering–Least Mean Square filters, Constrained Least square restoration, Blind Deconvolution.
IMAGE SEGMENTATION: Edge detection-,Edge linking, Threshold based segmentation methods–Region based Approaches –Template matching–use of motion in segmentation
UNIT V
IMAGE COMPRESSION:
Redundancies in Images - Compression models, Information theoretic perspective- Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

Text Books:
1. R.C .Gonzalez & R.E. Woods, "Digital Image Processing", Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A.K.Jain,"FundamentalsofDigitalImageprocessing",PHI.

Reference Books:
1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, "Digital Image processing using MATLAB", Tata McGrawHill, 2010.
2. Sjayaraman,SEsakkirajan,TVeerakumar,"DigitalImageprocessing",TataMcGrawHill
3. WilliamK.Pratt,"DigitalImageProcessing",JohnWilely,3rdEdition,2004.

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**													**3**
CO2	**3**	**2**	**3**											**3**
CO3	**3**	**2**				**2**								**2**
CO4	**3**	**2**	**2**			**1**								**2**
CO5	**3**	**2**	**1**			**3**								**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0408	ADAPTIVE SIGNAL PROCESSING	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Understand device filtering solutions for optimising the cost function indicating error in estimation of parameters and appreciate the need for adaptation in design.
CO2: Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters of stationary random process clearly considering practical application specifications.
CO3: Analyse convergence and stability issues associated with adaptive filter design and come up with optimum solutions for real life applications taking care of requirements in terms of complexity and accuracy.
CO4: Analyse Multipath communication channel and synthesis of FIR digital filter.
CO5: Design and implement filtering solutions for applications such as channel equalisation, interference cancelling and prediction considering present day challenges.

UNIT 1
ADAPTIVE SYSTEMS:

Definitions and characteristics - applications – properties examples - adaptive linear combiner input signal and weight vectors - performance function-gradient and minimum mean square error - introduction to filtering smoothing and prediction - linear optimum filtering-orthogonality - Wiener – Hopf equation-performance surface

UNIT 2
SEARCHING PERFORMANCE SURFACE-STABILITY AND RATE OF CONVERGENCE:

Learning curve gradient search - Newton's method - method of steepest descent - comparison - Gradient estimation - performance penalty - variance - excess MSE and time constants – mis adjustments

UNIT 3
LMS ALGORITHM CONVERGENCE OF WEIGHT VECTOR:

LMS/Newton algorithm - properties - sequential regression algorithm - adaptive recursive filters - random-search algorithms - lattice structure - adaptive filters with orthogonal signals

UNIT 4
APPLICATIONS-ADAPTIVE MODELING AND SYSTEM IDENTIFICATION:

Multipath communication channel, geophysical exploration, FIR digital filter synthesis.

UNIT 5
INVERSE ADAPTIVE MODELING:

Equalization, and deconvolution adaptive equalization of telephone channels-adapting poles and zeros for IIR digital filter synthesis.

Text Books:
1. Bernard Widrow and Samuel D. Stearns, ―Adaptive Signal Processing‖, Person Education, 1985.

Reference Books:
1. Simon Haykin, ―Adaptive Filter Theory‖, Pearson Education, 2003.
2. John R. Treichler, C. Richard Johnson, Michael G. Larimore, ―Theory and Design of Adaptive Filters‖, Prentice-Hall of India, 2002.

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**				**3**								**3**	**1**
CO2		**2**			**3**								**2**	
CO3	**3**		**3**		**3**									**2**
CO4	**3**	**2**				**3**							**3**	**1**
CO5					**3**	**2**							**3**	**2**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
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B.Tech IV Year VII Semester

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0409	TELEVISION ENGINEERING	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Understand different modules present in the TV transmitter and receiver and their design considerations
CO2: Analyze Essentials of Television Cameras and Color picture tube.
CO3: Acquire the knowledge of Monochrome TV Receiver and IF subsystem.
CO4: Understand the concepts of Color Signal Decoding
CO5: Understand the functioning of modern televisions system such as direct to home satellite TV, digital TV receiver, digital terrestrial TV.

UNIT-I
INTRODUCTION:
TV transmitter and receivers, synchronization, Television pictures: Geometric form and aspect Ratio, image continuity, interlaced scanning, picture Resolution, composite video signal: Horizontal and vertical sync, Scanning sequence, color signal generation and encoding: perception of brightness and colors, , Luminance signal, color difference signals, encoding of color difference signals, formation of Chrominance signals, PAL encoder.
TV SIGNAL TRANSMISSION AND PROPAGATION:
Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, Interference, TV broadcast channels, TV transmission antennas.
UNIT-II
TV CAMERAS:
Camera tube types: Vidicon, silicon diode array vidicon, monochrome TV camera, color camera.
PICTURE TUBES:
Monochromatic picture tube, electrostatic focusing, color picture tubes, TV standards: American 525 line B&W TV system, NTSC color system, 625-line monochrome system, bPAL color system.
UNIT-III
MONOCHROME TV RECEIVER:
RF tuner, IF sub system, video amplifier, sound section, sync separation and processing, scanning circuits, PAL-D color receiver: electron tuners, IF sub system, Y-signal channel, Chroma decoder, separation of U & V color phasors, Raster circuits.
VISION IF SUB SYSTEM: AGC, video and inter carrier sound signal detection, vision IF sub system of Black & White receivers, color Receivers IF sub system. Receiver sound system: FM detection, FM sound detectors, typical applications.TV receiver tuners: tuner operation, VHF and UHF tuners, digital tuning techniques, Remote control of receiver functions.
UNIT-IV
COLOR SIGNAL DECODING:
PAL-D decoder, chroma signal amplifiers, separation of U & V signals, color Burst separation, Burst phase discriminator, Reference Oscillator, Indent and color killer circuits, RO phase shift, U & V demodulators, color signal mixing.
UNIT-V
SYNC.SEPARATION, AFC AND DEFLECTION OSCILLATORS:
Synchronous separation, K Noise in sync. Pulses, separation of frame and line sync. Pulses, AFC, single ended AFC circuit. Deflection oscillators, Receiver antennas, Digital TV digital satellite TV, direct to home satellite TV, digital TV receiver, digital terrestrial TV.

Text Books:

1. Modern television practice-Principles, Technology and service-R.R. Gulati, New Age International publication, 2002.
2. Monochrome and color TV-R.R Gulati, New Age International publication, 2002.

Reference Books:

1. Color Television Theory and practice-S.P.Bali, TMH, 1994.
2. Television and Video engineering-A.M. Dhake, 2nd Edition, Tata McGraw Hill.
3. Basic television and video systems-B.Grob and C.E.Herndon, McGraw Hill, 1999.

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**											**3**	**2**
CO2	**3**		**3**										**2**	**2**
CO3	**3**	**2**	**3**										**3**	**1**
CO4	**3**	**2**											**2**	**1**
CO5	**3**		**3**										**3**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0410	ELECTRONIC MEASUREMENT AND INSTRUMENTATION	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to

CO1: Understand basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on.

CO2: Understand & analyze the CRO for measuring voltage, current, resistance, frequency and soon.

CO3: Analyze the working of advanced instruments such as wave analyzer and spectrum analyzers.

CO4: Illustrate principles of measurements associated with different bridges

CO5: Analyze Electrical Parameters using advanced Electrical and Mechanical Transducers.

UNIT I

PERFORMANCE CHARACTERISTICS OF INSTRUMENTS:

Static characteristics: Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics: speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters: multirange, range extension/solid state and differential voltmeters, AC voltmeters–multirange, range extension. Thermocouple type RF ammeter, ohmmeters: series type, shunt type, multimeters for voltage, current and resistance measurements.

UNIT II

OSCILLOSCOPES:

Standard specifications of CRO, CRT features, vertical and horizontal amplifiers, horizontal and verticaldeflection systems, sweep trigger pulse, delay line, probes for CRO – active, passive,and attenuator type, triggered sweep CRO, dual trace CRO and dual beam CRO, Measurement of amplitude, frequency (Lissajous method) and phase. Principles of sampling oscilloscope, storage oscilloscope and digital storage oscilloscope, Digital frequency counters, time& Period measurements.

UNIT III

SIGNAL GENERATORS:

Fixed and variable, AF oscillators, Function generators, Pulse, Random Noise, sweep, and arbitrary waveformgenerators,theirstandards,specificationsandprinciplesofworking(Blockdiagramapproach).Waveanalyzers,Harmonic distortion analyzers,Spectrum analyzers.

UNIT IV

REVIEW OF DCBRIDGES:

Wheatstone bridge, Kelvin Bridge, errors and precautions in using bridges, AC bridges: Measurement ofinductance- Maxwell's bridge, Anderson Bridge, Hays Bridge. Measurement of capacitance: Schearing Bridge, Wein Bridge, Q-meter.

UNIT V

SENSORS AND TRANSDUCERS:

Active and passive transducers: Measurement of displacement-inductance (LVDT), Force (strain gauges), Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, pH measurement, Signal ConditioningCircuits.

Text Books:

1. A.D.HelfrickandW.D.Cooper,"ModernElectronicInstrumentationandMeasurementTechniques", PHI, 5th Edition, 2002.
2. H.S.Kalsi,"Electronicinstrumentation",secondedition,TataMcGrawHill,2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", Pearson Education, 2009.

Reference Books:

1. H.S.Kalsi,"Electronic instrumentation", second edition,TataMcGrawHill,2004.
2. Ernest O Doebelin and Dhanesh N Manik,"Measurement Systems Application and Design", TMH, 5th Edition, 2009.
3. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.

4. Robert A.Witte, “Electronic Test Instruments, Analog and Digital Measurements”, Pearson Education, 2nd Ed., 2004.
5. DavidA.Bell,“ElectronicInstrumentation&Measurements”,PHI,2ndEdition,2003.

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**	**1**											**3**	**2**
CO2		**3**											**3**	**1**
CO3	**3**				**2**								**2**	**2**
CO4		**3**											**3**	**1**
CO5	**3**				**2**								**2**	**2**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI

(AUTONOMOUS)

B.Tech IV Year VII Semester

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0417	SENSORS AND IOT	3	0	0	3

Course Outcomes:

Upon completion of the course, students will be able to

CO1: Understand the concepts of Converters and Sensor data acquisition systems.

CO2: Understand the concepts of various sensing technologies.

CO3: Acquire Knowledge in the basics of IoT and enabling technologies.

CO4: Design basic IoT applications using Arduino.

CO5: Design IoT applications using Raspberry pi.

UNIT I

SENSOR DATA ACQUISITION SYSTEMS AND ARCHITECTURES:

Introduction, General measurement system, Analog-to-digital converter architectures-Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC Digital-to-Analog conversion-Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC

UNIT II

INTRODUCTION AND CLASSIFICATION OF SENSORS:

Introduction to sensors- Principles, Classifications, Parameters- Characteristics, Passive sensors- Introduction, Resistive Potentiometer, Strain Gauge, Inductive sensor, Capacitive senor, Recent trends in sensor technologies -Film sensors-Thin & Thick, MEMS-Micromachining, Nano sensors.

UNIT III

INTRODUCTION TO INTERNET OF THINGS:

Characteristics of IoT, Design principles of IoT, IoT Architecture and Protocols, Enabling Technologies for IoT, IoT levels and IoT vs M2M.

IoT Design Methodology: Design methodology, Challenges in IoT Design, IoT System Management, IoT Servers

UNIT IV

BASICS OF ARDUINO:

Introduction to Arduino, Arduino IDE, Basic Commands for Arduino, Connecting LEDs with Arduino, Connecting LCD with Arduino. Arduino IDE Sketch examples – Blink LED, Control Actuator using Bluetooth, Read data from analog and digital sensor

UNIT V

BASICS OF RASPBERRY PI:

Introduction to Raspberry pi, Installation of NOOBS on SD Card, Installation of Raspbian on SD Card, Terminal Commands, Installation of Libraries on Raspberry Pi, Getting the static IP address of Raspberry Pi, Run a Program on Raspberry Pi, Installing the Remote Desktop Server, Pi Camera, Face Recognition using Raspberry Pi, Installation of I2C driver on Raspberry Pi, SPI (serial peripheral interface) with Raspberry Pi, Programming a Raspberry Pi, Play with LED and Raspberry Pi, Reading the digital input, Reading an edge triggered input, Interfacing of Relay with Raspberry Pi, Interfacing of Relay with Raspberry Pi, Interfacing of LCD with Raspberry Pi, Interfacing LCD with Raspberry Pi in I2C mode, Interfacing of DHT11 sensor with Raspberry Pi, Interfacing of ultrasonic sensor with Raspberry Pi, Interfacing of camera with Raspberry pi.

Text Books:

1. D. Patranabis, “Sensors & Transducers”, PHI, 2nd ed., 2018.
2. Rajesh Singh, Anitha Gehlot, Loviraj Gupta, “Internet of Things with Raspberry pi and Arduino” CRC Press, 2020.

Reference Books:

1. Jacob Fraden, “Hand book of Modern Sensors”, Springer, Fourth Edition, 2010.
2. D. Roy Choudhury & Shail B.Jain, “Linear Integrated Circuits” Fourth Edition, New age International Publications.

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**	**1**											**3**	**3**
CO2	**3**		**2**										**3**	**3**
CO3	**3**												**2**	**2**
CO4	**1**		**3**										**1**	**1**
CO5	**1**		**3**										**2**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0412	RF INTEGRATED CIRCUITS	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to

CO1: Understand working of Series/Parallel RLC networks & Transmission lines at Radio frequencies.

CO2: Analyze MOS devices in RF amplifier circuits and different types of noise effect on RF devices.

CO3: Compare different noise parameters and mixers.

CO4: Design different RF power amplifier circuits for high frequency application.

CO5: Illustrate fundamental techniques in radio architectures.

UNIT I
INTRODUCTION RF SYSTEMS:
Basic architectures, Transmission media and reflections, Maximum power transfer , Passive RLC Networks, Parallel RLC tank, Q, Series RLC networks, matching, Pi match, T match, Passive IC Components Interconnects and skin effect, Resistors, capacitors Inductors

UNIT II
REVIEW OF MOS DEVICE PHYSICS:
MOS device review, Distributed Systems, Transmission lines, reflection coefficient, the wave equation, examples, Lossy transmission lines, Smith charts – plotting Gamma, High Frequency Amplifier Design, Bandwidth estimation using open-circuit time constants, Bandwidth estimation, using short-circuit time constants, Rise time, delay and bandwidth, Zeros to enhance bandwidth, Shunt-series amplifiers, tuned amplifiers, Cascaded amplifiers

UNIT III
NOISE:
Thermal noise, flicker noise review, Noise figure, LNA Design, Intrinsic MOS noise parameters, Power match versus, noise match, large signal performance, design examples & Multiplier based mixers. Mixer Design, Subsampling mixers.

UNIT IV
RF POWER AMPLIFIERS:
Class A, AB, B, C amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples, Voltage controlled oscillators, Resonators, Negative resistance oscillators, Phase locked loops, Linearized PLL models, Phase detectors, charge pumps, Loop filters, and PLL design examples

UNIT V
FREQUENCY SYNTHESIS AND OSCILLATORS:
Frequency division, integer-N synthesis, Fractional frequency, synthesis, Phase noise, General considerations, and Circuit examples, Radio architectures, GSM radio architectures, CDMA, UMTS radio architectures

Text Books:
1. The design of CMOS Radio frequency integrated circuits by Thomas H. Lee Cambridge university press, 2004.
2. RF Micro Electronics by Behzad Razavi, Prentice Hall, 1997.

Reference Books:
1. The Art of Electronics, Horowitz and Hill, Second Edition, Cambridge University Press, 1989. ISBN 0521370957.
2. US Navy, Basic Electronics, Dover, 1973. ISBN 0486210766
3. Introduction to Electric Circuits, Dorf and Svoboda, Sixth Edition, John Wiley & Sons, 2004. ISBN 0471447951.

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**											**2**	**1**
CO2			**3**										**3**	**2**
CO3	**3**		**1**										**2**	**1**
CO4			**3**										**3**	**1**
CO5	**3**												**2**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B.Tech IV Year VII Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE0413	RADAR SYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Understand RADAR fundamentals and detection of the radar signals.
CO2: To acquire knowledge on the design of CW, FM-CW RADAR and its applications.
CO3: Able to learn the performance of MTI Radar systems and its applications.
CO4: Demonstrate the Principle of tracking RADAR
CO5: Illustrate the working of RADAR receiver devices.

UNIT I
BASICS OF RADAR:
Introduction, Maximum Unambiguous Range, Simple form of RADAR Equation, Radar Block Diagram and Operation, RADAR Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, IllustrativeProblems.
RADAR EQUATION:
SNR, Envelope Detector, False Alarm Time and Probability, Integration of RADAR Pulses, Radar Cross Section of Targets (simple targets - sphere, Cone sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.
UNIT II
CW AND FREQUENCY MODULATED RADAR:
Doppler Effect, CW Radar– Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver and width Requirements, Applications of CW radar, Illustrative Problems.
FM CW RADAR: Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/RecedingTargets), FM-CWaltimeter, Multiple Frequency CWRadar.
UNIT III
MTI AND PULSE DOPPLER RADAR:
Introduction, Principle, MTI Radar with – Power AmplifierTransmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation and Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.
UNIT IV
TRACKINGRADAR:
Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar –Amplitude Comparison Monopulse (one-and two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparisonof Trackers.
UNIT V
DETECTION OF RADAR SIGNALS IN NOISE:
Introduction, Matched Filter Receiver – ResponseCharacteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matchedFilters, MatchedFilterwith Non-white Noise.
RADAR RECEIVERS:
Noise Figure and Noise Temperature, Displays – types. Duplexers– Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

Text Books:
1. Introduction to Radar Systems– Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition,2007.

Reference Books:

1. Introduction to Radar Systems–MerrillI. Skolnik, 3rdEdition, TataMcGraw-Hill,2001.
2. Radar Principals, Technology, Applications–Byron Edde, Pearson Education,2004.
3. Radar Principles–Peebles, Jr.,P.Z.Wiley, New York,1998.

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**												
CO2	**2**	**3**												
CO3	**1**		**3**											
CO4	**1**		**3**											
CO5	**1**	**3**												

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
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B.TECH IV YEAR VII SEMESTER

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0414	SATELLITE COMMUNICATIONS	3	0	0	3

Course Outcomes:

CO1: Understand the architecture of satellite system.
CO2: Analyze various aspects related to satellite systems.
CO3: Analyze the effects on Satellite communication.
CO4: Design of satellite link for specified parameters.
CO5: Apply various modulation and multiple access schemes in Satellite Communication.

UNIT -I

INTRODUCTION TO SATELLITE COMMUNICATION:

Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity of a satellite, concepts of Solar day and Sidereal day.

UNIT -II

SATELLITE SUB-SYSTEMS:

Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems.

UNIT III

EFFECTS ON SATELLITE COMMUNICATION:

Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

UNIT -IV

SATELLITE LINK DESIGN:

Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N.

UNIT-V

MODULATION AND MULTIPLE ACCESS SCHEMES:

Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

Text Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002.

Reference Books:

1. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009. 3. Dennis Roddy: Satellite
Communication: 4th Edition, McGraw Hill, 2009

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**											**2**	**1**
CO2	**3**		**1**										**2**	**1**
CO3	**3**		**2**										**3**	**2**
CO4			**3**										**2**	**1**
CO5	**3**												**3**	**2**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:
TIRUPATI (AUTONOMOUS)
B.TECH IV YEAR VII SEMESTER
(Common to ECE, CSE, CIC, & AIDS)

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0415	WIRELESS COMMUNICATIONS	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to
CO1: Able to understand the effective bandwidth utilization to accommodate large number of mobile users by using various accessing techniques
CO2: Analyze networking considerations, practical networking approaches with mobile data services.
CO3: Able to understand WAP Architecture and services, WML scripts.
CO4: Analyze the protocols used in wireless LAN technologies.
CO5: Able to identify mobile data and advanced wireless networks

UNIT I
INTRODUCTION TO WIRELESS COMMUNICATIONS AND MULTIPLE ACCESS TECHNIQUES:
Evolution of mobile radio communications, examples of Wireless Communication systems, comparison of common Wireless Communication systems, Multiple access techniques: Introduction, FDMA, TDMA, Spread Spectrum, Multiple Access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.
UNIT II
WIRELESS NETWORKING AND DATA SERVICES:
Wireless Networking: Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks. Data Services: Data services, CCS, BISDN and ATM, SiganalingSystemNo7
UNIT III
MOBILE IP AND WIRELESS ACCESS PROTOCOL:
Mobile IP: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling. WAP: WAP Architecture, overview, WML scripts, WAP service, WAP session protocol.
UNIT IV
WIRELESS LAN TECHNOLOGY AND BLUETOOTH:
Wireless LAN: Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE802.11 Protocol architecture and services. Bluetooth: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol.
UNIT V
MOBILE DATA NETWORKS AND HIPER LAN:
Mobile Data Networks: GPRS and higher data rates, Short messaging service in GSM, HIPER LAN: HIPERLAN-1.

Text Books:
1. Wireless Communications, Principles, Practice –Theodore S. Rappaport, PHI, 2nd Ed., 2002. 2. Wireless Communication and Networking

2. Wireless Communication and Networking – William Stallings, PHI, 2003.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

Reference Books:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.

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**												**3**	**1**
CO2	**3**	**2**											**2**	**2**
CO3	**3**												**3**	**1**
CO4	**1**			**3**									**2**	**1**
CO5	**1**				**3**								**2**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI

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B.TECH IV YEAR VII SEMESTER

Course Code	Computer Networks		L	T	P	C
20APC0516			3	0	0	3
Pre-requisite	Digital Communications and Operating Systems	Semester	IV-I			

Course Objectives:

The students will be able to

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

Course Outcomes:

CO1: understand the basics of data communications and networking
CO2: classify the functionalities of two sub layers of Data link Layer
CO3: know briefly about Network Layer through algorithms and protocols
CO4: distinguish the services provided by Transport Layer
CO5: recognize the services offered by Application Layer to the user

UNIT - I	9 Hrs

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

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

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

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

UNIT - II	9Hrs

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

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

UNIT - III	9 Hrs

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

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

UNIT - IV	9 Hrs

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

UNIT - V	9 Hrs

The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.
Textbooks:
1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012. 2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.
Reference Books:
1. Data Communication and Networks, Bhushan Trivedi, Oxford 2. "Internetworking with TCP/IP – Principles, protocols, and architecture - Volume 1, Douglas E. Comer, 5th edition, PHI 3. "Computer Networks", 5E, Peterson, Davie, Elsevier. 4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications. 5. "Computer Networks and Internets with Internet Applications", Comer.
Online Learning Resources:
https://www.youtube.com/watch?v=O--rkQNKqls&list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up

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	**2**	**3**											**2**	
CO3	**2**	**2**	**3**		**1**								**2**	
CO4	**2**	**3**	**3**		**2**								**3**	**2**
CO5	**2**	**2**											**1**	

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

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B.TECH IV YEAR VII SEMESTER

COURSECODE	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 FUZZY LOGIC

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:
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B.TECH IV YEAR VII SEMESTER

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20AOE0402	BIO MEDICAL INSTRUMENTATION	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to

CO1: Ability to understand the philosophy of the heart, lung, blood circulation and Respiratory systems.

CO2: Ability to gain knowledge on various sensing and measurement devices of electrical origin.

CO3: Ability to understand the analysis of various organ system types.

CO4: Ability to bring out the important and modern methods of imaging techniques and their analysis.

CO5: Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

UNIT I
INTRODUCTION:
Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II
NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES:
Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

UNIT III
ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS:
Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV
IMAGING MODALITIES AND ANALYSIS:
Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V
LIFE ASSIS ING, THERAPEUTIC AND ROBOTIC DEVICES:
Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart –

Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

Text Books:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi,2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012

Reference Books:

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

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**										**3**	**1**
CO2	**3**												**2**	**2**
CO3		**3**	**1**										**3**	**1**
CO4	**2**			**3**									**2**	**1**
CO5	**1**				**3**								**2**	**1**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:
TIRUPATI (AUTONOMOUS)
B.TECH IV YEAR VII SEMESTER

Course Code	**Database Management Systems**		**L**	**T**	**P**	**C**
20APC0502			**3**	**0**	**0**	**3**
Pre-requisite	**NIL**	**Semester**	**IV-I**			

Course Objectives:

This course is designed to:

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagrams for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on transaction and concurrency techniques

Course Outcomes (CO):

After completion of the course, students will be able to

CO1: know the fundamentals of Databases

CO2: Understand SQL and PL/SQL Concepts

CO3: Design a database for a real-world information system

CO4: Process and Optimize the query

CO5: Working of transaction and concurrency techniques in real time applications

UNIT - I	**Introduction, Introduction to Relational Model**	9Hrs

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT - II	**Introduction to SQL, Advanced SQL**	9 Hrs

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

UNIT - III	**Database Design and the E-R Model, Relational Database Design**	9 Hrs

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design:

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT - IV	**Query Processing, Query optimization**	9 Hrs
Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions. Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.		
UNIT - V	**Transaction Management, Concurrency control and Recovery System**	10Hrs
Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.		
Textbooks:		
1. A. Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019		
Reference Books:		
1. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA 2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, StevenMorris, Peter Robb, Cengage Learning. 3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH		
Online Learning Resources:		
https://onlinecourses.nptel.ac.in/noc21_cs04/preview		

Mapping of course outcomes with program outcomes

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:
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B.TECH IV YEAR VII SEMESTER

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APE0416	COMPUTER SYSTEM ARCHITECTURE	3	0	0	3

Course Outcomes:
Upon completion of the course, students will be able to

CO1: Understand the structure of various Functional modules.

CO2: Learn the concepts in the Register transfer language, Micro Operation & Instruction Set.

CO3: Analyze arithmetic and logic operations via CPU.

CO4: Use various memory and I/O devices effectively.

CO5: Study the concept of Pipelining and basic structure of multiprocessors.

UNIT I

BASIC STRUCTURE OF COMPUTERS:

Computer types, Functional units, Basic operational concepts, Bus structures, Software, performance, multiprocessors and multi computers. Data types, Complements, Data representation: Fixed point and floating point representations, Error detection codes.

UNIT II

REGISTER TRANSFER LANGUAGE AND MICRO PERATIONS:

Register transfer language, register transfer, Bus and memory transfer, Arithmetic Micro Operations, logic micro operations, shift micro operations, arithmetic logic shift unit, Instruction codes, Computer registers computer instructions Instruction cycle, memory reference instructions, input output and interrupt.

UNIT III

CENTRAL PROCESSING UNIT AND COMPUTER ARITHMETIC:

Stack organization, Instruction formats, Addressing modes, data transfer and manipulation, Program control, reduced instruction set computer. COMPUTER ARITHMETIC: Addition and subtraction, multiplication algorithms, Division algorithms MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, and micro program example.

UNIT IV

THE MEMORY SYSTEM & INPUT OUTPUT ORGANIZATION:

Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, virtual memory, memory management hardware.

INPUT OUTPUT ORGANIZATION: Peripheral devices, input output interface, Priority Interrupt, Direct Memory Access, Input output processor (IOP).

UNIT V

PIPELINE AND VECTOR PROCESSING:

Parallel processing, pipelining, Arithmetic pipeline, Instruction Pipeline, RISC pipeline vector processing, Array Processing. Multi Processors: Characteristics of multiprocessors, interconnection structures, Inter processor Arbitration.

Text Books:

1. M.Moris Mano, Computer System Architecture, PHI, III Edition, 2006.
2. Car Hamacher, ZvonkoVranesic, SafwatZaky, Car Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, Mc.GrawHill Edition, 2002.

Reference Books:

1. William Stallings, Computer Organization and Architecture, PHI, Seventh Edition, 2006.
2. John P.Hayes, Computer Architecture and Organization, McGraw Hill International editions, 1998.

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**										**1**	**2**
CO2	**2**	**3**											**2**	**2**
CO3	**1**	**3**											**1**	**3**
CO4				**3**	**2**									**2**
CO5	**2**				**3**								**1**	**2**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI

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B. Tech IV Year VII Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AOE0301	ROBOTICS	3	0	0	3

Course Outcomes:

CO: 1 The fundamental concepts of various configurations of the robot manipulators and their working principles used in the industries

CO: 2 The basics of motion analysis of manipulator and process to find forward kinematics and inverse kinematics of the robot manipulator

CO: 3 The path planning of a robot manipulator for given polynomial equation and how to avoid obstacles in its path

CO: 4 The performance of various feedback components like sensors.

CO: 5 The performance of actuators and how they can be used according to the specifications of the manipulator

UNIT I

INTRODUCTION AND COMPONENTS OF THE INDUSTRIAL ROBOTICS

Introduction: **Automation** and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT II

MOTION ANALYSIS:

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT III

TRAJECTORY PLANNING (09)

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton

– Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion –straight line motion.

UNIT IV

ROBOT ACTUATORS AND FEEDBACK COMPONENTS (09)

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

ROBOT APPLICATION IN MANUFACTURING (09)

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding& spray painting - Assembly and Inspection.

Text Books:

1. Groover M P, "Industrial Robotics", Mc Graw Hill.
2. Ramachandran Nagarajan, "Introduction to Industrial Robotics", Pearson.

Reference Books:

1. Spony, Vidyasagar, "Robot Dynamics and Controls", John Wiley,
2. Asada, Slotine, "Robot Analysis and control", Wiley Inter-Science

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B. Tech IV Year VII Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASA0401	EMBEDDED SYSTEMS AND UNMANNED AERIAL VEHICLE	1	0	2	2

Course Outcomes:

Upon completion of the course student can be able to

CO1: Understand the fundamental concepts of Embedded Systems

CO2: Perform the Program using TM4C123GH6PM for various tasks.

CO3: Design and implement some specific real time applications Using TM4C123GH6PM microcontroller

CO4: Study and Assemble quadcopter, hexacopter and RC Electric Glider Aircraft.

CO5: Operate quadcopter, hexacopter and RC Electric Glider Aircraft.

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

MICROCONTROLLER APPLICATIONS

Program for configuration of GPIO ports for Input and output operation (blinking LEDs, push buttons interface). Program for EK-TM4C123GXL Launch pad and associated Timer ISR to toggle onboard LED using interrupt programming technique. Configure hibernation module of the TM4C123GH6PM microcontroller for different applications.

UNIT IV

UNMANNED AERIAL VEHICLE

Study of Unmanned Aerial Vehicle (UAV) System and its subsystems, sensors and their main characteristics. Assembling of Quadcopter Drone with GPS. Assembling of Hexacopter Drone with GPS.

UNIT V

APPLICATIONS OF UAV

UAV Applications of UAV- Take a snapshot using Quad copter Drone with Camera. Takeoff and

land Quadcopter and Hexacopter drones. Fly RC Electric Glider Aircraft. Attach 5 Liter sprayer tank and fly Quadcopter Drone.

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
4. Basics of Unmanned Aerial Vehicles : Time to start working on Drone Technology Paperback – by Garvit Pandya, 2021

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
5. Unmanned Aerial Vehicle: Applications in Agriculture and Environment

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**

VIII Semester (B.Tech –IV year)

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
Theory										
1	MOOCS	OE/PE	MOOC-NPTEL	0	0	0	3	25	75	100
2	PR	20APR0402	Internship	0	0	0	3	100	-	100
3	PR	20APR0403	Project work	0	0	0	9	60	140	200
TOTAL							**15**	185	215	400
Grand Total							**163**	2595	3925	6520