

Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)
I YEAR I SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19199101	BSC	Mathematics-I	3	0	0	3	30	70	100
2	19199102	HSMC	Communicative English-I	3	0	0	3	30	70	100
3	19199103	BSC	Engineering Physics	3	0	0	3	30	70	100
4	19195104	ESC	Problem Solving & Programming in C	3	0	0	3	30	70	100
5	19193175	ESC	Engineering Graphics	1	0	3	2.5	30	70	100
6	19199196	MC	Environmental Studies	2	0	0	0	30*	-	-
7	19199111	HSMC	Communicative English Laboratory-I	0	0	3	1.5	50	50	100
8	19199112	BSC	Engineering Physics Laboratory	0	0	3	1.5	50	50	100
9	19195113	ESC	Problem Solving & Programming Laboratory with C	0	0	3	1.5	50	50	100
TOTAL				15	0	12	19	300	500	800
BSC 7.5	HSMC 4.5	ESC 7	MC 0							

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)
I YEAR II SEMESTER

Sl. No.	CourseCode	Course Category	Subject Title	Periods per week			C	Scheme of ExaminationMaximum Marks		
				L	T	P		Int.	Ext.	Total
1	19199201a	BSC	Mathematics-II	3	0	0	3	30	70	100
2	19199202	HSMC	Communicative English-II	3	0	0	3	30	70	100
3	19199203	BSC	Applied Chemistry	3	0	0	3	30	70	100
4	19192204	ESC	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
5	19195205	ESC	Python Programming	3	0	0	3	30	70	100
6	19199296b	MC	Professional Ethics & Human Values	2	0	0	0	30*	-	-
7	19199211	HSMC	Communicative English Laboratory-II	0	0	3	1.5	50	50	100
8	19199212	ESC	Basic Electrical & Electronics Engineering Laboratory	0	0	3	1.5	50	50	100
9	19195213	ESC	Python Programming Laboratory	0	0	3	1.5	50	50	100
10	19199214	BSC	Engineering Chemistry Laboratory	0	0	3	1.5	50	50	100
TOTAL				17	0	12	21	350	550	900
BSC 7.5	HSMC 4.5	ESC 9	MC 0							

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

II YEAR I SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19149301	BSC	Complex Variables & Transform Techniques	3	0	0	3	30	70	100
2	19142302	ESC	Network Analysis	3	0	0	3	30	70	100
3	19140303	PCC	Electronic Devices & Circuits	3	0	0	3	30	70	100
4	19140304	PCC	Switching Theory & Logic Design	3	0	0	3	30	70	100
5	19140305	PCC	Signals and Systems	3	0	0	3	30	70	100
6	19140306	PCC	Electromagnetic Waves & Transmission Lines	3	0	0	3	30	70	100
7	19140387	MC	Design Thinking & Product Innovation	2	0	0	0	30*	-	-
8	19142311	ESC	Network Analysis Laboratory	0	0	3	1.5	50	50	100
9	19140312	PCC	Electronic Devices & Circuits Laboratory	0	0	3	1.5	50	50	100
TOTAL				20	0	6	21	280	520	800
BSC 3	PCC 13.5	ESC 4.5								

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

II YEAR II SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19149401	BSC	Random variable and stochastic process	3	0	0	3	30	70	100
2	19143462 19145462 19142462 19144462 19141462 19147462 19146462	OEC	Open Elective-I ▪ Robotics ▪ Fundamentals of Operating Systems ▪ Utilization of Electrical Energy ▪ Internet of Things ▪ Environmental Pollution & Control ▪ Basic Automobile Engineering ▪ Elements of Mining Technology	3	0	0	3	30	70	100
3	19140403	PCC	Electronic Circuit Analysis	3	0	0	3	30	70	100
4	19140404	PCC	Analog Communications	3	0	0	3	30	70	100
5	19140405	PCC	Pulse and Digital Circuits	3	0	0	3	30	70	100
6	19140411	PCC	Electronic Circuit Analysis Lab	0	0	3	1.5	50	50	100
7	19140412	PCC	Pulse and Digital Circuits Lab	0	0	3	1.5	50	50	100
8	19140413	PCC	Analog Communication Lab	0	0	3	1.5	50	50	100
9	19140421	PR	Community Service Oriented Project	0	0	1	0.5	100	-	100
TOTAL				15	0	10	20	400	500	900
BSC	PCC	PR	OEC							

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

3	13.5	0.5	3							
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III YEAR I SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of ExaminationMaximum Marks		
				L	T	P		Int.	Ext.	Total
1	19149501	HSMC	Soft Skills	0	0	3	1.5	50	50	100
2	19143562 19145562 19142562 19144562 19141562 19147562 19146562	OEC	Open Elective-II ▪ MEMS ▪ Information Security ▪ Energy Management ▪ Digital Image Processing ▪ Solid Waste Management ▪ Hybrid and Electrical Vehicles ▪ Disasters Management in Mining	3	0	0	3	30	70	100
3	19140503	PCC	Linear & Digital IC Applications	3	0	0	3	30	70	100
4	19140504	PCC	Digital Communication	3	0	0	3	30	70	100
5	19140505	PCC	Antenna and Wave Propagation	3	0	0	3	30	70	100
6	19140566A 19140566B 19140566C 19140566D	PEC	Professional Elective-I ▪ Electronic Measurement and Instrumentation ▪ Computer Architecture and Organization ▪ Information Theory and Coding ▪ Artificial Neural Networks and Fuzzy Logic	3	0	0	3	30	70	100

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4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)
III YEAR I SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
7	19149507	MC	Constitution of India	2	0	0	0	30*	-	-
8	19140511	PCC	Linear IC Applications Laboratory	0	0	3	1.5	50	50	100
9	19140512	PCC	DSD& Digital IC Applications Laboratory	0	0	3	1.5	50	50	100
10	19140513	PCC	Digital Communications Laboratory	0	0	3	1.5	50	50	100
11	19140521/ 19140581	PR	Mini Project – 1/Study Project/Internship	0	0	0	2	100	-	100
TOTAL				17	0	12	23	450	550	1000
OEC 3	PCC 13.5	PR 2	HSMC 1.5	PEC 3						

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

III YEAR II SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1		OEC	Open Elective - III	3	0	0	3	30	70	100
	19143661		▪ Nano Technology							
	19145661		▪ Human Computer Interaction							
	19142661		▪ Renewable Energy Resources							
	19144661		▪ Data Communication							
	19141661		▪ Global Environment: Problems & Policies							
	19147661		▪ Modern Vehicle Technology							
	19146661		▪ Remote Sensing & GIS in Mining							
2	19144602	PCC	Computer Networks	3	0	0	3	30	70	100
3	19144603	PCC	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
4	19144604	PCC	Digital Signal Processing	3	0	0	3	30	70	100
5	19144605	PCC	Microwave Engineering	3	0	0	3	30	70	100

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)
III YEAR II SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
6	19140665A 19140665B 19140665C 19140665D	PEC	Professional Elective - II							
			▪ Wireless and Mobile Communication							
			▪ Digital System Design Using Verilog							
			▪ Control Systems							
			▪ Telecommunication Switching Systems and Networks	3	0	0	3	30	70	100
7	19140611	PCC	Digital Signal Processing Laboratory	0	0	3	1.5	50	50	100
8	19140612	PCC	Microprocessors and Microcontrollers Laboratory	0	0	3	1.5	50	50	100
TOTAL				18	0	6	21	280	520	800
OEC 3	PCC 15	PEC 3								

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

IV YEAR I SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19149701a 19149701b 19149701c 19149701d 19149701e 19149701f 19149701g 19149701h 19149701i	OEC	Open Elective - IV							
			▪ MEFA							
			▪ Entrepreneurship Qualities for Engineers							
			▪ Principles of Management							
			▪ Financial Management for Engineers							
			▪ Operation Management							
			▪ Digital Marketing							
			▪ Total Quality Management							
			▪ Organizational Behavior							
			▪ Human Resource Management							
2	19140702	PCC	VLSI Design	3	0	0	3	30	70	100
3	19140703	PCC	Optical Communication	3	0	0	3	30	70	100
4	19140704	PCC	Digital Image Processing	3	0	0	3	30	70	100
5	19149795	MC	Intellectual Property Rights and Patents	2	0	0	0	30*	-	-

IV YEAR I SEMESTER

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
6	19140706A	PEC	Professional Elective - III ▪ Bio Medical Instrumentation ▪ Embedded System Design ▪ Digital Signal Processors and Architecture ▪ Wireless Sensor Networks	3	0	0	3	30	70	100
	19140706B									
	19140706C									
	19140706D									
7	19140711	PCC	Microwave Engineering and Optical Communication Laboratory	0	0	3	1.5	50	50	100
8	19140712	PCC	VLSI Laboratory	0	0	3	1.5	50	50	100
9	19140721/ 19140781	PR	Mini Project – 2/Internship	0	0	0	2	100	-	100
TOTAL				17	0	6	20	350	450	800
OEC 3	PCC 12	PR 2	PEC 3							

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

IV YEAR II SEMESTER

Sl. No.	Course Code	Course Category	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19140801A 19140801B 19140801C 19140801D	PEC	Professional Elective - IV ▪ EMI & EMC ▪ Digital IC Design ▪ Speech Processing ▪ Network Security and Cryptography	3	0	0	3	30	70	100
2	19140802A 19140802B 19140802C 19140802D	PEC	Professional Elective - V ▪ Radar System Engineering ▪ Low Power VLSI Design ▪ Multimedia Communication ▪ Internet of Things	3	0	0	3	30	70	100
3	19140841	PR	Project	0	0	18	9	80	120	200
TOTAL				6	0	18	15	140	260	400

PROFESSIONAL ELECTIVES

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

Professional Electives	Communication	VLSI & Embedded Systems	Signal Processing	Networking
Elective - I	Electronic Measurement and Instrumentation	Computer Architecture & Organization	Information theory and Coding	Artificial Neural Networks and Fuzzy Logic
Elective - II	Wireless and Mobile Communication	Digital system design using Verilog	Control Systems	Telecommunication Switching Systems and Networks
Elective - III	Bio Medical Instrumentation	Embedded System Design	Digital Signal Processors and Architecture	Wireless Sensor Networks
Elective - IV	EMI & EMC	Digital IC Design	Speech Processing	Network Security and Cryptography
Elective - V	Radar system Engineering	Low Power VLSI Design	Multimedia Communication	Internet of Things

OPEN ELECTIVE-I	OPEN ELECTIVE-II	OPEN ELECTIVE-III	OPEN ELECTIVE-IV
Mech:	Mech:	Mech:	MEFA

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

Robotics	MEMS	Nano Technology	
CSE: Operating Systems	CSE: Information Security	CSE: Human Computer Interaction	Entrepreneurship Qualities for Engineers
EEE: Utilization of Electrical Energy	EEE: Energy Management	EEE: Renewable Energy Resources	Principles of Management
ECE: Internet of Things	ECE: Digital Image Processing	ECE: Data Communication	Financial Management for Engineers
CE: Environmental Pollution & Control	CE: Solid Waste Management	CE: Global Environment: Problems & Policies	Operations management
AME: Basic Automobile Engineering	AME: Hybrid and Electric Vehicles	AME: Modern Vehicle Technology	Digital Marketing
Mining: Elements of Mining Technology	Mining: Disaster Management in Mining	Mining: Remote Sensing & GIS in Mining	Total Quality Management
			Organizational Behavior
			Human Resource Management

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech. (Electronics and Communication Engineering) Course Structure: (2019-20)

CATEGORY	ECE DEPARTMENT ALLOCATED CREDITS	AICTE	APSCHE
BSC	21	25	24
HSMC	10.5	12	13
PCC	67.5	48	59
ESC	20.5	24	24
MC	0	0	0
OEC	12	18	12
PEC	15	18	12
PR	13.5	15	13
LC	-	-	03
	160	160	160

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem			
Course Code 19199101	MATHEMATICS -1 (COMMON TO ALL BRANCHES)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Types of matrices, Limits, continuity.		3	0	0	3

Course Objective:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students understand advanced level mathematics to develop the confidence and ability to handle real world problems and their applications.

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Transform the knowledge of solving system of linear equations using matrices.
C02:	Apply mean value Rolls, Lagranges and Cauchy mean value theorem in engineering applications.
C03:	Acquire the knowledge maxima and minima of function of several variables
C04:	Evaluate multiple integrals and their applications
C05:	Understand Beta and Gamma functions, evaluate improper integrals.

Syllabus:

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of linear homogeneous and non-homogeneous equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the Quadratic forms, reduction of Quadratic form to canonical form by diagonalisation and orthogonal transformation.

Unit II: Mean Value Theorems

Rolle's

Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof).

Unit III: Multivariable calculus

Partial derivatives, total derivatives, chain rule, Homogeneous functions and Euler's theorem, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Multiple Integrals

Evaluation of double integrals (cartesian and polar coordinates) and triple integrals, change of variables, change of order of integration, areas enclosed by plane curves.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem
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Unit V: Special Functions

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of improper integrals.

Text books:

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

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-III, .Chand Publicationbns, 2018.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2015.

Web Links:

1. <https://nptel.ac.in/courses/111105121/>
2. <https://nptel.ac.in/courses/111105035/>
3. <https://www.sanfoundry.com/engineering-mathematics-multiple-choice-questions-answers/>
4. <https://ocw.mit.edu/courses/mathematics/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	2	2	-	-	-	-	-	-	-	1
C02	3	2	2	2	-	-	-	-	-	-	-	1
C03	3	2	2	2	-	-	-	-	-	-	-	1
C04	3	2	2	2	-	-	-	-	-	-	-	1
C05	3	2	2	2	-	-	-	-	-	-	-	1

Course Code 19199102	COMMUNICATIVE ENGLISH –I (common for all the branches)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Learner should be equipped with basic language and communication skills like Reading, Writing, Listening and Speaking.		3	0	0	3

Course Objectives: This course aims

- To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- To impart effective strategies for good writing , summarize information and practice writing essays
- To provide the knowledge of grammatical structures, vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:

On Completion of the course, the students will be able to	
C01:	students will be able to develop effective reading strategies
C02:	will be able to demonstrate writing skills that are required for professional development and use graphic elements for communication
C03:	will be able to apply grammatical skills and vocabulary effectively in speech and writing

Syllabus:

UNIT-I

READING: Detailed Text: Exploration- “A Proposal to Girdle the Earth (Excerpt)” by Nellie Bly, from English All Round: Communication Skills for Under Graduate Learners-1 by ORIENT BLACK SWAN.

Non-Detailed Text: ‘An Ideal Family’ by Katherine Mansfield from 'Panorama: A Course on Reading.'- OXFORD

GRAMMAR: Concept of word Formation, Verbs, adjectives, adverbs, Word order in sentences

VOCABULARY: Content words and function words; Word forms

WRITING SKILLS: Paragraph writing-Beginnings and endings of paragraphs - introducing a topic, providing a transition to the next paragraph.

UNIT-II

READING: Detailed Text: On Campus - An excerpt from “The District School as It Was by One Who Went to It” by Warren Burton from English All Round: Communication Skills for Under Graduate Learners-1 by ORIENT BLACK SWAN

Non-Detailed Text: ‘War’ by Luigi Pirandello from 'Panorama: A Course on Reading.' -OXFORD

GRAMMAR: Use of articles and zero article; prepositions.

VOCABULARY: Linkers, sign posts and transition signals.

WRITING SKILLS: Summarizing an oral or written text.

UNIT-III

READING: Detailed Text: Working Together - The Future of Work? (Adopted from web resources)From English All Round: Communication Skills for Under Graduate Learners-1 by ORIENT BLACK SWAN

Non-Detailed Text: 'The Verger' by Somerset Maugham from Panorama: A Course on Reading'-OXFORD

GRAMMAR: Tense and aspect; direct and indirect speech, reporting verbs for academic purposes.

VOCABULARY: Prefixes and suffixes

WRITING SKILLS: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions

Unit-IV

READING:

Detailed Text: Fabric of Change- H. G. Wells and the Uncertainties of Progress by Peter J. Bowler from English All Round: Communication Skills for Under Graduate Learners-1 by ORIENT BLACK SWAN

GRAMMAR: Correction of sentences-sequencing jumbled sentences

VOCABULARY: use of antonyms and homophones

WRITING SKILLS: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables -Sensible writing, Defining and classifying

Unit – V

READING: Detailed Text: Tools for Life -Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far From English All Round: Communication Skills for Under Graduate Learners-1 by ORIENT BLACK SWAN.

GRAMMAR: Reading comprehension- framing right answers and editing the given text

VOCABULARY: Idioms and Phrases

WRITING SKILLS: Writing structured essays on specific topics using suitable claims and evidences.

Text Books:

Detailed Textbook: ENGLISH ALL ROUND: Communication Skills for Under Graduate Learners-1 Published by Orient Black swan Pvt Ltd

Non-detailed Textbook: PANORAMA: A COURSE ON READING, Published by Oxford University Press India

REFERENCE BOOKS:

- Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
- InfoTech English by Maruthi Publications

WEB REFERENCES:

All Skills (LSRW)

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

CO-PO Mapping:

(1: Slight [Low];

2: Moderate [Medium];

3: Substantial [High], '-' : No Correlation)

Regulation GRBT-19		Godavari Institute of Engineering & Technology (Autonomous)								I B.Tech. I Sem			
CourseCode 19199103		Engineering Physics (common for CSE, ECE, EEE)											
Teaching		Total contact hours - 48								L	T	P	C
										3	0	0	3

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	
C01	-	-	-	-	-	2	3	2	-	-	-	-	
C02	-	-	-	-	-	3	3	3	-	-	-	1	
C03	-	-	-	-	-	2	3	3	-	-	-	-	

Course Objective

Physics Curriculum is re-oriented to the needs of CSE, ECE and EEE branches of graduate engineering courses that serve as a transit to understand the specific advanced topics.

Course Outcomes:

On Completion of the course, the students will be able	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To interpret dielectric loss, Lorentz field and Claussius- Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO3:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO4:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.

Syllabus:

UNIT –I OPTICS

12h

Interference of Light -Principle of Superposition- Interference in thin films (reflected light)-Newton's Rings – Theory and Applications
Introduction on Diffraction - Single slit Diffraction (Qualitative) - multiple slits (Grating) – Grating spectrometer to determine the Wavelength
Polarization - Brewster's law - Types of Polarization (plane, circular, elliptical) – Double refraction - Nicol's Prism - Half wave and Quarter wave plate - Engineering applications of Interference, Diffraction and Polarization

UNIT –II DIELECTRICS

12h

Introduction to Dielectrics - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant- Types of dielectric polarizations (Quantitative) - Claussius-Mosotti equation (qualitative)-Applications of Dielectrics

MAGNETIC PROPERTIES

Introduction to Magnetism-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-Ferrites, Magnetic device applications

UNIT –III

10h

Electromagnetic Fields

Divergence and Curl of Electric and Magnetic Fields-Maxwell's Equations, Electromagnetic wave propagation (conducting and non-conducting media)

Fiber Optics

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of Propagation-Acceptanceangle - Numerical Aperture-Classification of fibers based on Refractive index profileand modes.

UNIT –IV

12h

QUANTUM MECHANICS:

Introduction to matter waves – Schrodinger -Time Independent and Time Dependent wave equations - Particle in a box

FREE ELECTRON THEORY:

Classical free electron theory –Drawbacks - Quantumfree electron theory – Concept of Fermi Level – Density of states(Qualitatively)

UNIT –V

12h

Band Theory of Solids:

Bloch's theorem (Qualitatively) – Kronig Penny model – Origin of Energy Bands -Energy bands in crystalline solids – classification of crystalline solids according to band theory.

Semiconductor Physics:

Introduction – Density of carriers in Intrinsic and Extrinsic semiconductors-Drift & Diffusion-relevance of Einstein's equation – Hall effect in semiconductors

Text books

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
2. P.K.Palanisamy, "Engineering Physics", Sci-tech Publications.
3. H.K.Malik&A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018

Reference Books

1. David J.Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014
2. GerdKeiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
3. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
4. R. K. Gaur, S. L.Gupta, Engineering Physics, Dhanpat Rai Publications.
5. P.K.Palanisamy, "Applied Physics"Sci-tech Publishers.

Web Links:

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech I Sem.			
CourseCode 19199104	PROBLEM SOLVING & PROGRAMMING IN C				
Teaching	Total contact hours-48	L	T	P	C
Prerequisite(s): Basic knowledge of Mathematics, Logical Ability		3	0	0	3

1. <https://www.britannica.com/science/interference-physics>
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

CO-PO Mapping:

1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High],
'-' : No Correlation

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

Course Objective(s)

This course is intended to teach the problem solving through programming and to train the student to the basic concepts of C-programming language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes:

On completion of the course, the students will be able to-
CO-1. Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO-2. Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO-3. Develop program by using Control structure, different looping and Jump statement.
CO-4. Implement applications of Array, Structure and String inside the program.

Also acquire the knowledge of different FILE operations.
CO-5. Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.

UNIT-1

Introduction to Computers: Generations,CPU, Memory, I/o Devices

Introduction to Problem Solving: Algorithm, Pseudo code and Flowchart.

Introduction to Computer Programming:Computer Languages: Machine level, Assembly level and High-level language.

UNIT-2

C' Fundamentals:Structure of a C-program,C-character set, C Tokens:variables, constants, identifiers, data types and sizes, operators, Preprocessor.

I/O Functions: Header files, Standard I/O library functions-formatted I/O functions.

Decision making statements: simple if, if-else, nested if-else, else-if ladder, switch-case statements and sample programs.

Iterative Statements: for, while, do-while. Jump Statements-break, continue, goto

UNIT-3

Introduction to Arrays, Strings

Arrays- Declaration, initialization, storing and accessing elements of 1-D, 2-D and multi-dimensional arrays.

Array Applications: addition, multiplication, transpose, symmetry of a matrix.

Strings: declaration, initialization, reading and writing characters into strings, string operations, character and string manipulation functions.

UNIT-4: Pointers,Functions & Storage Classes

Pointers: Introduction to pointers, defining a pointer variable, Pointer to Pointer, Examples of pointers, using pointers in expressions, pointers and arrays.

Functions: declaration, definition, prototype, function call, return statement, types of functions, parameter passing methods, and function recursion.

Storage Classes: Auto, Static, Extern and Register

UNIT-5

Structures, Unions and Files

Structure and Union: Declaration, initialization, storing and accessing elements by using structure and union.

Files: Definition, Input and output operation into file.

Text Books

1. Problem Solving and Programming Concepts, Maureen Sprankle and Jim Hubbard, Pearson, 9th Edition.
2. "Programming in ANSI C" by E.Balagurusamy,McGraw Hill Publications.
3. "Programming in C" by Ashok N. Kamthane, 2/e Pearson, 2013.
4. "The C – Programming language" B.W.Kernighan, Dennis M. Ritchie.PHI.
5. "Let Us C", 12th Edition by Yashavant P. Kanetkar online in India.

Reference Books

1. Programming in C by Ajay Mittal, Pearson.
2. Programming with C, Bichkar, Universities press.
3. Programming in C, ReemaThareja, OXFORD.

CO-PO Mapping:

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem			
Course Code 19199196a	ENVIRONMENTAL STUDIES				
Teaching	Total contact hours - 32	L	T	P	C
Prerequisite(s): Knowledge of environment science		2	0	0	0

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Course Objective: To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5:	Influence their society in proper utilization of goods and services.

Syllabus:

UNIT – I: 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 ground water – 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-pesticide problems, water logging, salinity.

UNIT – II: Ecosystems, Biodiversity, and its Conservation

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – 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
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : 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-spots 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 and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. 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 and landslides.

UNIT – IV: Social Issues and the Environment

SOCIAL ISSUES AND THE ENVIRONMENT: Urban problems – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. 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 – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health –Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES :

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem			
Course Code 19199111	COMMUNICATIVE ENGLISH LAB- I				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisite(s) Learner should be equipped with basic language and communication skills like, Listening and Speaking which ensure good pronunciation and ease in communication		0	0	3	1.5

Web Links:

5. <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
6. https://www.tutorialspoint.com/environmental_studies/environmental_studies_tutorial.pdf
7. https://play.google.com/store/apps/details?id=com.techzone.higher.enviroment&hl=en_US

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	3	2	3	1	2	2	3	2	3	3	1
C02	3	2	3	2	3	2	3	2	3	3	3	2
C03	3	2	3	2	3	2	3	2	3	3	3	1
C04	2	3	3	2	1	3	2	3	2	3	3	2
C05	3	2	3	3	2	3	2	3	2	3	2	3

Course Objective: The course aims to

- Adopt activity based teaching-learning methods to ensure effective learning both in the classroom and laboratory sessions.
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- To improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Learning to communicate in English
C02:	Comprehend native speakers accent.
C03:	Speak appropriately in real life situations

Syllabus:

UNIT 1: BASIC AURAL AND ORAL SKILLS

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

Speaking: Phonetics-Accent and pronunciation

UNIT 2 CONVERSATIONAL SKILLS

Listening: Listening to audio texts, framing question in order to find out the gist of the text.

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Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks

UNIT 3: LANGUAGE IN USE

Listening: Listening for global comprehension and summarizing.

Speaking: 1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologizing, Advising, Suggesting, Agreeing and Disagreeing

UNIT 4: LANGUAGE APPLICATION

Listening: Making predictions while listening to conversations/ transactional dialogues; listening to video and narrating the theme.

Speaking: word stress-di-syllabic words, Poly-Syllabic words -Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

UNIT 5: FORMAL INTERPRETATION

Listening: TED Talks – understanding the summary

Speaking: Formal oral presentations on topics from academic contexts and technical background

Suggested Lab Manual: INTERACT from Orient Black Swan

Reference Books:

1. English Pronunciation in use- Mark Hancock, Cambridge University Press
2. English Phonetics and Phonology-Peter Roach, Cambridge University Press.

Web links:

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

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	3	3	3	-	-	-	3
C02	-	-	-	-	-	2	3	2	-	-	-	1
C03	-	-	-	-	-	3	2	3	-	-	-	1

CourseCode 19199113	Problem Solving & Programming Laboratory Using C				
Teaching	Total contact hours-36	L	T	P	C
Prerequisite(s): Basic knowledge of Mathematics, Logical Ability		0	0	3	1.5

Course Objective(s):

This course is intended to impart adequate programming skills to solve mathematical problems and to develop programming skills using the fundamentals and basics of C language. This enables effective usage of arrays, strings, functions, pointers and files.

Course Outcomes:

On completion of the course, the students will be able to-
CO-6. Know concepts in problem solving.
CO-7. Analyze a problems and Implement programs in C language.
CO-8. Work with arrays, pointers and structures.
CO-9. Apply functions concepts for problem solving.
CO-10. Implement FILE operations for storage purpose.

Programs:

- Write a C Program to
 - Calculate the area of triangle using the formula

$$\text{Area} = (s(s-a)(s-b)(s-c))^{1/2}$$
, where $s = (a+b+c)/2$
 - To find the largest of three numbers using ternary operator.
 - To swap two numbers without using a temporary variable.
- Write a C program that perform the following operations:
 - Reading and writing a complex number
 - Addition of two complex numbers
- Write a C program to
 - 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
 - Find the roots of a quadratic equation.
 - Take two integer operands and one operator form the user, Performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement)
- Write a C Program to print the following patterns
 - Floyd's triangle
 - Pyramid
 - Pascal Triangle
- Write a C program to
 - Check whether the given number is Armstrong number or not.
 - Check whether the given number is palindrome or not.
 - Find the sum of individual digits of a positive integer and find the reverse of the given number.
 - A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

- e) Generate all the prime numbers between 1 and n, where n is a value supplied by the user.
6. Write a C Program to
- Print the multiplication table of a given number n up to a given value, where n is entered by the user.
 - Enter a decimal number, and calculate and display the binary equivalent of that number.
 - Enter a binary number, and calculate the decimal equivalent of that number.
7. Write a C program to
- Interchange the largest and smallest numbers in the array.
 - Implement a linear search.
 - Implement binary search.
8. Write a C program to
- Examples which explore the use of structures, union and other user defined variables.
 - Declare a structure for calculating the percentage achieved by 3 students, by considering the structure elements as name, pin no, mark1, mark2, mark3.
9. Write C Programs
- For the following string operations without using the built in functions to
 - length of a string
 - reverse a string
 - append a string to another string
 - compare two strings
 - Write a C Programs to check whether the given string "MADAM" is palindrome or not without using the built in functions.
10. Write a C program
- Use functions to perform the following operations:
 - To insert a sub-string in to given main string from a given position.
 - To delete n Characters from a given position in a given string.
 - To replace a character of string either from beginning or ending or at a specified location
11. Write a C Programs for the following string operations with and without using the built in functions
- To reverse a string using pointers.
 - To concatenate two strings by using pointer.
12. Write a C programs that use both recursive and non-recursive functions for the following
- To find the factorial of a given integer.
 - To find the GCD of two given integers.
 - To find Fibonacci sequence.
13. Write C programs to
- Find the area of triangle by using call by value and call by reference concepts.
 - Pointer based function to exchange value of two integers using passing by address.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. IISem			
CourseCode 19199201b	(PROBABILITY & STATISTICS)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisite(s): Knowledge of Mathematics at 10+2 , Basic Statistics with Reasoning ability		3	0	0	3

14. Write C programs to
- Read and display the data from a file.
 - Copy the data from one file to another file.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Course Objective:

- Paraphrase a comprehensive set of descriptive statistical methods, in order to display data in a meaningful way.
- Integrate correlation analysis in order to estimate the nature and the strength of the linear relationship.
- Implement regression analysis to predict the value of one variable based on the value of the other variable.
- Exemplify probability theory in order to evaluate the probability of real world events;
- Apply discrete and continuous probability distributions to provide solutions for practical problems.
- Monitoring confidence interval estimates and hypotheses tests for population parameters. Execute comprehensive set of statistical tools in making practical decisions and creating reports in workplace situations; and in completing papers and research projects in other university and college courses.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.
CO2:	Apply the Knowledge of Probability in practical Engineering problems.
CO3:	Demonstrate the knowledge of Probability distributions.
CO4:	Enhance knowledge in Sampling & Estimation techniques.
CO5:	Enhance Knowledge in Design of Experiments.

Syllabus:

Unit I: Descriptive Statistics and Methods for Data Science

Data science, Statistics Introduction, Population vs Sample, event, mutually exclusive, independent and exhaustive events. Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

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UNIT II: Probability

Probability, axioms of probability, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III: Probability Distributions

Probability distribution - Binomial, Poisson approximation to the Binomial distribution and Normal distribution-their properties.

UNIT IV: Estimation and Testing of Hypothesis, Large Sample Tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNIT V: Small Sample Tests

Student t-distribution (test for single mean and two means), testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes. One-way ANOVA Classified data.

Text Books:

1. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. Probability and statistics for Engineering and Scientists : Ronald E. Walpole, Sharon L. Mayers and Keying Ye: Pearson.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

Web Links:

1. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-151-probability-and-statistics-in-engineering-spring-2005/lecture-notes/>
2. <https://lecturenotes.in/subject/69/probability-and-statistics-ps>
3. <https://nptel.ac.in/courses/111105041/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Course Code 191199202	COMMUNICATIVE ENGLISH –II				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisite(s): Learner should possess the primary communicative abilities suitable for global exposure and professional communication		3	0	0	3

Course Objective: This course aims to

- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids.
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal Correspondence.
- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Paraphrase short academic texts using suitable strategies and conventions
CO2:	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO3:	Build the ability to convey in different communicative forms.

Syllabus:

UNIT: I

READING: Detailed Text: Mohammad Yunus’ Speech at the Nobel Prize ceremony. AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

Non-Detailed Text: The Scare Crow by Satyajit Ray from 'Panorama: A Course on Reading.'- OXFORD

GRAMMAR: Conjunctions and sentence connectors

VOCABULARY: Adjective-noun collocations

WRITING SKILLS: E-mail writing: structure, etiquette.

UNIT: II

READING: DETAILED TEXT: Biography of A. R. Rahman from AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

NON-DETAILED TEXT: A village Lost to the Nation by Krishna Chandra Pujari from 'Panorama: A Course on Reading.'-OXFORD

GRAMMAR: Active and passive voice, foreign expressions in English.

VOCABULARY: ACRONYMS and their usage

WRITING SKILLS: Formal letter writing- structure, conventions and etiquette (enquiry, complaints, seeking permission, seeking internship);

UNIT: III

READING: DETAILED TEXT: “You Start Dying Slowly” by Pablo Neruda. AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

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Non-Detailed Text: Martin Luther King by Chinua Achebe from 'Panorama: A Course on Reading.'- OXFORD

GRAMMAR: subject agreement, verb-noun collocations

VOCABULARY: word roots

WRITING: Resume- drafting a cover letter for job application.

UNIT IV:

READING: DETAILED TEXT: 'Most Beautiful' by Ruskin Bond. AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

GRAMMAR: Misplaced modifiers-conditional clauses

VOCABULARY: Idiomatic expressions

WRITING: Note taking- avoiding redundancies and clichés in written communication

UNIT V:

READING: DETAILED TEXT: "Film Making" by Satyajit Ray. From AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

GRAMMAR: Editing short texts, correcting common errors in grammar and usage,

VOCABULARY: words often confused

Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references. Writing Introduction and Conclusion

Prescribed Text books:

DETAILED TEXTBOOK: AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

NON-DETAIL TEXT BOOK: 'Panorama: A Course on Reading.'-OXFORD

Reference Books:

- Bailey, Stephen. Academic writing: A handbook for international students. Rutledge, 2014.
- Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Henley ELT; 2nd Edition, 2018.

WEB REFERENCES:

English Language Learning Online

BBC Vocabulary Games

Free Rice Vocabulary Game

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], ' : No Correlation)

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

Course Code 19199203	APPLIED CHEMISTRY				
Teaching	Total contact hours-48	L	T	P	C
Prerequisite (s): Knowledge of theoretical and experimental from Intermediate level, Application of Chemistry theory and calculations required course.		3	0	0	3

Course Objective:

To instruct electrochemical energy systems and their applications , basic concepts of battery technology and Photovoltaic's and to expose the students to latest instrumental techniques such as scanning electronic microscope (SEM) & transmission electron microscope (TEM).

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Compare different types of cells
CO2	Explain the merits of fuel cells
CO3	List various sources of renewable energy
CO4	Distinguish between polymers and plastics
CO5	Distinguish between nano clusters & nanowires, polymers

Syllabus

Unit- I

ELECTROCHEMICAL ENERGY SYSTEMS - I

Introduction- concept of conductivity, Electrode Potential, Measurement of single Electrode Potentials, Nernst equation, Electrochemical Series, Reference electrodes (Calomel electrode, Standard Hydrogen electrode) - electrochemical cell - Galvanic Cell vs Electrolytic Cell - Ion Selective Electrodes- glass membrane electrode- gas sensing electrodes - Concentration Cells.

Unit-II

ENERGY SOURCES AND APPLICATIONS

Basic concepts, battery characteristics, classification of batteries, Important applications of batteries, Classical batteries-dry/ Leclanche cell, Modern batteries-zinc air, lithium cells-Li MnO₂ cell-challenges of battery technology. Fuel cells- Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell. p and n type semi conductors - PV cell / solar cell- Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy.

Unit- III

CORROSION AND ITS PREVENTION

Definition-theories of corrosion (chemical and electrochemical) galvanic corrosion, differential aeration corrosion, Pitting corrosion, Passivity of metals, factors influencing corrosion, corrosion control methods, proper designing and cathodic protection, protective coatings-cathodic and anodic coating, electroplating ,paints.

Unit-IV

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for CIVIL, ECE, MECH, CSE,AME, MINING)				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Basics of Physics		3	0	0	3

Course Objective:

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To learn the principle of operation and constructional details of transformers, alternator and induction motors.
4. To study the operation of PN junction diode, half wave, full Wave rectifiers and OP-AMPS
5. To study operation of PNP and NPN transistors and various amplifiers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.

Syllabus:

UNIT –I Electrical Circuits

Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits, star-delta and delta-star transformations.

UNIT –II DC Machines

Principle of operation of DC generator- emf equation, types, DC motor types, torque equation, applications, three point starter, Swinburne's Test, speed control methods.

UNIT –III AC Machines

Principle of operation of single phase transformers, e.m.f. equation, efficiency and regulation. Principle of operation of alternators, Principle of operation of 3-Phase induction motor- slip-torque characteristics, efficiency.

UNIT –IV Rectifiers & Linear Integrated Circuits

PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT –V Transistors

PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Text books:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group

Reference Books:

1. Basic Electrical Engineering by M.S.Naidu and S.Kalnakshiah, TMH Publications
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition
3. Basic Electrical Engineering by Nagsaricar, Sukhija, Oxford Publications, 2nd edition
4. Industrial Electronics by GK. Mittal, PHI

Web Links:

1. www.electrical4u.com
2. www.nptel.com

CO-PO Mapping:

(1: Slight [Low];

2: Moderate[Medium];

3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	3	2	1	3	-	-	2	-	1	-	1
C02	2	3	-	-	3	-	-	2	3	-	-	1
C03	2	3	-	-	3	-	-	2	3	-	-	1
C04	2	1	2	-	3	-	-	2	2	-	-	1
C05	2	1	-	-	3	-	-	2	-	1	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. II Sem			
CourseCode 19199205	PYTHON PROGRAMMING				
Teaching	Total contact hours - 48	L	T	P	C

Prerequisite(s): Knowledge of any programming language	3	0	0	3
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Course Objective(s):

This course is intended to teach adequate knowledge on different data structures technique and to develop solutions for problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

Course Outcomes:
On completion of the course, the students will be able to-
CO-1: Handle different data structures.
CO-2: understand the use of control statements, function overloading, operator overloading in real time application
CO-3: Implement files using various file operations.

UNIT-1

Introduction to Python: History Features, Installing Python, Running Python, Comments, Operators, Identifiers, and Variables.

UNIT-2

Conditional Statements, Loops, Statements and Syntax, Numbers

UNIT-3

Sequences: Strings, Lists, Tuples, Dictionaries, Files and Input/output

UNIT-4

Errors and Exceptions, Functions and functional programming, Modules.

UNIT-5

Object oriented programming in Python, Execution environment, Regular expressions.

Text Books

1. Wesley J. Chun "Core Python Programming" Prentice Hall
2. Head First Python, 2nd Edition

Reference Books

1. Mark Lutz "Programming Python, 4th Edit O'ReillyMedia
2. David Beazley and Brian K. Jones "Python Cookbook" O'Reilly

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (I semester)			
Course Code	PROFESSIONAL ETHICS AND HUMAN VALUES				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basic Knowledge on Human Values, moral values and ethics.		3	0	0	

Course Objectives:

- The objectives of this course on 'Professional Ethics and Human Values' are:
- (1) to understand the moral values that ought to guide the Engineering profession,
 - (2) to resolve the moral issues in the profession, and
 - (3) to justify the moral judgment concerning the profession.

Course outcomes:

On Completion of the course, the students will be able	
CO1:	Create awareness on professional ethics and Human values
CO2:	Create awareness on engineering ethics providing basic knowledge about engineering ethics, Variety of moral dilemmas Professional ideas and virtues
CO3:	Provide basic familiarity about engineers as responsible experimenters, Research ethics, codes of ethics, Industrial standards
CO4:	Inculcate knowledge and exposure on safety and risk, risk benefit analysis and have an idea about collective bargaining, confidentiality, professional, employee, intellectual property rights
CO5:	Have an adequate knowledge about MNC's Business environment, computer ethics, moral leadership Sample code of conduct, cyber crime

UNIT I: Human values

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II: Engineering ethics:

The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer–Self Interest, Customs and Religion–Uses of Ethical Theories–Professional Ethics–Types of Inquiry – Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma.

UNIT III: Engineering as social experimentation:

Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering. Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the Instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous Computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

UNIT IV: Engineers' responsibility for safety and risk:

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences – Expected Probability - Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk – Safety and the Engineer - Designing for Safety –Risk - Benefit Analysis-Accidents

UNIT V: Engineer's responsibilities and rights:

Collegiality - Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty – misguided – Loyalty - professionalism and Loyalty- Professional Rights – Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self Interest , Customs and Religion- Ethical egoism-Collective bargaining Confidentiality Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational in other companies- Occupational - price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.

TEXT BOOKS

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana - Maruthi -Publications
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications

Reference:

1. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
4. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

Course Code 19199211	COMMUNICATIVE ENGLISH LABORATORY - II				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisite(s) Learner should be equipped with basic language skills and communication skills like Listening and Speaking		0	0	3	1.5

Course Objectives the course aims

- To enable students to develop listening skills for better comprehension of academic presentations, lectures and speeches.
- To hone the speaking skills of students by engaging them in various activities such as just a minute (JAM), group discussions, oral presentations, and role plays.
- To expose learners to key Reading techniques such as Skimming and Scanning for comprehension of different texts. .

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy
C02:	speak grammatically correct sentences employing appropriate vocabulary suitable to different contexts
C03:	read for various scholarly materials for information and comprehension

Syllabus:

UNIT1: ARGUMENTATIVE SKILLS

Listening: Listening for presentation strategies and answering questions on the speaker, audience and key points.

Speaking: Debating-dos and don'ts – structure of a debate

UNIT 2: PRESENTATION SKILLS

Formal and informal Presentations-Following an argument/ logical flow of thought; answering questions on key concepts after listening to key concepts and academic discourse

UNIT 3: CO-ORDINATING SKILLS-

Listening: Group Discussion -Identifying views and opinions expressed by different speakers while listening to discussions.

Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position- types and styles of G.Ds

UNIT 4: INTERVIEW SKILLS-industry readiness

Listening: Watching and listening to job interviews-understanding interview questions

Speaking: Mock Interviews-Interview etiquette

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for CIVIL, ECE, MECH, CSE, AME, MINING)				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Basics of Physics		3	0	0	3

Course Objective:

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To learn the principle of operation and constructional details of transformers, alternator and induction motors.
4. To study the operation of PN junction diode, half wave, full Wave rectifiers and OP-AMPS
5. To study operation of PNP and NPN transistors and various amplifiers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines, 3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.

Syllabus:

UNIT –I Electrical Circuits

Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits, star-delta and delta-star transformations.

UNIT –II DC Machines

Principle of operation of DC generator- emf equation, types, DC motor types, torque equation, applications, three point starter, Swinburne's Test, speed control methods.

UNIT –III AC Machines

Principle of operation of single phase transformers, e.m.f. equation, efficiency and regulation. Principle of operation of alternators, Principle of operation of 3-Phase induction motor- slip-torque characteristics, efficiency.

UNIT –IV Rectifiers & Linear Integrated Circuits

PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT –V Transistors

PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Text books:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group

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2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition
3. Basic Electrical Engineering by Nagsaricar, Sukhija, Oxford Publications, 2nd edition
4. Industrial Electronics by GK. Mittal, PHI

Web Links:

1. www.electrical4u.com
2. www.nptel.com

CO-PO Mapping:

(1: Slight [Low];

2: Moderate[Medium];

3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	3	2	1	3	-	-	2	-	1	-	1
C02	2	3	-	-	3	-	-	2	3	-	-	1
C03	2	3	-	-	3	-	-	2	3	-	-	1
C04	2	1	2	-	3	-	-	2	2	-	-	1
C05	2	1	-	-	3	-	-	2	-	1	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. II Sem			
CourseCode 19199214	ENGINEERING CHEMISTRY LABORATORY				
Teaching	Total contact hours 48	L	T	P	C
Prerequisite(s): Basic knowledge of Engineering Chemistry Applications		0	0	3	1.5

1. Implement a Python program that obtains the name from the user and prints the message "Hello Username, Welcome to the Python World!".
2. Implement a Python program to print all the prime numbers below n. n value should be taken from the user at the time of execution.
3. Implement Sorting Program in Python:
4. Enter a list of numbers and sort the values in largest-to -smallest order.
5. Implement a Python program for finding the factorial of a given number.
6. Implement a STACK program by using PYTHON.
7. Implement a QUEUE program by using PYTHON.
8. Implement a Python Program for creating a dictionary and display its keys alphabetically.
9. A string with parentheses is well bracketed if all parentheses are matched: every opening bracket has a matching closing bracket and vice versa. Write a Python function well bracketed(s) that takes a string s containing parentheses and returns True if s is well bracketed and False otherwise.
10. Implement a Python Program that reads and displays the contents of a file.
11. Program to show how a class method calls a function defined in the global namespace.
12. Program to illustrate the difference between public and private variables using class.
13. Program to call a class method from another method of the same class.

COURSE OBJECTIVES

To familiarize the students with the basic concepts of Engineering Chemistry lab, training the students on how to handle the instruments and to demonstrate the digital and instrumental methods of analysis.

COURSE OUTCOMES

On Completion of the course, the students will be able to-	
CO1:	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO2:	Determine the total hardness of water
CO3:	Perform various Redox titrations
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils

LIST OF EXPERIMENTS

1. Determination of strength of an acid by pH metric method
2. Determination of Fe (II) in Mohr's salt by potentiometric method
3. Determination of conductance by conductometric method
4. Determination of Hardness of a ground water sample.
5. Determination of chromium (VI) in potassium dichromate
6. Determination of strength of KMnO_4 using standard Oxalic acid solution.
7. Determination of Zinc by EDTA method.
8. Preparation of Phenol-Formaldehyde resin
9. Determination of viscosity of a liquid
10. Determination of surface tension of a liquid
11. Estimation of active chlorine content in Bleaching powder

TEXT BOOKS

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

CO-PO Mapping:

1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common for CIVIL, ECE, MECH, CSE,AME, MINING)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basics of Electricity		0	0	3	1.5

Course Objective:

1. To determine performance of electrical machines.
2. To determine characteristics of electronic devices
3. To control speed of DC motor
4. To identify the types of different suitable devices for conducting of experiment.
5. To understand Kirchhoff's laws.

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Determine performance of electrical machines
C02:	Determine characteristics of electronic devices
C03:	Control speed of DC motor
C04:	Measure current, voltage and power in a circuit.
C05:	Determine current and voltage using Kirchhoff's laws.

List of Experiments:

1. Verification of Kirchhoff's laws
2. Verification of Ohm's laws
3. Measurement of current, voltage, power in R-L-C series circuit excited by single phase supply
4. Verification of voltage & current relations in Star & delta connections
5. Study of various wiring components (wires, switches, fuses, sockets, plugs, Lamp holders, lamps etc. their uses and ratings)
6. Swinburne's test on a DC shunt machine.
7. Speed control of D.C. Shunt motor by Armature Voltage control and Field flux control method
8. Efficiency and regulation of a single phase transformer by OC & SC tests.
9. Brake test on a three phase squirrel cage induction motor

10. PN junction Diode characteristics a). Forward bias b).Reverse bias. (Cut in voltage & Resistance calculations)
11. Zener diode characteristics
12. Half wave rectifier
13. Full wave Rectifier
14. Transistor common emitter characteristics.
15. Transistor common base characteristics.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	3	2	-	-	-	-	-	-	-	-	
C02	-	-	2	-	-	-	-	-	-	-	-	
C03	1	-	-	-	-	-	-	-	-	-	3	
C04	-	-	-	-	-	-	-	-	2	-	-	
C05	-	3	-	-	-	-	-	-	2	-	-	

Course Code 19199112	Engineering Physics Laboratory (common for CSE, ECE, EEE)				
Teaching	Total contact hours-48	L	T	P	C
		-	-	3	1.5

Course Objectives:

On Completion of the course, the students will be able	
CO1:	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colors using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the acceptance angle of an optical fiber and numerical aperture and determine the resistivity of the given semiconductor using four probe method
CO4:	To identify the type of semiconductor i.e., n-type or p-type using Hall effect and determine the band gap of a given semiconductor

List of Physics Experiments

1. Determination of the radius of curvature of the lens by Newton's ring method
2. Magnetic field along the axis of a circular coil carrying current.
3. To determine the resistivity of semiconductor by Four probe method
4. To determine the energy gap of a semiconductor
5. Measurement of resistance with varying temperature
6. To determine the V-I characteristics of P-N Junction diode
7. To determine the V-I characteristics Zener diode
8. To verify the laws of vibration using sonometer
9. To determine the acceleration due to gravity using compound pendulum.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

Web link:

1. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

CO-PO Mapping:

1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial [High],

'-' : No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code	Complex Variables and Transform Techniques (FOR EEE & ECE)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Derivatives, integration and complex numbers To familiarize the transform techniques and complex variables.		3	-	-	3

Course Objective:

- To familiarize the transform techniques and complex variables.
- To equip the students to solve application problems in their disciplines.

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Demonstrate the knowledge of continuity, analytic and C-R equations of complex function, evaluate Taylor and Laurent series and apply Cauchy residue theorem
C02:	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
C03:	Evaluate Fourier series for different functions
C04:	Understand properties of Fourier transformation apply for different function
C05:	Understand properties of Z transformations and apply to solve differential equations

Syllabus:

Unit 1: Complex Variables

Review: Simple functions of a complex variable – real and imaginary parts- No questions may base on this portion.

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Integration in the complex plane: Cauchy theorem (without proof), Cauchy integral formula (without proof), zeros and singularities of analytic functions, Residue, Cauchy's residue theorem (without proof), Evaluation of integrals of the type (i) $\int_0^{2\pi}$

$\int_{-\infty}^{\infty} R(x)dx$ and (ii) $\int f(\cos\theta, \sin\theta)d\theta$

—∞

Unit II: Laplace Transforms

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t , convolution theorem, periodic functions, unit step function, unit impulse function, (without proofs). Applications to ordinary linear differential equations with constant coefficients.

Unit III: Fourier Series

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

Unit IV: Fourier Transforms

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

Unit V: Z-Transforms

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, solutions of linear difference equations using Z-transforms.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. <https://nptel.ac.in/courses/111103070/>
2. <https://nptel.ac.in/courses/111/106/111106084/>
3. <https://nptel.ac.in/courses/111/106/111106046/>
4. <https://nptel.ac.in/courses/111105123/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	3	2	-	-	-	-	-	-	-	1
C02	3	3	3	2	-	-	-	-	-	-	-	1
C03	3	3	3	2	-	-	-	-	-	-	-	1
C04	2	3	2	2	-	-	-	-	-	-	-	1
C05	3	3	2	2	-	-	-	-	-	-	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code	Complex Variables and Transform Techniques (FOR EEE & ECE)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Derivatives, integration and complex numbers To familiarize the transform techniques and complex variables.		3	-	-	3

Course Objective:

- To familiarize the transform techniques and complex variables.
- To equip the students to solve application problems in their disciplines.

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Demonstrate the knowledge of continuity, analytic and C-R equations of complex function, evaluate Taylor and Laurent series and apply Cauchy residue theorem
C02:	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
C03:	Evaluate Fourier series for different functions
C04:	Understand properties of Fourier transformation apply for different function
C05:	Understand properties of Z transformations and apply to solve differential equations

Syllabus:

Unit 1: Complex Variables

Review: Simple functions of a complex variable – real and imaginary parts- No questions may base on this portion.

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Integration in the complex plane: Cauchy theorem (without proof), Cauchy integral formula (without proof), zeros and singularities of analytic functions, Residue, Cauchy's residue theorem (without proof), Evaluation of integrals of the type (i) $\int_0^{2\pi}$

and (ii) $\int_{-\infty}^{\infty} R(x)dx$ $f(\cos\theta, \sin\theta)d\theta$

Unit II: Laplace Transforms

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t , convolution theorem, periodic functions, unit step function, unit impulse function, (without proofs). Applications to ordinary linear differential equations with constant coefficients.

Unit III: Fourier Series

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

Unit IV: Fourier Transforms

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

Unit V: Z-Transforms

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, solutions of linear difference equations using Z-transforms.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. <https://nptel.ac.in/courses/111103070/>
2. <https://nptel.ac.in/courses/111/106/111106084/>
3. <https://nptel.ac.in/courses/111/106/111106046/>
4. <https://nptel.ac.in/courses/111105123/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	3	2	-	-	-	-	-	-	-	1
C02	3	3	3	2	-	-	-	-	-	-	-	1
C03	3	3	3	2	-	-	-	-	-	-	-	1
C04	2	3	2	2	-	-	-	-	-	-	-	1
C05	3	3	2	2	-	-	-	-	-	-	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	DESIGN THINKING AND PRODUCT INNOVATION				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisites: Positive attitude, Desire, Dream, Determination		2	-	-	0

Course Objectives:

1. Understand the design thinking process.
2. Understand the creative collaboration and project structure.
3. Understand various design thinking tools and methods.
4. Develop creative thinking and accidental innovation through various case studies.
5. Understand self- analysis and self-improvement processes and methods.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Understand the core elements of design thinking and product innovation.
CO2:	Learn about structuring the innovative ideas and solutions.
CO3:	Apply various methods and tools for innovation.
CO4:	Develop creative and innovative solutions for challenges.
CO5:	Develop own innovative design thinking cycles, phases and development.

Unit 1: Introduction to Design Thinking

The need for more out-of-the-box thinking, Background, concept of design thinking: What is design thinking? A short history of design thinking, Tackling the way of working vs the workshop approach, The three core elements of design thinking: Be mindful of people, the team and their experience, the audience and their context, be mindful of the (work) place, be mindful of process, Divergent vs. convergent thinking, Separating the research from the search for a solution, The double diamond

Unit 2: Deconstructing Stereotypes Through Creative Collaboration

Structure of the project, Focus: gender equality, Results of the creative collaboration, A more human-centered and optimistic mindset, improving team spirit, Visual and creative approach, Immediate intervention and co-creation, Be compassionate – even towards withholders

UNIT 3: Design Thinking Tools and Methods

Facilitate your team, Methods for facilitation: Warm-ups, I like, I wish, Visual thinking, Make use of the walls, Be curious, Methods for nurturing curiosity: Stakeholder mapping, Interviews, Observation, Be compassionate, Methods for being compassionate: Storytelling and clustering, Mood board, Personas, Journey mapping, Be creative, Collaborative creativity: How might we...?, Ideation technique: Creative matrix, Be constructive, Methods for constructing solutions: Voting visually, Idea napkin, Six thinking hats, Behavioral change world café, Storyboard, Testing the concepts.

UNIT 4: Challenges and Case Studies

Pitfalls: Where to be cautious, Outlook: How design thinking could help in other projects. Case studies: **Consumer Packaged Goods:** Designing a Simplified IOT Electric Toothbrush, **Education:** Design Thinking STEAM School Case Study, **Financial Services:** How ABN AMRO Leverages Design Thinking, **Healthcare:** Design Thinking at Stanford University Medicine, **Retail:** How Nike Became a Fashion Powerhouse through Design, **Technology:**

Innovation at Apple, Design Thinking at IBM, How the Uber Eats Team Designs, **Transportation:** How Makassar Plans to Use Design Thinking to Improve Transport.

UNIT 5: Self-Improvement Analysis

Design your life through Design Thinking, Design Thinking for a Better You.

Text Books:

1. Moritz Gekeler, "A practical guide to design thinking", Friedrich-Ebert-Stiftung, 2019.
2. Jeanne Liedtka, Andrew King and Kevin Bennett, "Solving Problems with Design Thinking", Columbia University Press.

Weblinks:

1. <http://designresearchtechniques.com/>
2. <https://dschool.stanford.edu/resources>
3. <https://designsprintkit.withgoogle.com/introduction/overview>
4. <https://theaccidentaldesignthinker.com>

CO-PO Mapping:

	(1: Slight [Low])					2: Moderate [Medium]			3: Substantial [High]			'-': No Correlation)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	2	2	3	3	-	2	-	2	2	-	3	3	
CO2	1	1	-	3	-	-	3	-	-	-	3	3	
CO3	-	-	2	2	3	-	-	-	-	2	-	3	
CO4	3	3	2	3	1	2	3	3	2	2	3	2	
CO5	3	3	3	3	3	3	3	3	3	3	3	3	

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	ELECTRONIC DEVICES AND CIRCUITS LAB (Common for ECE, EEE)				
Teaching	Total Contact Hours - 12	L	T	P	C
Prerequisites: Knowledge of Engineering physics related to semiconductors, Trigonometry, Integration etc.		-	-	3	1.5

Course Objectives:

1. To observe the working nature of different electronic measuring equipment.
2. To observe the characteristics of different diodes and transistors.
3. To plot the characteristics of different amplifier circuits.
4. To implement the biasing circuits.
5. To observe the characteristics of LED and LDR.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Understand the working nature of different electronic measuring equipment.
CO2:	Understand the characteristics of different diodes and transistors.
CO3:	Understand the working of amplifiers at different frequencies.
CO4:	Understand the need of biasing and also knows the different biasing methods.
CO5:	Understand the working of LED and LDR.

List of Experiments:

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C components (color codes), Potentiometers, Coils, Gang condensers, Relays, Bread boards.
2. Identification, Specifications and testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering practice - Simple circuits using active and passive components.
4. Study and operation of ammeters, voltmeters, analog and digital multimeters, Function Generator, Regulated power supply and CRO.

PART B: List of Experiments (For Laboratory Examination-Minimum of Ten Experiments)

1. P-N junction diode characteristics
 - i. Germanium diode (Forward bias & Reverse bias)
 - ii. Silicon diode (Forward bias only)
2. Zener diode characteristics
 - i. V-I characteristics
 - ii. Zener diode as voltage regulator
3. Rectifiers (without and with c-filter)
 - i. Half-wave rectifier
 - ii. Full-wave rectifier

4. BJT characteristics (CE configuration)
 - i. Input characteristics
 - ii. Output characteristics
5. BJT characteristics (CB configuration)
 - i. Input characteristics
 - ii. Output characteristics
6. FET characteristics (CS configuration)
 - i. Drain characteristics
 - ii. Transfer characteristics
7. SCR characteristics
8. UJT characteristics
9. Transistor biasing
10. CRO operation and its measurements using Lissajous figures
11. BJT-CE amplifier
12. Emitter follower-CC amplifier
13. FET-CS amplifier
14. LED characteristics
15. LDR characteristics
16. Photo diode characteristics
17. Diode applications

PART C: Equipment required for Laboratory

1. Bread boards
2. Ammeters (Analog or Digital)
3. Voltmeters (Analog or Digital)
4. Active & Passive electronic components
5. Regulated power supplies
6. Analog/Digital storage oscilloscopes
7. Analog/Digital function generators
8. Digital multimeters
9. Decade resistance boxes/rheostats
10. Decade capacitance

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem
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Course Code	ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES	(3 semester)			
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Applied Physics		3	-	-	3

Course Objectives:

1. To introduce the concept of types to analyze the motion of object and their applications in free space.
2. To impart the knowledge of electric and magnetic fields in real time applications.
3. To introduce the fundamental theory of electromagnetic waves in transmission lines and their practical applications.
4. To study the propagation characteristics of electromagnetic wave in bounded and unbounded media.
5. To calculate various line parameters by conventional and graphical methods.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Understand the propagation of EM waves in free space and their characteristics at the boundary between media.
CO2:	Learn Maxwell's equations to understand boundary conditions of time varying fields.
CO3:	Analyze electromagnetic wave propagation and attenuation in various medium and propagation through boundaries between media.
CO4:	Analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.
CO5:	Learn parameters and transmission lines.

Syllabus:

UNIT-1

Electrostatics

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, Related problems, Convection and conduction currents, Continuity equation, Relaxation time, Poisson's and Laplace's equations, Related problems.

Magneto Statics

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, Related Problems.

Unit – 2 Maxwell's Equations (Time Varying Fields)

Faraday's law and transformer emf, Inconsistency of Ampere's law and displacement current density, Maxwell's equations in different final forms and word statements, Conditions at a boundary surface: Dielectric-Dielectric and Dielectric-Conductor interfaces, Related Problems.

Unit – 3 EM Wave Characteristics – I & II

Wave equations for conducting and perfect dielectric media, Uniform plane waves, Relations between E & H, Wave propagation in lossless and conducting media, Wave propagation in good conductors and good dielectrics, Polarization, Related problems.

Normal and oblique incidences for both perfect conductor and perfect dielectrics, Brewster angle, Critical angle and Total Internal Reflection (TIR), Poynting vector and Poynting theorem – Applications, Related Problems.

Unit – 4 Transmission Lines – I

Types, Parameters, Transmission line equations, Primary & Secondary constants, Expressions for characteristic impedance, Propagation constant, Phase and group velocities, Infinite line concepts, Losslessness/Low loss characterization, Distortion – condition for distortionlessness and minimum attenuation, Loading - types of loading, Related Problems.

Unit – 5 Transmission Lines – II

Input impedance relations, SC and OC lines, Reflection coefficient, VSWR, UHF lines as circuit Elements; $\lambda/4$, $\lambda/2$, $\lambda/8$ lines – Impedance transformations, Smith chart – configuration and applications, Single and double stub matching, Related Problems.

Text Books:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 2001, 3/e.
2. Antenna and wave propagation- K. D. Prasad, 2014

Reference Books:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2000, 2/e.
2. Engineering Electro-magnetic – William H. Hayt Jr. and John A. Buck, TMH, 2006, 7/e.

Web Links:

1. <http://www.iienet2.org/>
2. <http://www.ilo.org/global/publications/lang--en/index.htm>
3. <http://nptel.ac.in/courses>.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	ELECTRONIC DEVICES AND CIRCUITS (Common for ECE, EEE)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Engineering physics related to semiconductors, Trigonometry, Integration etc.		3	-	-	3

Course Objectives:

1. To learn the basics of semiconductor physics.
2. To study the operation and construction different diodes and their characteristics.
3. To learn the principle of operation of different rectifiers and filter circuits.
4. To study the operation of different transistors and FETs.
5. To learn the basics of different biasing circuits and also to learn the basics of small signal amplifier models using h-parameters.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Apply the Knowledge of semiconductor physics for designing the circuits of electronic devices.
CO2:	Obtain the characteristics of diode in forward and reverse bias and perform mathematical modeling of diode as a resistor and capacitor.
CO3:	Perform analysis and design of a complete AC to DC converter consisting of rectifiers, filters and regulators.
CO4:	Describe the construction and working of a transistor in various modes and design circuits for stabilization and compensation of both BJT and FET.
CO5:	Gain knowledge of small signal low frequency transistor amplifier models.

Syllabus:

Unit-1 Semiconductor Physics

Introduction to metals classification using energy band diagrams, Mobility and conductivity, Electrons and holes in intrinsic semiconductors, Extrinsic semiconductors, Drift and diffusion, Charge densities in semiconductors, Hall effect, Continuity equation, Mass action law, Fermi levels in intrinsic and extrinsic semiconductors.

Unit-2 Junction Diode Characteristics

Open circuited p-n junction, Biased p-n junction, p-n junction diode, Current components in p-n junction diode, Diode equation, V-I Characteristics, Temperature dependence of V-I characteristics, Diode resistance, Diode capacitance, Energy band diagram of p-n junction Diode.

Special Semiconductor Devices Zener diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Varactor diode, Tunnel diode, Thyristors (DIAC, TRIAC, SCR), UJT construction, Operation and characteristics of all the diodes is required to be considered.

Unit-3 Rectifiers and Filters

Basic rectifier setup, Half wave rectifier, Full wave rectifier, Bridge rectifier, Derivations of characteristics of rectifiers, Rectifier circuits-operation, Input and output waveforms, Filters, Inductor filter, Capacitor filter, L-section filter, π -section filter, Comparison of various filter circuits in terms of ripple factors, Voltage regulators- series and shunt, IC voltage regulators.

Unit-4 Transistor Characteristics, Biasing and Thermal Stabilization

Bipolar junction transistor, Transistor current components, Transistor equation, Transistor configurations, Transistor as an amplifier, Characteristics of transistor in common base, Common emitter and common collector configurations, Punch through/Reach through effect, Photo transistor.

FET: FET types, Construction, Operation, Characteristics, Parameters, MOSFET-types, Construction, Operation, Characteristics

Unit-5 Biasing and Thermal Stabilization, Transistor Amplifier Models

Need for biasing, Operating point, Load line analysis, BJT biasing- methods, Stability factors, (S, Si, S”), Compensation techniques, Thermal runaway, Thermal stability, Introduction to Heat Sinks. FET biasing methods and Stabilization.

BJT: Two port network, Transistor hybrid model, Determination of h- parameters, Generalized analysis of transistor amplifier model using h- parameters.

Text books:

1. Electronic Devices and Circuits - J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits - B. P. Singh, Rekha Singh, Pearson Publications, Second Edition.

Reference Books:

4. Electronic Devices and Circuits - Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
5. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.

Web Links:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. <http://www.satishkashyap.com/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

CO4	1	3	3	2	3	-	1	-	-	-	2	1
CO5	2	2	3	3	3	1	3	1	-	-	3	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)		II B.Tech. I Sem (3 semester)			
Course Code	NETWORK ANALYSIS LAB					
Teaching	Total Contact Hours - 45		L	T	P	C
Prerequisites: Knowledge of Engineering Mathematics and Basic Electrical Engineering			-	-	3	1.5

Course Objectives:

1. To verify the network theorems - Thevenin's, Norton's, Superposition, Reciprocity, Maximum Power Transfer theorem
2. To determine the impedance and admittance parameters of a given two-port network
3. To understand series and parallel resonance of the given network
4. To understand the time response of first order RC/RL network

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Verify the network theorems - Thevenin's, Norton's, Superposition, Reciprocity, Maximum Power Transfer theorem
CO2:	Determine the impedance and admittance parameters of a given two-port network
CO3:	Calculate the series and parallel resonance of the given network
CO4:	Determine the time response of first order RC/RL network for periodic non-sinusoidal inputs

All the experiments are to be done compulsorily

List of Experiments:

1. Verification of Thevenin's and Norton's theorem
2. Verification of superposition and Maximum power transfer theorem
3. Verification of Compensation theorem and Reciprocity theorem
4. Verification of Milliman's theorem
5. Z parameters
6. Series resonance and Parallel resonance
7. Determination of self-mutual inductances and co-efficient of coupling
8. Y parameters
9. Transmission line parameters and Hybrid parameters
10. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	Network Analysis				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Engineering Mathematics and Basic Electrical Engineering		3	-	-	3

Course Objectives:

1. To get a basic understanding of network, network elements and network topology and also study various network analysis and reduction technique
2. To understand AC fundamentals, study of steady state analysis of AC circuits and resonance and also study the concept of self and mutual inductance and coupled circuit analysis
3. To understand the application of network theorems in analyzing both AC and DC networks
4. To understand fundamentals of two-port networks, study of various two-port network parameters and relationship between parameters sets
5. To study of transients (AC and DC), understanding time constant, time domain and frequency domain transient analysis, concepts of filter and filter designing

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Analyze network, network topology and various network reduction techniques.
CO2:	Understand AC fundamentals, steady-state analysis of AC circuits, magnetic circuits and resonance concepts.
CO3:	Apply network theorems to both DC and AC networks and know about various two-port network parameters.
CO4:	Know about study of transients (AC and DC), time and frequency domain transient analysis and concepts of filters and filter designing

Syllabus:

Unit-1 Introduction to Electrical Circuits

Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchhoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also

A.C Fundamentals and Network Topology

Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasor, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology

Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

Unit-2 Steady State Analysis of A.C Circuits

Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, Numerical Problems.

Unit-3 Coupled Circuits and Resonance

Coupled Circuits Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits-problem solving. 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, anti-resonance at all frequencies

Unit-4

Network Theorems

Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Max Power Transfer, Tellegens- dependent and independent sources- both with DC & AC excitation

Two-port networks

Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, cascading of two port networks, series connection of two port networks, Numerical Problems

Unit-5 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 and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

Filters

Introduction to filters - low pass, high pass and band pass filters

Text books:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle, TMH

Reference Books:

1. Network lines and Fields by John. D. Ryder 2nd edition,

2. Basic Circuit Analysis by DR Cunningham, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications.

Web-Resources:

1. www.electrical4u.com
2. www.nptel.com

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	SIGNALS & SYSTEMS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Differential equations and Integrals, Laplace transforms, Ordinary differential equations, Series and expansions, Fourier analysis		3	-	-	3

Course Objectives:

1. To understand the fundamental characteristics and classifications of signals and systems.
2. To understand the Nyquist sampling theorem and the process of reconstructing a continuous-time signal from its samples.
3. To develop expertise in time-domain and frequency domain approaches to the analysis of continuous and discrete systems.
4. To use linear systems tools, especially transform analysis and convolution, to analyze the behavior of linear systems.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Characterize and analyze the properties of CT and DT signals that are commonly used in engineering applications.
CO2:	Analyse the spectral characteristics of continuous-time periodic and aperiodic signals using Fourier analysis.
CO3:	Classify systems based on their properties and determine the response of LTI system using convolution.
CO4:	Understand the process of sampling and the effects of under sampling.

CO5:	Apply the Laplace transform and Z-transform to analyze continuous-time and discrete-time signals and systems.
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UNIT-1 Introduction to Signals and Fourier Series

Definition of signal, Classification of signals, Elementary signals - Continuous Time (CT) signals, Discrete Time (DT) signals, Basic operations on signals.

Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Properties of Fourier series, Complex Fourier spectrum.

UNIT-2 Fourier Transform and Sampling

Deriving Fourier transform from Fourier series, Fourier transform of standard and arbitrary signals, Fourier transform of periodic signals, Properties of Fourier transform.

Introduction to sampling theorem, Graphical and analytical proof for band limited signals, Reconstruction of signal from its samples, Effect of under sampling - Aliasing.

UNIT-3 Signal Transmission Through Linear Systems

Classification of systems, Linear Time Invariant (LTI) systems, Impulse response, Transfer function of an LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics.

UNIT-4 Convolution and Correlation of Signals

Concept of convolution in time and frequency domain, Graphical representation of convolution, Auto and cross correlation of functions, Properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between convolution and correlation.

UNIT-5 Laplace and Z-Transforms

Review of Laplace transforms, Concept of region of convergence (ROC) for Laplace transforms, Properties of L. T's, Relation between L.T and F.T. of a signal, Inverse Laplace transform. Z-transform of a discrete time sequence, Distinction between Laplace, Fourier and Z-transforms, Region of convergence in Z-transforms, Properties of Z-transform, Inverse Z-transform.

Text books:

1. Signals and Systems - A.V Oppenheim, A. S. Willsky and S.H. Nawab, PHI, 2nd Edn.
2. Signals, Systems & Communications - B.P. Lathi, Oxford Publications, 8th Impression 2014.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.

Web Links:

1. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
2. <http://www.iienet2.org/>
3. <http://www.ilo.org/global/publications/lang--en/index.htm>
4. <http://nptel.ac.in/courses/Webcoursecontents/IITROORKEE/INDUSTRIALENGINERRING/>
5. <http://nptel.ac.in/courses>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)
Course Code	SWITCHING THEORY AND LOGIC DESIGN	

Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Engineering and Network circuits.		3	-	-	3

Course Objectives:

1. Understand the concepts of number system and logic gates.
2. Formulate logic and design circuits for practical problems.
3. Understand the different combinational logic circuits.
4. Understand the sequential logic circuits and their conversions.
5. Understand design and development of finite state machine.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Represent numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
CO2:	Realize Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
CO3:	Design and analyze combinational circuits and to use standard combinational functions/building blocks to build complex circuits.
CO4:	Design and analyze sequential circuits and devices and to use standard sequential functions/building blocks to build complex circuits.
CO5:	Design and analyze finite state machine.

Syllabus:

UNIT-1 Review of Number Systems & Codes

Representation of different radix, Number systems base conversion methods, complements of numbers, r 's, $r - 1$'s compliment of signed numbers, 4-bit codes, BCD, excess-3, alphanumeric code, self-complement codes, Weighted and Non-weighted codes.

Logic operations: Basic Logic gates- NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR gates, Canonical and Standard form, Gray code, Error detection and correction codes, Parity checking codes, Hamming codes, Multi-level NAND – NAND, NOR – NOR realizations.

UNIT-2 Minimization of Switching Functions

Minimization of logic functions using Boolean theorems, Complements and duality of logic expressions, De-Morgan theorems, Minimization of switching functions using Boolean theorem, K-map up to 6-variables, Code converters using K-map, Tabular minimization (Quine McCluskey method).

Design of half adder, Full adder, Half subtractor, Full subtractor, Applications of full adders, 4-bit binary adder, 4-bit binary subtractor, 4-bit adder/subtractor circuit, BCD adder, Carry look-a-head adder, Binary multiplier.

UNIT-3 Combinational Logic Circuits

Design of decoder, Encoder, Multiplexer, De-multiplexer, Priority encoder, Comparators and seven segment display decoder, Realization of Boolean functions using decoders and multiplexers, Implementing multiplexers 32 to 1, 16 to 1 using other multiplexers, Implementing decoders 5x32, 4x16 using other decoders.

PLDS: PAL, PLA & PROM structures, Merits & demerits and their comparison, Implementation of circuits like Full adder, Full subtractor, Decoders, Multiplexers using PROM, PAL, PLA, Realization of Boolean functions with the help of programming tables of PROM, PAL, and PLA.

UNIT-4 Sequential Logic Circuits

Difference between combinational and sequential circuits, RS-Latch, Difference between latch and flip-flop, Classification of sequential circuits, Flip-flops with truth tables, Excitation tables, State diagram and state equation and Conversion of flip-flops.

Design of asynchronous and synchronous counters, Johnson and ring counters, Shift register, Bi-directional shift register and universal shift register, Realization of circuits using various flip-flops.

UNIT-5: Capabilities and Minimization of Sequential Machines

Introduction to state machines, State diagrams, State tables and state equations, Finite state machines: Analysis of clocked sequential circuits, Reduction of state tables, state diagrams and state assignments, Design procedure, Mealy and Moore models, Mealy to Moore conversion and vice-versa, Vending machine example on state machines.

Text books:

1. Digital Design, M. Morris Mano, Prentice Hall; 3 edition (August 1, 2001).
2. Switching and Finite automata theory – Zvi Kohavi, Tata McGraw – Hill, 1978, 2/e.

Reference Books:

1. Fundamentals of Logic Design – Charles H. Roth Jr, Jaico Publishers.
2. Fundamentals of Digital Circuits, Anand Kumar A, PHI; 2nd edition (8 June 2012).

Web Links:

1. <http://www.ni.com/example/14493/en/>
2. <http://nptel.ac.in/courses/117106086/2>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19		Godavari Institute of Engineering & Technology (Autonomous)										II B.Tech. II Sem (4 semester)			
Course Code 19140405		PULSE AND DIGITAL CIRCUITS													
Teaching		Total contact hours - 50										L	T	P	C
Prerequisites: Knowledge of Electronic devices and circuits.												3	1	-	3
	CO4	3	3	2	3	1	2	3	-	-	-	2	1		
	CO5	3	3	2	2	3	1	1	-	-	1	3	1		

Course Objectives:

1. To impart knowledge on linear wave shaping.
2. To understand the concepts of non-linear waveshaping circuits.
3. To generate non sinusoidal signals using multivibrators.
4. To understand time base generators and blocking oscillators.
5. To understand principles of synchronization and frequency division.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Design linear wave shaping circuits for various input signals.
CO2:	Design non linear wave shaping circuits using diodes and transistors
CO3:	Generate various non sinusoidal signals using multivibrators for various electronic application.
CO4:	Design time base generators which are used in different applications and also Understand the principles of blocking oscillators.
CO5:	Apply the operating principles of sampling gates for their applications and Understand the principles of synchronization and frequency division in systems operating at different frequencies.

Syllabus:

UNIT-1 Linear wave shaping:

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, double differentiation, attenuators, RL and RLC circuits and their response for step input, Ringing circuit

UNIT-2

Non – Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-3

Multivibrators: Analysis & Design of Bistable Multivibrators :Fixed bias& self biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit, applications, Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled

Monostable multivibrators, Triggering in monostable multivibrator, Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

UNIT-4

Time Base Generators : General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

Blocking oscillators: Basic operating principles of blocking oscillators, Applications.

UNIT-5:

Synchronization and Frequency Division: Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Phase delay & phase jitters; Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

Sampling gates:

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Four-diode sampling gates; Applications of sampling gates.

Text books:

- 1 . J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, 1991.
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2008. Second Edition .

Reference Books:

1. Venkat Rao. K. Ramasudha K, Manmadha Rao G, "Pulse and Digital Circuits," Pearson Education, 2010
2. David J Comer , "Digital Logic State Machine Design", Oxford University Press, 2008, Third Edition.

Web Links:

1. <http://www.iienet2.org/>
2. <http://www.ilo.org/global/publications/lang--en/index.htm>
3. <http://nptel.ac.in/courses>.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	-	3	-	-	1	-	-	-	-	-	2
C02	2	-	3	-	-	1	-	-	-	-	-	-
C03	-	3	2	-	-	2	-	-	-	1	-	1
C04	-	-	2	-	-	2	-	-	-	-	-	1
C05	3	-	2	-	-	2	-	-	-	-	1	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)							
Course Code	RANDOM VARIABLES AND STOCHASTIC PROCESSES								
Teaching	Total contact hours - 50					L	T	P	C
Prerequisites: Mathematics basics like integral and differential calculus.						3	1	-	3

Course Objectives:

1. To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and communication engineering.
2. To introduce students to the basic methodology of randomness in nature and to apply it to problems.
3. To understand basic concepts of probability theory, random variables, multiple random variables, Conditional probability, joint distribution statistical independence between random variables and expectation including mean square estimation.
4. To understand the difference between time averages and statistical averages.
5. Analysis of random process and application to the various fields.
6. To teach students how to apply sums and integrals to compute probabilities, means, and expectations.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand probabilities and able to solve using an appropriate sample space.
CO2:	Compute various operations like expectations from probability density functions (pdfs) and probability distribution functions.
CO3:	Perform Likelihood ratio tests from pdfs for statistical engineering problems.
CO4:	Mean and covariance functions for simple random variables. Understand auto-correlation and cross correlation properties between two random variables.
CO5:	Explain the concept of random process, differentiate between stochastic and ergodic processes and also explain the concept of power spectral density and power density spectrum of a random process with random inputs.

Syllabus:

UNIT-1

Probability and Random Variable:

The Random Variable: Concepts of probability, Random experiments, Sample space, Events and nature of events, Probability, Types of axioms: Additive, Multiplicative theorems, Random variable: Properties, Types of distribution functions: Probability mass function, Probability density function: Properties, Binomial, Poisson, Uniform, Normal, Exponential and Rayleigh distributions and their properties.

UNIT-2

Operations on Single & Multiple Random Variable – Expectations:

Introduction, Expected value of a random variable, Function of a random variable, Moments about the origin, Central moments, Variance and skew, Chebychev's inequality, Characteristic

function, Moment generating function, Transformations of a random variable: Monotonic transformations of a continuous random variable, Non-monotonic transformations of a continuous random variable, Introduction to the concept of multiple random variables, concepts of conditional and unconditional joint distribution and density functions-related properties, Statistical independence of random variables, Transformations of multiple random variables, Linear transformation of Gaussian random variables.

UNIT-3

Random Processes in the Time Domain:

Introduction to the concept of random process - Temporal characteristics, Classification of random processes, Deterministic and Non-deterministic random processes, Definitions of distribution and density functions of a random process, Concepts of stationary and statistical independence of random processes, Classification of stationary random processes (First order, Second order, Wide-sense and Strict-sense stationary processes), Autocorrelation function and its properties, Cross correlation function and its properties, Covariance function, Concept of time averages and ergodicity, Measures of random processes (Gaussian random process, Poisson random process).

UNIT-4

Random Processes in the Frequency Domain:

Introduction to the concept of random process-spectral characteristics, The power spectrum and its properties, Relation between power spectrum and autocorrelation function, The cross-power density spectrum and its properties, Relation between cross-power spectrum and cross-correlation function.

UNIT-5

Linear Systems with Random Inputs:

Introduction to 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 spectra of input and output, Concepts of band-pass, Band-limited and narrowband processes – Properties, Noise sources: Resistive (Thermal) Noise, Arbitrary noise, Effective noise temperature, Average noise figure.

Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles," TMH, 2001, 4th Edition, 2001.
2. Probability and random process- Scott Miler, Donald Childers, 2 Ed, Elsevier, 2012, 2nd Edition.

References:

1. Athanasius Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes," PHI, 2002, 4th Edition.

Web Links:

www.nptel.ac.in
www.ocw.mit.edu

CO-PO Mapping:

(1: Slight [Low])

2: Moderate [Medium]

3: Substantial [High], -: No Correlation)

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

CourseCode	ANALOG COMMUNICATIONS				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite (s): Knowledge of Communication with in analog signals with relevant mathematical expressions		3	-	-	3

Course Objectives:

1. The main objective of this course is to know about analog communication system, the need for modulation and the different modulation techniques.
2. Understand the concept of noise and detection of signals in presence of noise.
3. Understand different radio transmitters and receivers.
4. Study the concept of multiplexing and pulse modulation techniques.

Course Outcomes:

On Completion of the course, the students will be able to-	
C01:	Relate modulation, demodulation techniques and understand major building blocks of communication systems.
C02:	Understand the communication systems and distinguish between different modulation techniques.
C03:	Analyze generation and detection of FM signals in both time domain and frequency domains and Learn about less noise immune systems.
C04:	Sample analog signals and understand multiplexing of signals.
C05:	develop a clear insight into the relations between the input and output AC signals in various stages of a transmitter and receiver of AM and FM systems.

Syllabus:

Unit I AMPLITUDE MODULATION

Introduction to communication system, need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector Noise in Analog communication System.

Unit II DSB & SSB MODULATION

Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSB-SC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency discrimination method for generation of AM SSB Modulated Wave, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, Noise in DSB & SSB System, Noise in AM System

Unit III ANGLE MODULATION

Basic concepts, Frequency Modulation: Singletone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis.

Unit IV TRANSMITTERS & RECEIVERS:

Radio Transmitter – Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super - heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Unit V PULSE MODULATION

Sampling, Time Division Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM vs FDM.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCES:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems – R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masoud, Salehi PEA, 2006.

WEB REFERENCES:

1. NPTEL online courses.
2. MOOCs online courses by JNTUK

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)
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	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	3	3	-	-	-	-	-	-	-	-	-
C02	-	2	1	-	-	-	-	-	-	-	-	-
C03	3	3	2	-	-	-	-	-	-	-	-	-
C04	-	2	2	-	-	3	-	-	-	-	-	-
C05	-	-	3	1	-	3	-	-	-	-	-	-

CourseCode XXXXX	ANALOG COMMUNICATION LAB				
Teaching	Totalcontacthours-12	L	T	P	C
Prerequisite(s): Knowledge of Communication with analog signals		-	-	3	1.5

Course Objective:

1. To Observe the working nature of different communication systems
2. To Observe the different AM techniques.
3. To Observe the different FM techniques and requirements of Emphasis techniques
4. To Observe the different Sampling of analog signals
5. To Observe the Simulation process

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Identify and describe different Amplitude modulation techniques
CO2:	Identify and applying Emphasis techniques in analog systems
CO3:	Sample analog signals
CO4:	Analyze different discrete pulse modulation techniques
CO5:	Understand and Simulate the different codes using MATLAB

Syllabus:

List of Experiments:

PART A: List of Experiments based on Hardware

- i. Amplitude modulation- Modulation & Demodulation
- ii. AM-DSB SC- Modulation & Demodulation
- iii. Spectrum Analysis of Modulated signal using Spectrum Analyzer
- iv. Diode Detector
- v. Pre-emphasis & De-emphasis
- vi. Frequency Modulation & Demodulation
- vii. AGC Circuits
- viii. Sampling Theorem
- ix. Pulse Amplitude Modulation & Demodulation.
- x. Pulse Width Modulation (PWM)- Modulation & Demodulation
- xi. Pulse Position Modulation (PPM)- Modulation & Demodulation
- xii. Phase locked loop (PLL)

PART B: List of Experiments based on MATLAB Software

1. Amplitude modulation- Modulation & Demodulation

2. AM-DSB SC- Modulation & Demodulation
3. Diode Detector
4. Pre-emphasis & De-emphasis
5. Frequency Modulation & Demodulation
6. Sampling Theorem
7. Pulse Amplitude Modulation & Demodulation.
8. Pulse Width Modulation (PWM)- Modulation & Demodulation
9. Pulse Position Modulation (PPM)- Modulation & Demodulation

PART C: Equipment required for Laboratory

1. Bread boards.
2. Active & Passive Electronic Components
3. Regulated Power supplies
4. Analog/Digital Storage Oscilloscopes
5. Analog/Digital Function Generators
6. Digital Multimeters
7. Trainer Kits

Web Links:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. <http://www.satishkashyap.com/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
CourseCode 19140411	ELECTRONIC CIRCUIT ANALYSIS LAB				
Teaching	Total contact hours-12	L	T	P	C
Prerequisite(s): knowledge of electronic devices and circuits.				3	1.5

Course Objectives:

5. Understand the design of Small Signal Transistor Amplifier models.
6. Understand the concepts feedback amplifiers and oscillators
7. Understand the concepts of multistage amplifier and differential amplifier using BJT
8. Understand the design of different types of power amplifiers
9. Understand the design of different types of tuned amplifiers

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Perform analysis and design of Small Signal Transistor Amplifier models.
CO2:	Design and analysis of feedback amplifiers and oscillators
CO3:	Demonstrate the knowledge of multistage amplifier and differential amplifier using BJT.
CO4:	Design and analysis of different types of power amplifiers
CO5:	Design different types of tuned amplifiers for real time applications

PART A:

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 Oscillators.
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 Amplifier.
12. Complementary Symmetry Class-B Push pull Power amplifier.
13. Single tuned Voltage amplifier.
14. Double Tuned Voltage Amplifier.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)
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PART-B: Equipment Required for Laboratory

1. Multisim / Pspice/Equivalent licensed simulation tool.
2. Computer system with required specifications

Hardware:

1. Regulated power Supplies
2. Analog/Digital Storage Oscilloscopes.
3. Analog/ Digital function generators.
4. Digital Multi-meters.
5. Decade Resistance boxes.
6. Decade Capacitance boxes.
7. Ammeters
8. Voltmeters.
9. Active & Passive Electronic Components

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

CourseCode XXXXX	ELECTRONIC CIRCUIT ANALYSIS				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites: knowledge of electronic devices and circuits and also solve the fundamental problems in Engineering physics related to semiconductor. semiconductor.		3	1	-	3

Course Objectives:

10. Understand the design of Small Signal Transistor Amplifier models.
11. Understand the concepts of high frequency response of BJT and FET.
12. Understand the concepts of multistage amplifier and differential amplifier using BJT
13. Understand the concepts of both positive and negative feedback in electronic circuits.
14. Understand the design of different types of power amplifiers

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Perform analysis and design of Small Signal Transistor Amplifier models.
CO2:	Perform analysis of high frequency response of BJT and FET.
CO3:	Demonstrate the knowledge of multistage amplifier and differential amplifier using BJT.
CO4:	Analyze the concepts of both positive and negative feedback in electronic circuits and to generate signals in various frequency ranges.
CO5:	Design different types of power amplifiers for real time applications

Syllabus:

UNIT-1 Small Signal analysis of BJT and FET

Small signal analysis of BJT: Small signal equivalent circuit model, small signal analysis of CE,CC,CB amplifier. Effect of R_s and R_L on CE amplifier operation, Emitter follower, cascade amplifier, Darlington connection.

Small signal analysis of FET: Small signal equivalent circuit model. small signal analysis of CS,CD,CG amplifier, Effect of R_{sig} and R_L on CS amplifier, Source follower and cascaded system.

UNIT-2 High frequency response of FET and BJT:

High frequency equivalent models and frequency response of BJT's and FET's. Frequency response of CS amplifier. Frequency response of CE amplifier.

UNIT-3 Multistage Amplifiers

Classification of Amplifiers, methods of coupling, cascade transistor amplifier and its analysis, analysis of two stage coupled amplifier, high input resistance transistor amplifier circuits and their analysis- Darlington pair amplifier, Cascode amplifier, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT-4 Feedback Amplifiers and Oscillators

Concepts of positive and negative feedback. Four basic feedback topologies, Principle of sinusoidal oscillator, Wein-Bridge, Phase shift and crystal oscillator. Hartley oscillator, Colpitts oscillator, Ideal op-amp characteristics.

UNIT-5 Power Amplifiers

Classification of amplifiers, class A power amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifier and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class – C power amplifier, distortion in amplifiers.

Text books:

1. Integrated Electronics- J. Millman and C.C Halkias ,Tata Mc Graw Hill 1972.
2. Electronic circuit analysis and design –Donald A, Meaman, Mc Graw Hill.

Reference Books:

1. Microelectronic Circuit- Sedra A.S. and K.C. Smith, Oxford university press, 6th edition.
2. Electronic devices and circuit theory- Robert L. Boylestad and Louis Nashelsky, Pearson tenth edition.

Web Links:

1. www.electronics-tutorials.ws/
2. www.nptel.com
4. <http://www.satishkashyap.com/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
CourseCode 19140412	PULSE AND DIGITAL CIRCUITS LAB				
Teaching	Total contact hours-12	L	T	P	C
Prerequisite(s): knowledge of electronic devices and circuits.		-	-	3	1.5

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

Course Objective:

1. Generation and processing of sinusoidal and non-sinusoidal signals.
2. Fundamentals of basic logic gates and its applications.
3. Analysis and design of various multivibrator circuits.
4. Design and analysis of UJT relaxation oscillator and boot-strap sweep circuits

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Generate and process sinusoidal and non-sinusoidal signals.
CO2:	Understand fundamentals of basic logic gates and design applications
CO3:	Design and analyze various multivibrator circuits.
CO4:	Design and analyze UJT relaxation oscillator
CO5:	Design and analyze UJT relaxation oscillator and boot-strap sweep circuits

Syllabus:

List of Experiments:

PART A:

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap sweep circuit.

PART B: List of Experiments

(Software)

1. High pass filter
2. low pass filter
3. Non Linear wave shaping – Clippers
4. Non Linear wave shaping – Clampers)
5. Attenuators
6. Sampling gates.

Web Links:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. <http://www.satishkashyap.com/>

CO-PO Mapping: Total contact hours- 48 L T P C

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
Course Code 19150403	FUNDAMENTALS OF OPERATING SYSTEMS				
Teaching					
Prerequisite(s): Basic knowledge about Computer Peripherals and Computer Architecture					

Course Objective(s):

- To understand the general structure of modern computers
- To acquire the knowledge of general purpose, structure and functions of operating systems
- To identify and illustrate the of OS aspects by example

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: Describe the general architecture of computers

CO-2: Describe, contrast and compare differing structures for operating systems

CO-3: Understand and analyse theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

UNIT-1

Computer System and Operating System Overview: Overview of computer operating system, operating system structure, operating system operations, protection and security, services, systems calls, operating system generation.

UNIT-2

Process Management: Process concept- process scheduling, operations, Process criteria and algorithms, and their evaluation, Multi Thread programming models, Inter process communication.

UNIT-3

Concurrency: Process synchronization, the critical- section problem, Peterson's Solution, synchronization hardware, semaphores, classic problems of synchronization, monitors.

UNIT-4

Memory Management:

table, segmentation.

Swapping, contiguous memory allocation, paging, structure of the page

Virtual Memory Management: Virtual memory, demand paging, page-Replacement algorithms, Allocation of Frames, Thrashing

UNIT-5

Mass-Storage Structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling (FCFS, SCAN, CSCAN, SSTF)

Text Books

- Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
- Operating Systems – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education.

Reference Books

- Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH
- Operating System A Design Approach-Crowley, TMH.
- Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

Web References:

<https://nptel.ac.in/courses/106/106/106106144/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DIGITAL IMAGE PROCESSING (Open Elective-II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Signals and Systems, Digital Signal Processing		3	-	-	3

Course Objectives:

1. To understand the fundamental concepts and applications of Image Processing.
2. To understand the concepts of Intensity Transformations and Spatial Filtering.
3. To understand Image Restoration and Reconstruction.
4. To understand the concepts of Color image processing.

On Completion of the course, students will be able to	
CO1:	Understand the fundamental steps in digital image processing.
CO2:	Examine various types of images, intensity transformations and spatial filtering.
CO3:	Develop Fourier transform for image processing in frequency domain.
CO4:	Evaluate the methodologies for image restoration and segmentation.
CO5:	Understand color image processing models

UNIT-1 Digital Image Fundamentals

Fundamental steps in DIP, Components of digital image processing, Elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, Image sensing and acquisition, Sampling and quantization of images, Representation of digital image, Spatial and gray level resolution, zooming and shrinking, some basic relationships between pixels.

UNIT-2 Image Enhancement in the Spatial Domain

Gray Level Transformations, Piecewise linear transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filters, Use of first order and second order derivative in enhancement.

UNIT-3 Image Enhancement in the Frequency Domain

Two-dimensional Fourier Transform, some properties of the 2-D Discrete Fourier transform, correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters, Homomorphic Filtering.

UNIT-4 Image Restoration

A model of the image Degradation/Restoration process, Noise models, Restoration in the presence of noise only - Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear Position Invariant Degradations, Estimation of the degradation function, Inverse filtering, Minimum mean square error(Wiener) filtering.

UNIT-5 Color Image Processing

Color Fundamentals, Color Models, Pseudo color Image Processing.

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

Reference Books:

1. B. Chanda and D. Dutta Majumdar, "Digital Image Processing and Analysis" PHI, 2003.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd edition, Prentice Hall, 2009.
3. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011.

Web Links:

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

Course Code	LINEAR & DIGITAL IC ALPPLICATIONS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Electronic Devices & Circuits, Switching Theory and Logic, Electronic Circuit Analysis.		3	-	-	3

Course Objectives:

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non - linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To teach the theory of ADC and DAC.
5. To understand and implement the working of basic digital circuits.

On Completion of the course, students will be able to	
CO1:	Understand the internal operation of Op-Amp and its specifications.
CO2:	Analyze and design linear and nonlinear applications using Op-Amp.
CO3:	Operate 555 timers in different modes like bistable, monostable and astable operations and study their applications.
CO4:	Understand the conversion process of ADC and DAC in digital electronics.
CO5:	Explain the differences between CMOS and TTL logic families and study various digital ICs.

UNIT – 1 Operational Amplifier

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger.

Voltage Regulators: Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators

UNIT – 2 Op-Amp, IC-555 & IC 565 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer - Functional Diagram, Monostable, and Astable Operations, Applications, IC565 PLL – Block Schematic, Description of Individual Blocks, Applications.

UNIT – 3 Data Converters

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC,

DAC and ADC Specifications.

UNIT – 4 Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families
Combinational Logic ICs – Specifications and Applications of TTL-74XX & Code
Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, Multiplexers,
Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor,
Magnitude Comparators.

UNIT – 5 Sequential Logic ICs and Memories

Familiarity with commonly available 74XX CMOS 40XX Series ICs – All Types of Flip-
flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMs & Applications, RAM Architecture, Static &
Dynamic RAMs.

Text Books:

1. Op-amps & linear ICs- RamakanthAGayakwad, PHI, 2003.
2. Digital Fundamentals-Floyd and Jain, Pearson education, 8th edition 2005.
3. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.

Reference Books:

1. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.
2. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson, 2009.
3. Linear Integrated Circuits and Applications – Salivahanan.
4. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

Web Links:

1. <https://nptel.ac.in/courses/117107094/>
2. <https://nptel.ac.in/content/storage2/courses/117108107/Lecture%2035.pdf>
3. <https://nptel.ac.in/courses/117106086/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DIGITAL COMMUNICATION				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Signals & Systems, Random Variables and Stochastic Process		3	-	-	3

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To understand the pulse digital modulation systems such as PCM, DPCM and DM.
3. To analyze the performance of various digital modulation techniques in terms of probability of error.
4. To understand the concept of entropy and need for source coding.
5. To understand linear block codes, cyclic codes and convolution codes.

On Completion of the course, students will be able to	
CO1:	Explain the conventional digital communication system.
CO2:	Discuss the pulse digital modulation schemes such as PCM, DPCM and DM.

CO3:	Evaluate the performance of various digital modulation techniques in terms of probability of error.
CO4:	Analyze the performance of digital communication system in the presence of noise
CO5:	Compute and analyze block codes, cyclic codes and convolution codes.

UNIT – 1 Elements of Digital Communication Systems

Elements of Communication System, Block diagram of digital communication system, Certain issues in Digital Transmission, Advantages of Digital Communication, Channels for Digital communication, Digital Representation of Analog Signal – Sampling, Sampling theorem for band limited signals, Hartley Shannon Law, Bandwidth-S/N tradeoff.

UNIT – 2 Pulse Digital Modulation

Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems, Differential PCM systems (DPCM), Time Division Multiplexing & Demultiplexing, Delta modulation, its drawbacks, adaptive delta modulation, comparison of PCM and DM systems, Noise in PCM and DM systems.

UNIT – 3 Digital Modulation Techniques

Introduction, ASK modulator, Coherent and Non-Coherent ASK detector, FSK modulator, Spectrum of FSK, coherent reception, non-coherent detection of FSK. BPSK transmitter, Coherent reception of BPSK, DPSK, QPSK.

Data Transmission: Base band signal receiver, probability of error, The optimum filter, Matched filter, probability of error using matched filter, Optimum filter using correlator, Probability of error of ASK, FSK, BPSK and QPSK.

UNIT – 4 Information Theory

Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise. Source coding - Huffman Code, variable length coding, Source coding to Increase average Information per bit, Lossy source coding.

UNIT – 5 Linear Block Codes & Convolution Codes

Introduction to Linear block codes, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, Syndrome calculation.

Introduction to Convolution codes, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: State, tree and trellis diagram

decoding using Viterbi algorithm.

Text books:

1. Digital Communication - Simon Haykin, Jon Wiley, 2005.
2. Principles of communication systems - Herbert Taub. Donald L Schilling, Goutam Sana, 3rd Edition, Tata McGraw Hill, 2008.
3. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

Reference Books:

1. Digital Communications - John G. Proakis, Masoud Salehi, 5th Edition, McGraw-Hill, 2008.
2. Digital Communications - Ian A. Glover, Peter M. Grant, Pearson Edu., 2008.
3. Communication Systems - B.P. Lathi, BS Publication, 2006.

Course Objectives:

1. To understand the applications of electromagnetic waves in free space.
2. To introduce working principles of various antenna types.
3. To discuss major applications of antennas with an emphasis on how antennas are employed.
4. To understand the concept of radiation mechanism parameters, current distribution and antenna arrays in various antennas.
5. To understand the concept of wave propagation in various layers and losses due to earth effects

On Completion of the course, students will be able to	
CO1:	Acquire knowledge of basic antenna parameters.
CO2:	Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas.
CO3:	Analyze the field patterns radiated by various types of antennas.
CO4:	Understand the working and characteristics of antenna arrays.
CO5:	Compute several antenna parameters to assess antenna's performance.

UNIT – 1 Antenna Fundamentals

Antenna Parameters - Radiation Patterns and Mechanism, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, Illustrated problems.

Thin Linear Wire Antennas:

Potential function and electromagnetic field: Heuristic Approach, Maxwell Equation approach, Potential function for time periodic fields, Radiation from an oscillating Dipole

and alternating current element, The Hertzian Dipole, Network Theorems and its application in Antenna.

UNIT – 2 Antenna Arrays

Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays, Directivity Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations. Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics, Smart antennas.

UNIT – 3 Non-Resonant Radiators

Introduction, Traveling wave radiators – Basic concepts, Long wire antennas – Field strength calculations and Patterns, Micro Strip Antennas-Introduction, Features, Advantages and Limitations. Rectangular Patch Antennas –

Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, Basic properties. Design considerations for mono-filer helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT – 4 VHF, UHF and Microwave Antennas

Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. Horn Antennas

– Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT –5 WAVE PROPAGATION

Concepts of Propagation – Frequency ranges and types of propagations. Friis Free Space Equation, Reflection of radio waves from plane surface of earth, Reflection coefficient for horizontal and vertical polarization, Ground Wave Propagation–Field strength, Attenuation Characteristic for vertical and Horizontal polarized wave, Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF Calculations for flat and spherical earth cases.

Text books:

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH,

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)
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- 2003.
- Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.
 - Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.

Reference Books:

- Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
- Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
- Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
- Antennas and Wave Propagation-G.S.N Raju, Pearson Education.

Web Links:

- NPTEL online courses.
- MOOCS online courses by JNTUK

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	ELECTRONIC MEASUREMENTS & INSTRUMENTATION (Professional Elective – I)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of characteristics of instruments, measurement of physical parameters of transducers, data acquisition and display devices		3	-	-	3

Course Objectives:

1. To understand the static and dynamic characteristics of various instruments.
2. To understand the performance characteristics of various signal generators.
3. To understand the working and features of CRO.
4. To understand different types of bridges and transducers.
5. To understand the working principle of data acquisition and display devices.

On Completion of the course, students will be able to	
CO1:	Describe the fundamental concepts and principles of instrumentation.
CO2:	Understand functioning, specification and application of signal analyzing instruments.
CO3:	Apply the measurement techniques for different types of tests.
CO4:	Explain the operation of various instruments required in measurements.
CO5:	Choose specific instruments for specific measurement function.

UNIT- 1 Performance Characteristics of Measuring Instruments

Performance characteristics: Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag;

Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT- 2 Signal Generators and Analyzers

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator.

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers.

UNIT- 3 Oscilloscopes

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT –4 Transducers

Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchro's, Special Resistance Thermometers, Piezoelectric Transducers, Magneto Strictive Transducers.

UNIT –5 Bridges

Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge. Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

Text books:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques -A.D.Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A. Witte, Pearson Education, 2nd Ed., 2004.
3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

Web Links:

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-' : No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	COMUTER ARCHITECTURE & ORGANIZATION (Professional Elective-1)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Logic Design, Basic computing, Architectural features of Computer, Processing, Memory and I/O organization		3	-	-	3

CO1	3	2	2	-	-	-	-	-	-	2	-	-
CO2	3	2	2	-		-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	2	-		-	-	-	-	2	-	-
CO5	3	2	2	-	-	-	-	-	-	2	-	-

Course Objectives:

1. To understand computer architecture and its organization with operating system functionality
2. To understand central processing unit functionality with micro programmed and hardwired controlling concepts.
3. To familiarize input-output interfacing techniques in computer architecture.
4. To develop design logics of control circuits and arithmetic circuits.
5. To understand pipelining concepts in processor for improving computational speed.

On Completion of the course, students will be able to	
CO1:	Learn Basic operational concepts, computer arithmetic operations and Register Transfer language.
CO2:	Learn the concept of central processing unit, micro programmed control and hard-wired control
CO3:	Learn the concept of Memory management hardware, Input-Output Interface and Input-Output Processor
CO4:	Apply digital logic concepts to design computer arithmetic circuits and control logic circuits

UNIT-1 Basic Structure of Computers and Data Representations

Computer types, functional units, basic operational concepts, bus structures, software performance, multiprocessors and multi computers, Data types, complements, data representation, Fixed point representation, Floating – point representations, Concepts of Operating Systems and Application software.

UNIT-2 Register Transfer Language and Micro Operations

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 Instructions and Interrupts.

UNIT-3 Central Processing Unit and Micro Programmed Control

Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Control memory, Address sequencing, Micro program example, Design of control unit-Hard wired control, Micro programmed control.

UNIT-4 Memory System and Input – Output Organization

Memory organization-RAM, ROM, Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Cache Coherence, Virtual memory, Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes, Priority Interrupt, Direct memory Access, Input–Output Processor (IOP), Serial communication.

UNIT-5 Computer Arithmetic and Pipeline

Addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations. Decimal arithmetic unit, Decimal arithmetic operations, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

Text books:

1. Computer System Architecture – M.Moris Mano, 3rd Edition, PHI / Pearson, 2006.
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, Safwat Zaky, V Edition, McGraw Hill, 2002.

Reference Books:

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)
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editions,1998.

- Computer Organization and design D. A. Patterson and J. l. Hennessey, 4th Edition.

Web Links:

- NPTEL online courses.
- MOOCS online courses by JNTUK
- [https://nptel.ac.in/courses/122104019/numerical-analysis/Rathish kumar/ num1/new3.htm](https://nptel.ac.in/courses/122104019/numerical-analysis/Rathish%20kumar/num1/new3.htm)
- <https://www.sanfoundry.com/computerarchitecture-interview-questions-answers/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	INFORMATION THEORY & CODING (Professional Elective – I)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Probability and Random Processes, Digital Communications		3	-	-	3

Course Objectives:

1. To introduce the principles and applications of information theory.
2. To equip students with the basic understanding of fundamental concept of entropy and information as they are used in communications.
3. To enhance knowledge of probabilities, entropy, measures of information.
4. To teach coding schemes, including error correcting codes.
5. To explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.

On Completion of the course, students will be able to	
CO1:	Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source.
CO2:	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms.
CO3:	Model the continuous and discrete communication channels using input, output and joint probabilities.
CO4:	Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes.
CO5:	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.

UNIT-1 Information Theory

Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources.

UNIT-2 Source Coding

Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI, Encoding of the Source Output, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm.

UNIT-3 Information Channels

Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix,

Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of: Binary Symmetric Channel, Binary Erasure Channel, Muroga's Theorem, Continuous Channels.

UNIT – 4 Error Control Coding

Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes.

Linear Block Codes: Matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting Hamming Codes, Table lookup Decoding using Standard Array.

Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an $(n-k)$ Bit Shift register, Syndrome Calculation, Error Detection and Correction

UNIT – 5 Important Cyclic Codes & Convolution Codes

Golay Codes, BCH Codes. Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm.

Text books:

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.
3. Information Theory and Coding, Muralidhar Kulkarni, K.S. Shivaprakash, Wiley India Pvt. Ltd, 2015, ISBN:978-81-265-5305-1.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007.
2. Principles of digital communication, J. Das, S. K. Mullick, P. K. Chatterjee, Wiley, 1986 - Technology & Engineering.
3. Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016, ISBN: 9780134724058.

Web Links:

1. <https://www.cl.cam.ac.uk/teaching/0809/InfoTheory/InfoTheoryLectures.pdf>
2. <https://nptel.ac.in/courses/117101053/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	ARTIFICIAL NURAL NETWORKS AND FUZZY LOGIC (Professional Elective-1)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites Knowledge of Linear Algebra, Statistics, Probability and Set Theory.		3	-	-	3

3. <https://nptel.ac.in/content/storage2/courses/117108097/Learning%20Material%20-%20ITC.pdf>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

1. To understand the operation of Neural Networks and their essentials
2. To provide adequate knowledge about supervised and unsupervised learning.
3. To provide adequate knowledge about fuzzy set theory.
4. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic.
5. To understand different optimization techniques

On Completion of the course, students will be able to	
CO1:	Understand the basics of neural networks and computational intelligence.

CO2:	Discuss the characteristics and applications of Supervised and unsupervised learning.
CO3:	Understand the concept of fuzziness involved in various systems.
CO4:	Analyze the role of application of fuzzy logic control to real time systems.
CO5:	Design the fuzzy control using genetic algorithm.

UNIT – 1 Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Evolution of Computing, Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics.

UNIT – 2 Artificial Neural Networks

Biological Neurons Networks, Artificial Neural Networks, Supervised and Unsupervised learning, Reinforcement Learning, Activation functions, Perceptron, Back propagation networks, Radial Basis Function Networks, Adaptive Resonance Architectures, Advances in Neural networks, SVM.

UNIT – 3 Fuzzy Logic

Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making, Introduction to Fuzzy models.

UNIT – 4 Neuro-Fuzzy Modeling

Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Neuro-Fuzzy Control, Hybrid learning algorithms, Applications of Neuro-fuzzy concepts.

UNIT – 5 Optimization Algorithms

Heuristic search and optimization techniques, Random search, Introduction to Genetic Algorithms (GA), Applications of GA, Social Algorithms.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: Synthesis and applications by Rajasekharan and Rai, PHI Publication.
2. Introduction to Artificial Neural Systems, Jacek M. Zurada, JaiCo Publishing House, 1997.
3. Neuro-Fuzzy and Soft Computing, J.S. Roger Jang and Chuen-Tsai Sun and Eiji Mizutani,

Prentice Hall, 2003

Reference Books:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, N. Yadaiah and S.BapiRaju, Pearson Education.
2. Neural Networks – Simon Hykins, Pearson Education.
3. Neural Networks and Fuzzy Logic System by BrokKosko, PHI Publications.
4. Fuzzy Sets and Fuzzy Logic Theory and Applications, George J. Klir, Bo Yuan.

Web Links:

4. <https://nptel.ac.in/courses/117107094/>
5. <https://nptel.ac.in/content/storage2/courses/117108107/Lecture%2035.pdf>
6. <https://nptel.ac.in/courses/117106086/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	LINEAR IC AND APPLICATIONS LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Basic Knowledge of Electronic Devices and Circuits & Pulse and Digital Circuits.		0	0	3	1.5

Course Objectives:

1. To understand and analyze the operation of IC 741, IC 555, IC 565, IC 566, IC 1496.
2. To design Amplifiers, Active Filters and Oscillators using IC's.
3. To design different A/D and D/A converters.
4. To design and perform voltage regulation using IC 723.

On Completion of the course, students will be able to	
CO1:	Design and implementation of Filter circuits using IC 741
CO2:	Analyze the functionality of Multivibrator circuits using IC 555
CO3:	Work in teams to design amplifier circuits using IC 741
CO4:	Design and analyze A/D and D/A converters
CO5:	Design and perform voltage regulation using IC 723

List of experiments

1. Study of IC's – IC 741, IC 555, IC 565, IC 566, IC 1496 Functioning, parameters and specifications
2. OPAMP application-Adder, Subtractor, Comparator Circuits
3. Integrator and Differentiator Circuits using IC 741
4. Active Filters Applications-LPF, HPF(first order)
5. Active Filters Applications-BPF, Band Reject(wideband) And Notch Filter
6. IC 741 Oscillator Circuits-Phase shifting and Wien Bridge Oscillator
7. Function Generator using OP AMP's
8. IC 555 Timers- Monostable and Astable Operation Circuit.
9. Schmitt Trigger Circuit-using IC 741
10. IC 565- PLL Application
11. IC 566 – VCO Application
12. Voltage Regulator using IC 723
13. Three Terminal Voltage Regulator- 7805
14. 4-bit DAC using OP AMP & 4-bit ADC
15. Zero Crossing Detector
16. Inverting Amplifier and Non-Inverting Amplifier
17. Voltage Follower
18. Precision Rectifier
19. Logarithmic Amplifier

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DSD&DICA LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites Knowledge of Logic Design and Digital System Design		0	-	3	1.5

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

1. To design and draw the internal structure of the digital integrated circuits.
2. To develop VHDL source code.
3. To perform simulation using relevant simulator and analyze the obtained simulation results.
4. To verify the logic with necessary hardware

On Completion of the course, students will be able to	
CO1:	Use Boolean Algebra and resulting logic for control and data paths.
CO2:	Analyze the compatibility issues between technological implementation IC.
CO3:	Design basic digital building blocks such as multiplexers, selectors, and shift registers.

CO4:	Specify digital circuit timing: setup and hold times and logic propagation delays.
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EXPERIMENTS TO BE DONE USING DIGITAL IC

1. Realization of Logic Gates, Decoders - 74138
2. Multiplexer-74151 and 2x1 De-multiplexer-74155, 4-Bit Comparator-7485
3. Flip-Flop IC's-7474, 7493
4. IC Counter -7490 & 7493
5. Shift Register -7495
6. RAM (74189) and ALU
7. Laws and theorem of Boolean Algebra
8. Implementation of Boolean function using Logic Gates
9. Binary Adder and Binary subtractor

EXPERIMENTS TO BE DONE USING SIMULATOR

1. Realization of Logic Gates, Decoders
2. Multiplexers and Demultiplexer, 4Bit Comparator,
3. Flip Flops
4. Counters
5. Shift Registers
6. ALU
7. Implementation of Boolean Function using Logic Gates.
8. Binary adder and Subtractor.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	2	-	-	2	-	-	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DIGITAL COMMUNICATION LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Knowledge of digital modulation and demodulation techniques, multiplexing of signals, Information coding and MATLAB		0	-	3	1.5

CO2	2	2	-	-	2	-	-	-	-	-	-	2
CO3	2	-	-	-	2	-	-	2	2	-	-	2
CO4	-	-	-	-	2	-	-	2	-	-	-	3

Course Objectives:

1. Implementation of different digital modulation techniques using hardware.
2. Implementation of different digital modulation techniques using MATLAB.
3. Comparison of different digital modulation schemes.
4. Implementation of Spread Spectrum Modulation Techniques.

On Completion of the course, students will be able to	
CO1:	Implement different digital modulation and demodulation techniques.
CO2:	Compute and Analyze different source coding techniques.
CO3:	Analyze the performance of different multiplexing schemes
CO4:	Analyze performance of different digital modulation techniques.

List of Experiments:

1. PCM and DPCM Encoding and Decoding using MATLAB and hardware kit
2. Study of Time Division Multiplexing and Demultiplexing using hardware kit
3. Study of Delta modulation and Adaptive Delta Modulation using hardware kit
4. LINEAR BLOCK CODE-Encoder and Decoder
5. BINARY CYCLIC CODE- Encoder and Decoder
6. CONVOLUTION CODE- Encoder and Decoder
7. Study of ASK, FSK, PSK using MATLAB and hardware kit
8. Study of BPSK, QPSK modulation and demodulation techniques.
9. Study of QAM modulation and demodulation technique.
10. Plot the BER curve for various Digital modulation techniques

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DATA COMMUNICATION (Open Elective)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites Electronic Devices & Circuits, Switching Theory and Logic, Electronic Circuit Analysis.		3	-	-	3

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

- To comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- To explain the basics of data communication and various types of computer networks.
- To illustrate TCP/IP protocol suite and switching criteria.
- To demonstrate Medium Access Control protocols for reliable and noisy channels.
- To expose wireless and wired LANs along with IP version.

On Completion of the course, students will be able to	
CO1:	Understand and explain Data Communications System and its components.
CO2:	Enumerate the layers of the OSI model and TCP/IP and explain function(s) of each layer.
CO3:	Apply error detection and correction techniques to determine the error rate.
CO4:	Identify the different types of network topologies and protocols.
CO5:	Familiarity with the basic wireless networks, and how they can be used to assist in network design and implementation.

Unit-I

Introduction: Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.

Signals, Noise, Modulation, And Demodulation: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Digital Modulation.

Unit-II

Metallic Cable Transmission Media: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves

Optical Fiber Transmission Media: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit-III

Digital Transmission: Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage –to- Quantization Noise Voltage Ratio, PCM Line Speed, PCM and Differential PCM.

Data Communications Codes, Error Control and Data Formats: Data Communications Character Codes, Bar Codes, Error Control, Error Detection and Correction, Character Synchronization

Unit-IV

Wireless Communications Systems: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit-V

Telephone Instruments and Signals: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

Cellular Telephone Systems: First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, Global system for Mobile Communications.

Text Books:

1. Data Communications and Networking - Behrouz A. Forouzan, 5th Edition, Tata McGraw-Hill, 2013.
2. Data and Computer Communication - William Stallings, 8th Edition, Pearson Education, 2007.

Reference Books:

1. Communication Networks - Fundamental Concepts and Key architectures, Alberto Leon-Garcia and Indra Widjaja, 2nd Edition, Tata McGraw-Hill, 2004.
2. Computer Networks – A Systems Approach, Larry L. Peterson and Bruce S. Davie,

Course Code	COMPUTER NETWORKS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Build and understanding of the fundamental concepts of computer		3	-	-	3

Course Objectives:

6. To understand the principles and concepts of computer networks.
7. To familiarize the student with the basic taxonomy and terminology of the computer networking.
8. To understand general-purpose computer networks.
9. To introduce advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
10. To gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

On Completion of the course, students will be able to	
CO1:	Understand the fundamental principles of computer networks and various reference models.
CO2:	Identify the different types of network topologies and protocols.
CO3:	Understand and explain Data Communications System and its components.
CO4:	Understand and building the skills of subnetting and routing mechanisms.
CO5:	Identify the different types of network devices and their functions within a network

UNIT – 1 INTRODUCTION

OSI model overview, TCP/IP and other networks models, Network Topologies, Network technologies (WAN, LAN, MAN), Physical layer: Transmission media (Guided, Wireless).

UNIT – 2 DATA LINK LAYER

Design issues, Framing: Fixed size framing, Variable size framing, Flow control, Error control, Error detection and Correction (CRC, Checksum).

DATA LINK LAYER PROTOCOLS: Simplex protocol, Simplex Stop and Wait Protocol. Sliding window protocol: One bit, Go back N, Selective repeat- stop and wait protocol, Data link layer in HDLC: Configuration and Transfer modes, Frames, Control field, point to point protocol (PPP): Framing transition phase, Multiplexing

UNIT– 3 RANDOM ACCESS

ALOHA, Carrier Sense Multiple Access (CSMA), CSMA with Collision Detection (CSMA-CD), CSMA with Collision Avoidance (CSMA-CA), Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA).

UNIT – 4 NETWORK LAYER

Design Issues, Internetworking, Routing Algorithms: Shortest path routing, Flooding, Broadcast routing, Congestion control algorithms: General principles of congestion control, Congestion prevention policies.

NETWORK LAYER PROTOCOLS: ARP, ICMP, IPV addressing, IPV4, IPV6 Frame Format.

TRANSPORT LAYER: The Transport service, Elements of Transport protocols, The Internet transport protocols: UDP, TCP congestion control.

UNIT – 5 APPLICATION LAYER

Architecture: Client-Server model, Domain Name System (DNS): E-mail (SMTP) and File transfer (FTP), HTTP and WWW.

Text books:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.
2. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH.

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

Web Links:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. <http://www.satishkashyap.com/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROPROCESSORS AND MICROCONTROLLERS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Logic Design, C-programming, Computer Architecture and Organization		3	-	-	3

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

1. To understand Microprocessor (8086)&Microcontroller (AVR) architecture.
2. To develop methods for memory interfacing and accessing.
3. To familiarize with Embedded-C programming concepts and IDE tools.
4. To develop various on-chip and off-chip devices interfacing concepts.
5. To familiarize with various serial and parallel communication methods.

On Completion of the course, students will be able to	
CO1:	Learn architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure.
CO2:	Learn of RAM and ROM memory interfacing concepts and address calculations
CO3:	Apply concepts of programming in Assembly Language and Embedded C programming

CO4:	Analyze the concepts of Input / Output port Interfacing of microcontroller.
CO5:	Apply concepts of serial and parallel communication methods to various sensors

UNIT-1 8086 Microprocessors

Architecture of 8086 and Pin diagram, Register organization of 8086, Signal description of 8086, Physical memory organization, general bus operation, I/O addressing capability, Semiconductor memory (RAM and ROM) interfacing, Minimum mode and Maximum mode of 8086 system and timings diagrams.

UNIT – 2 Programming with 8086 and Interfacing

Addressing modes, Instruction set, Assembly language programming, Introduction to stack, Stack structure of 8086, Interrupts and interrupt service routines, Interrupt cycle of 8086, Non-maskable interrupt and Maskable interrupts, Interrupt programming, Architecture of 8255, Modes of operation of 8255, Stepper motor interfacing, Seven Segment Display Interfacing.

UNIT – 3 AVR Architecture and Assembly Programming

AVR architecture, General Purpose Registers and Special Purpose Registers, Status Registers, Program Counter, Stack Pointer and Stack Memory organization, Addressing Modes, Assembly Language Instruction Set, Delay Calculation and Directives, Bit-Addressability, Look-Up Table and processing, Macros.

UNIT – 4 Embedded C Programming

Compiler, Cross-Compilers, Intel and Motorola Hex file, Object File, Basics of Embedded C and C data types for AVR, I/O Programming in Embedded C, Delay calculation in Embedded C, LED interfacing and blinking.

UNIT-5 Interfacing AVR with External Peripherals

Interfacing Push-Buttons, Interfacing Key matrix, Seven Segment Display Interfacing, LCD Interfacing, Relay Interfacing, Temperature (LM35) Sensor Interfacing, DC motor Interfacing, Stepper Motor Interfacing, ADC & DAC Interfacing, AVR Timer Programming, AVR Interrupt Programming, AVR Serial Port Programming.

Text books:

1. Ray and Burchandi, “Advanced Microprocessors and Interfacing”, Tata McGraw–Hill.
2. M.A.Mazidi, S.Naimi and S.Naimi, “The AVR Microcontroller and Embedded Systems Using Assembly and C”, 1st Edition Pearson Publications, 2013.

Reference Books:

1. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press, 2010.
2. Dhananjay V. Gadre, “Programming and Customizing The AVR Microcontroller”, Tata McGraw-Hill publications, 2012.

Web Links:

1. <https://nptel.ac.in/courses/108105102/>
2. <https://www.udemy.com/course/8086-microprocessor-architecture-in-one-video-in-easy-way/>
3. <https://www.sanfoundry.com/microprocessors-interview-questions-answers/>
4. <https://www.sanfoundry.com/avr-microcontroller-mcqs-architecture/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DIGITAL SIGNAL PROCESSING				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Signals and Systems		3	-	-	3

Course Objectives:

1. To develop a thorough understanding of the central elements of discrete time signal processing theory and the ability to apply this theory to real-world signal processing applications.
2. To use z-transforms and discrete time Fourier transforms to analyze a digital system.
3. To understand the discrete Fourier transform (DFT), its applications and its implementation by FFT techniques.
4. To design and understand finite & infinite impulse response filters for various applications.
5. To understand the principles and concepts of multi rate signal processing.

On Completion of the course, students will be able to	
CO1:	Interpret, represent and process discrete/digital signals and systems.
CO2:	Understand frequency domain analysis of discrete time signals and systems using DTFT, DFT and FFT.
CO3:	Design and implement FIR and IIR filters using different methods, and how to test, analyze and refine design.
CO4:	Realize the basic structures of FIR and IIR systems.
CO5:	Acquire the basics of multi rate digital signal processing.

UNIT – 1 Introduction to Digital Signal Processing

Review of Discrete time Signals and systems, Linear Time-Invariant (LTI) systems and its properties, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems (DTFT) and its properties.

UNIT – 2 DFT and FFT

Discrete Fourier Transform (DFT) and Properties of DFT, Linear and circular convolution using DFT, Computation of DFT using Fast Fourier transforms (FFT) – Radix-2 Decimation in Time and Decimation in Frequency FFT Algorithms – Inverse FFT.

UNIT – 3 Digital IIR Filters

Analog filter Approximations - Butterworth and Chebyshev filters, Frequency Transformations of Low pass IIR filters, Design of IIR Digital filters from analog filters using Impulse Invariant and Bilinear Transformation Methods, Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT – 4 Digital FIR Filters

Characteristics of FIR Filters with linear phase, Frequency response of linear phase FIR filters, Design of Digital FIR Filters using Windowing technique (Rectangular, Triangular, Raised Cosine, Hanning, Hamming), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT – 5 Multirate Signal Processing

Introduction, Decimation, Interpolation, Sampling rate conversion, Implementation of sampling rate conversion and its applications.

Text Books:

1. Discrete Time Signal Processing: A.V. Oppenheim and Ronald W. Schaffer, PHI 4th Edition, 2017.
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis and Dimitris G. Manolakis, Pearson Education, PHI, 2013.
3. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006.

Reference Books:

1. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
2. Digital Signal Processing, A Computer Based Approach: Sanjit K. Mitra, Mc Graw Hil, 2011.
3. Digital Signal Processing: P. Ramesh Babu, 7th Edition, SciTech Publications, 2017.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROWAVE ENGINEERING				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites EM waves & Transmission lines, Antennas and Wave Propagation		3	-	-	3

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

Course Objectives:

1. To understand fundamentals of rectangular waveguides and circular waveguides through electromagnetic field analysis.
2. To understand the waveguide components and multiport junction concept.
3. To understand the working principle and characteristics of microwave tubes.
4. To understand the M-type tubes with their characteristics.

5. To understand the function, design, and integration of the major microwave components like oscillator, modulator in building a Microwave test bench setup for measurements.

On Completion of the course, students will be able to	
CO1:	Apply electromagnetic theory regarding Rectangular and circular waveguides.
CO2:	Apply the concept to multiport junction to calculate the scattering parameters.
CO3:	Analyse the types of microwave tubes.
CO4:	Distinguish between M-type and O-type tubes and modern tools.
CO5:	Analyse and measure microwave parameters using microwave bench.

UNIT – 1 Microwave Transmission Lines

Introduction, Microwave Spectrum and Bands, Applications of Microwaves, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode.

Circular waveguides- Introduction, Characteristic Equation, Dominant and Degenerate Modes. Microstrip Lines– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor. Cavity Resonators–Types, Resonant Frequencies, Q factor and Coupling Coefficients, Related Problems.

UNIT – 2 Waveguide Components and Applications

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities –Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters– Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for Two-port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers –2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT – 3 Microwave Tubes

Limitations and Losses of conventional tubes at microwave frequencies, Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning, Related Problems.

UNIT – 4 Helix TWTs

Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants.

M-type Tubes- Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, O-type tubes : 2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency

UNIT – 5 Microwave Solid State Devices

Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

Microwave Measurements-Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

Text books:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Microwave and Radar Engineering – M.Kulakarni, 4th Edition.

Reference Books:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- David M. Pozar, John Wiley, 4th edition, 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering – G S N Raju, I K International.
5. Microwave and Radar Engineering – G Sasibhushana Rao, Pearson.

Web Links:

1. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
2. <http://www.iienet2.org/>
3. <http://www.ilo.org/global/publications/lang--en/index.htm>
4. <http://nptel.ac.in/courses>

CO-PO Mapping:

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	WIRELESS AND MOBILE COMMUNICATION (Professional Elective-II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Analog and Digital Communications		3	-	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

1. To understand the fundamental characteristics and classifications of cellular generation.
2. To understand the core technology used in current wireless communication.
3. To understand the fundamental characteristics of cellular concepts.
4. To develop expertise in multiple access methodology.
5. To understand various wireless standards.

On Completion of the course, students will be able to	
CO1:	Understand the fundamentals of latest wireless communication and its modelling.
CO2:	Understand the key technologies for current wireless communication technology.
CO3:	Understand the basic cellular concepts.
CO4:	Choose proper multiple accessing methods depending on channel model
CO5:	Understand the various wireless standards and its application.

UNIT-1 An Overview of Wireless Systems

Introduction to 3G/4G/5G Wireless Communications: Introduction, 2G Wireless Standards, 3G Wireless Standards, 4G Wireless Standards, Overview of Cellular Service Progression Principles of Wireless Communications: The Wireless Communication Environment, Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh Fading Wireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER in Wireless Communication

System, Rayleigh BER at High SNR. Channel Estimation in Wireless Systems, Diversity in Wireless Communication. Introduction to 5G.

UNIT-2 Key Technologies in Wireless Communication

Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and Multicarrier Basics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect of Frequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR). MIMO: Introduction to MIMO Wireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMO MMSE Receiver.

UNIT-3 Cellular concepts and Mobile Radio Propagation

Introduction to cellular concept, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of service, Improving Coverage and Capacity in Cellular Systems.

Introduction to Radio wave propagation, Free Space Propagation Model, Reflection, Diffraction, Scattering, Outdoor propagation models, Indoor propagation models. Small scale fading, Rayleigh and Rician Distributions.

UNIT-4 Multiple Access Techniques for Wireless Communications

Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum Multiple Access – FHMA, CDMA, SDMA; Packet radio, Pure ALOHA, Slotted ALOHA, CSMA, Reservation ALOHA, PRMA - Capacity of Cellular Systems.

UNIT-5 Wireless systems and standards

GSM features, Architecture, Radio subsystem, Bluetooth, Zigbee, WCDMA, WiMAX, LTE, RFID.

Satellite based wireless system: Introduction, Satellite Orbits, Use of Satellites for Communication, Satellites and Transponders.

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Text books:

- Principles of Modern Wireless Communication Systems – Aditya K Jagannathan, Mc Graw Hill publishers, 2017
- Theodore S Rappaport, “Wireless Communications Principles and Practice”, Prentice Hall.

Reference Books:

- Stallings, *Wireless Communications and Networks*, Prentice Hall.
- Schwartz, *Mobile Wireless Communications*, Cambridge University Press.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	DIGITAL SYSTEM DESIGN USING VERYLOG (Professional Elective – II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Logic Design, Pulse and Digital Circuits		3	-	-	3

Course Objectives:

1. To design digital circuits using Verilog HDL
2. To design and analyze combinational circuits using Verilog HDL
3. To design and analyze synchronous and asynchronous sequential circuits using Verilog HDL
4. To write HDL code for combinational and sequential circuits using Verilog HDL
5. To develop behavioral and RTL modeling of digital circuits using Verilog HDL

On Completion of the course, students will be able to	
CO1:	Design the digital systems as an activity in a larger system design context.
CO2:	Study the design and operation of semiconductor memories frequently used in application specific digital system.
CO3:	Inspect how effectively ICs are embedded in package and assembled in PCBs for different applications.
CO4:	Design and diagnosis of processors and I/O controllers used in embedded systems.
CO5:	Describe Verilog model for sequential circuits and test pattern generation.

UNIT – 1 Introduction to Verilog HDL

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools. Language Constructs and Conventions- Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

UNIT – 2 Gate Level Modeling & Dataflow

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution, Net Types, Design of Basic Circuit, Modeling at Dataflow Level- Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vector, Operators.

UNIT – 3 Behavioral Modeling

Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Design at Behavioral Level, Blocking and Non-Blocking Assignments, The 'Case' Statement, Simulation Flow, 'If' and 'if-Else' Constructs, 'Assign- De-Assign' Constructs, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, Force-Release, Construct, Event.

UNIT–4 Switch Level Modeling

Basic Transistor Switches, CMOS Switches, Bi-Directional Gates, Time Delays with Switch Primitives, Instantiation with 'Strengths' and 'Delays', Strength Contention with Tri-reg Nets.

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT – 5 Sequential Models

Sequential Models - Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.

Components Test and Verification: Test Bench, Combinational Circuits Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

Text books:

1. Design Through Verilog HDL, T.R. Padmanabhan, B Bala Tripura Sundari, Wiley 2009.
2. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
3. Verilog Digital System Design, Zainalabdien Navabi, TMH, 2nd Edition.

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
2. Advanced Digital Logic Design using Verilog, State Machines & Synthesis for FPGA - Sunggu Lee, Cengage Learning, 2012.
3. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
4. Advanced Digital Design with Verilog HDL - Michel D. Ciletti, PHI, 2009

Web Links:

1. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
2. <http://www.iienet2.org/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	CONTROL SYSTEMS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites complex variables and Laplace transform		3	-	-	3

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

- To understand the operation of Neural Networks and their essentials
- To provide adequate knowledge about supervised and unsupervised learning.
- To provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic.
- To understand different optimization techniques

On Completion of the course, students will be able to	
CO1:	Demonstrate an understanding of the fundamentals of (feedback) control systems
CO2:	Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
CO3:	Determine the (absolute) stability of a closed-loop control system
CO4:	Apply root-locus technique to analyze and design control systems.
CO5:	Express and solve system equations in state-variable form (state variable models).

UNIT – 1 Mathematical Modeling of Control Systems

Introduction of control systems, Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, Transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor, AC Servo motor, Synchro-transmitter and Receiver, Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT – 2 Time Response Analysis

Standard test signals, Time response of first order systems, Time response of second order systems, Time domain specifications, Steady state errors and error constants, Effects of proportional derivative, proportional integral systems.

UNIT – 3 Stability and Root Locus Technique

The concept of stability, Routh's stability criterion, limitations of Routh's stability, The root locus concept, Construction of root loci (Simple problems).

UNIT – 4 Frequency Response Analysis

Introduction, Frequency domain specifications, Bode diagrams, Transfer function from the Bode Diagram, Phase margin and Gain Margin, Stability Analysis from Bode Plots, Polar Plots, Nyquist plots, Lag, Lead, Lag-Lead Compensators and pole-zero plot, Design of compensators using Bode plots.

UNIT – 5 State Space Analysis of Continuous Systems

Concepts of state, State variables and State model, State space representation of transfer function, Diagonalization, Solving the Time invariant state Equations, State Transition Matrix and its Properties, Concepts of Controllability and Observability.

Text Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic Control Systems, Benjamin C.Kuo, Prentice Hall of India, 2nd Edition

Reference Books:

1. Control Systems, Manik Dhanesh N, Cengage publications.
2. Control Systems principles and design, M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, Tata Mc Graw Hill Publications.
4. Control system engineering by A. Nagoorkani by R.B.A Publications. 4th Edition.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)
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Web Links:

1. <http://www.digimat.in/nptel/courses/video/108102043/L38.html>
2. <http://www.iienet2.org/>
3. <https://freevideolectures.com/course/3116/control-engineering-i>
4. https://swayam.gov.in/nd1_noc19_ee42/preview

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	TELECOMMUNICATION SWITCHING SYSTEMS & NETWORKING (Professional Elective – II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of basic Telecommunication Systems and Networking		3	-	-	3

Course Objectives:

1. To understand the basic concepts of Tele communication switching systems
2. To understand the principles of electronic switching systems.
3. To understand the concept of Traffic engineering and blocking network probabilities.
4. To understand the operation of signaling techniques in Telecommunication.
5. To understand the principles of ISDN and their architecture.

On Completion of the course, students will be able to	
CO1:	Understand the basics of telecommunication and its switching systems.
CO2:	Understand the concepts of electronic switching systems and their types.
CO3:	Understand the telephone traffic engineering and their parameters.
CO4:	Understand the basics of signaling techniques and their classifications.
CO5:	Understand the integrated services digital network and its classification.

UNIT-1 Introduction

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT – 2 Electronic Space Division Switching

Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Two-Stage Networks, Three-Stage Networks, N-Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching, N-Stage Combination Switching.

UNIT – 3 Telephone Networks

Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular Mobile Telephony.

Signaling: Customer Line Signaling, FDM Carrier Systems, PCM Signaling, Inter-Register Signaling, CommonChannel Signaling Principles, CCITT Signaling System no.6, CCITT Signaling System no.7, Digital Customer Line Signaling.

UNIT – 4 Telecommunications Traffic

The Unit of Traffic, Congestion, Traffic Measurement, Lost-call systems, Queuing Systems.

Packet Switching: Statistical Multiplexing, Local Area and Wide Area networks, Large Scale Networks, Broadband Networks.

UNIT – 5 Integrated Services Digital Network

Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User Network Interfaces, Signaling, Numbering and Addressing, Interworking, ISDN Standards, Broadband ISDN, Narrowband ISDN, Voice Data Integration and SONET concept. Introduction to server-based telephone exchange.

Text books:

1. Thiagarajan Viswanathan, “Telecommunication Switching Systems and Networks” PHI 2000.
2. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education, 2006.

Reference Books:

1. J. Bellamy, “Digital Telephony”, 2nd Edition, John Wiley, 2001.
2. Achyut S. Godbole, “Data Communications and Networks”, TMH, 2004.
3. B. A. Forouzan, “Data Communication & Networking” 3rd Edition, TMH, 2004

Web Links:

1. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
2. <http://www.iienet2.org/>
3. <http://www.ilo.org/global/publications/lang--en/index.htm>
4. <http://nptel.ac.in/courses/Webcoursecontents/IITROORKEE/INDUSTRIALENGINERRING/>
5. <http://nptel.ac.in/courses>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	2	-	-	-	-	-	-
CO2	3	3	-	-	3	-	-	-	-	-	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DIGITAL SIGNAL PROCESSING LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Linear system theory and Fourier Transforms, Digital Signal Processing, Basic Knowledge of MATLAB and C Programming		0	0	3	1.5

CO3	3	2	-	-	-	3	-	-	2	3	3	2
CO4	3	2	-	-	2	-	-	-	-	2	2	-
CO5	3	2	2	-	2	3	-	-	-	2	2	2

Course Objectives:

1. Knowledge to represent real world signals in digital format and understand transform-domain (Fourier and z-transforms) representation of the signals.
2. Learn to apply the linear systems approach to signal processing problems using high-level programming language.
3. Learn the basic architecture of microprocessors and digital signal processors and to learn about to implement linear filters in real-time DSP chips.

On Completion of the course, students will be able to	
CO1:	Design and implement a DSP system using tools like MATLAB

CO2:	Analyze and describe the functionality of a real world DSP system
CO3:	Work in teams to plan and execute the creation of a complex DSP system
CO4:	Apply DSP system design to real world applications

List of experiments

20. Linear Convolution
21. Circular convolution
22. Impulse and Step response of given LTI system
23. N point DFT and IDFT
24. Convolution using DFT and IDFT
25. a) FIR low Pass Filter b) FIR high pass filter
26. Analog IIR low pass filter – Butterworth & Chebyshev
27. Digital IIR low pass filter – Impulse Invariant & Bilinear
28. Study of Sampling theorem.
29. Power Spectral density
30. Auto and Cross Correlation of the given signals
31. Linear convolution using CC studio
32. Circular convolution using CC Studio
33. Impulse response of first and second order system using CC studio
34. N-point DFT using CC Studio

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROPROCESSORS AND MICROCONTROLLERS LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Basic knowledge of 8086 Microprocessors, Assembly & C Programming		0	-	3	1.5

Course Objectives:

- Understand the basic concepts of 8086 programming and Interfacing.
- Learn architecture of AVR Microcontroller, Importance of Bit addressability, function of Special registers and basic concepts of Assembly Language program
- Learn the concepts of Embedded C Programming and Interfacing
- Learn basic concepts of AVR Microcontroller Interfacing with real world through different device.

On Completion of the course, students will be able to	
CO1:	Develop Assembly Language Programme for various arithmetic and logical operations.
CO2:	Develop Assembly Language Programme for various string related operations.
CO3:	Develop 'C' programme for interfacing of various peripherals to 8086 microprocessors.
CO4:	Develop 'C' programme for interfacing of various peripherals to AVR microcontrollers.

EXPERIMENTS TO BE DONE USING DIGITAL IC

MASM programs:

- Arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division- Signed and using arithmetic operation, ASCII- Arithmetic operation.
- Logical Shifting Operations-Left shift, Right shift, rotate left, rotate right, converting packed BCD to Unpacked BCD, BCD to ASCII conversion.
- Using string operation and Instruction prefix: Move Block, Reverse string, Inserting, Deleting of string.
- String sorting: Ascending order, Descending order, String comparison, Length of the string.

INTERFACING WITH 8086

- Stepper motor interfacing
- DC motor interfacing
- Seven segment Display
- Traffic light interfacing

5. Analog to Digital converter
6. LCD Display

INTERFACING WITH AVR MCU

1. Stepper motor interfacing
2. DC motor interfacing
3. Seven Segment Display
4. Analog to Digital converter
5. LCD display

Text books:

1. Ray and Burchandi, “Advanced Microprocessors and Interfacing”, Tata McGraw–Hill.
2. M.A.Mazidi,S.Naimi and S.Naimi, “The AVR Microcontroller and Embedded Systems Using Assembly and C”, 1stEdition Pearson Publications, 2013.

References:

1. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press, 2010.
2. Krishna Kant, “Microprocessors and Microcontrollers”, PHI Publications, 2010.
3. Dhananjay V. Gadre,” Programming and Customizing the AVR Microcontroller”, TATA McGraw Hill publications, 2012.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DIGITAL COMMUNICATION LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Knowledge of digital modulation and demodulation techniques, multiplexing of signals, Information coding and MATLAB		0	-	3	1.5

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

- Implementation of different digital modulation techniques using hardware.
- Implementation of different digital modulation techniques using MATLAB.
- Comparison of different digital modulation schemes.
- Implementation of Spread Spectrum Modulation Techniques.

On Completion of the course, students will be able to	
CO1:	Implement different digital modulation and demodulation techniques.
CO2:	Compute and Analyze different source coding techniques.
CO3:	Analyze the performance of different multiplexing schemes
CO4:	Analyze performance of different digital modulation techniques.

List of Experiments:

- PCM and DPCM Encoding and Decoding using MATLAB and hardware kit
- Study of Time Division Multiplexing and Demultiplexing using hardware kit

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DATA COMMUNICATION (Open Elective)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites Electronic Devices & Circuits, Switching Theory and Logic, Electronic Circuit Analysis.		3	-	-	3

13. Study of Delta modulation and Adaptive Delta Modulation using hardware kit
14. LINEAR BLOCK CODE-Encoder and Decoder
15. BINARY CYCLIC CODE- Encoder and Decoder
16. CONVOLUTION CODE- Encoder and Decoder
17. Study of ASK, FSK, PSK using MATLAB and hardware kit
18. Study of BPSK, QPSK modulation and demodulation techniques.
19. Study of QAM modulation and demodulation technique.
20. Plot the BER curve for various Digital modulation techniques

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

10. To comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
11. To explain the basics of data communication and various types of computer networks.
12. To illustrate TCP/IP protocol suite and switching criteria.
13. To demonstrate Medium Access Control protocols for reliable and noisy channels.
14. To expose wireless and wired LANs along with IP version.

On Completion of the course, students will be able to	
CO1:	Understand and explain Data Communications System and its components.

CO2:	Enumerate the layers of the OSI model and TCP/IP and explain function(s) of each layer.
CO3:	Apply error detection and correction techniques to determine the error rate.
CO4:	Identify the different types of network topologies and protocols.
CO5:	Familiarity with the basic wireless networks, and how they can be used to assist in network design and implementation.

Unit-I

Introduction: Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.

Signals, Noise, Modulation, And Demodulation: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Digital Modulation.

Unit-II

Metallic Cable Transmission Media: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves

Optical Fiber Transmission Media: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit-III

Digital Transmission: Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage –to- Quantization Noise Voltage Ratio, PCM Line Speed, PCM and Differential PCM.

Data Communications Codes, Error Control and Data Formats: Data Communications Character Codes, Bar Codes, Error Control, Error Detection and Correction, Character Synchronization

Unit-IV

Wireless Communications Systems: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit-V

Telephone Instruments and Signals: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

Cellular Telephone Systems: First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, Global system for Mobile Communications.

Text Books:

[illegible]

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	COMPUTER NETWORKS				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Build and understanding of the fundamental concepts of computer		3	-	-	3

Course Objectives:

11. To understand the principles and concepts of computer networks.
12. To familiarize the student with the basic taxonomy and terminology of the computer networking.
13. To understand general-purpose computer networks.
14. To introduce advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
15. To gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

On Completion of the course, students will be able to	
CO1:	Understand the fundamental principles of computer networks and various reference models.
CO2:	Identify the different types of network topologies and protocols.
CO3:	Understand and explain Data Communications System and its components.
CO4:	Understand and building the skills of subnetting and routing mechanisms.
CO5:	Identify the different types of network devices and their functions within a network

UNIT – 1 INTRODUCTION

OSI model overview, TCP/IP and other networks models, Network Topologies, Network technologies (WAN, LAN, MAN), Physical layer: Transmission media (Guided, Wireless).

UNIT – 2 DATA LINK LAYER

Design issues, Framing: Fixed size framing, Variable size framing, Flow control, Error control, Error detection and Correction (CRC, Checksum).

DATA LINK LAYER PROTOCOLS: Simplex protocol, Simplex Stop and Wait Protocol. Sliding window protocol: One bit, Go back N, Selective repeat- stop and wait protocol, Data link layer in HDLC: Configuration and Transfer modes, Frames, Control field, point to point protocol (PPP): Framing transition phase, Multiplexing

UNIT– 3 RANDOM ACCESS

ALOHA, Carrier Sense Multiple Access (CSMA), CSMA with Collision Detection (CSMA-CD), CSMA with Collision Avoidance (CSMA-CA), Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA).

UNIT – 4 NETWORK LAYER

Design Issues, Internetworking, Routing Algorithms: Shortest path routing, Flooding, Broadcast routing, Congestion control algorithms: General principles of congestion control, Congestion prevention policies.

NETWORK LAYER PROTOCOLS: ARP, ICMP, IPV addressing, IPV4, IPV6 Frame Format.

TRANSPORT LAYER: The Transport service, Elements of Transport protocols, The Internet transport protocols: UDP, TCP congestion control.

UNIT – 5 APPLICATION LAYER

Architecture: Client-Server model, Domain Name System (DNS): E-mail (SMTP) and File transfer (FTP), HTTP and WWW.

Text books:

3. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.
4. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH.

Reference Books:

3. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

Web Links:

5. www.iitkgp.ac.in
6. www.electronic4u.com
7. www.nptel.com
8. <http://www.satishkashyap.com/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROPROCESSORS AND MICROCONTROLLERS				
Teaching	Total Contact Hours - 50	L	T	P	C

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Prerequisites: Knowledge of Logic Design, C-programming, Computer Architecture and Organization	3	-	-	3
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Course Objectives:

6. To understand Microprocessor (8086)&Microcontroller (AVR) architecture.
7. To develop methods for memory interfacing and accessing.
8. To familiarize with Embedded-C programming concepts and IDE tools.
9. To develop various on-chip and off-chip devices interfacing concepts.
10. To familiarize with various serial and parallel communication methods.

On Completion of the course, students will be able to	
CO1:	Learn architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure.
CO2:	Learn of RAM and ROM memory interfacing concepts and address calculations
CO3:	Apply concepts of programming in Assembly Language and Embedded C programming
CO4:	Analyze the concepts of Input / Output port Interfacing of microcontroller.
CO5:	Apply concepts of serial and parallel communication methods to various sensors

UNIT-1 8086 Microprocessors

Architecture of 8086 and Pin diagram, Register organization of 8086, Signal description of 8086, Physical memory organization, general bus operation, I/O addressing capability, Semiconductor memory (RAM and ROM) interfacing, Minimum mode and Maximum mode of 8086 system and timings diagrams.

UNIT – 2 Programming with 8086 and Interfacing

Addressing modes, Instruction set, Assembly language programming, Introduction to stack, Stack structure of 8086, Interrupts and interrupt service routines, Interrupt cycle of 8086, Non-maskable interrupt and Maskable interrupts, Interrupt programming, Architecture of 8255, Modes of operation of 8255, Stepper motor interfacing, Seven Segment Display Interfacing.

UNIT – 3 AVR Architecture and Assembly Programming

AVR architecture, General Purpose Registers and Special Purpose Registers, Status Registers, Program Counter, Stack Pointer and Stack Memory organization, Addressing Modes, Assembly Language Instruction Set, Delay Calculation and Directives, Bit-Addressability, Look-Up Table and processing, Macros.

UNIT – 4 Embedded C Programming

Compiler, Cross-Compilers, Intel and Motorola Hex file, Object File, Basics of Embedded C and C data types for AVR, I/O Programming in Embedded C, Delay calculation in Embedded C, LED interfacing and blinking.

UNIT-5 Interfacing AVR with External Peripherals

Interfacing Push-Buttons, Interfacing Key matrix, Seven Segment Display Interfacing, LCD Interfacing, Relay Interfacing, Temperature (LM35) Sensor Interfacing, DC motor Interfacing, Stepper Motor Interfacing, ADC & DAC Interfacing, AVR Timer Programming, AVR Interrupt Programming, AVR Serial Port Programming.

Text books:

3. Ray and Burchandi, “Advanced Microprocessors and Interfacing”, Tata McGraw–Hill.
4. M.A.Mazidi,S.Naimi and S.Naimi, “The AVR Microcontroller and Embedded Systems Using Assembly and C”, 1st Edition Pearson Publications, 2013.

Reference Books:

3. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press, 2010.
4. Dhananjay V. Gadre, “Programming and Customizing The AVR Microcontroller”, Tata McGraw-Hill publications, 2012.

Web Links:

5. <https://nptel.ac.in/courses/108105102/>
6. <https://www.udemy.com/course/8086-microprocessor-architecture-in-one-video-in-easy-way/>
7. <https://www.sanfoundry.com/microprocessors-interview-questions-answers/>
8. <https://www.sanfoundry.com/avr-microcontroller-mcqs-architecture/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-' : No Correlation

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DIGITAL SIGNAL PROCESSING				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Signals and Systems		3	-	-	3

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

Course Objectives:

- To develop a thorough understanding of the central elements of discrete time signal processing theory and the ability to apply this theory to real-world signal processing applications.
- To use z-transforms and discrete time Fourier transforms to analyze a digital system.
- To understand the discrete Fourier transform (DFT), its applications and its implementation by FFT techniques.
- To design and understand finite & infinite impulse response filters for various applications.
- To understand the principles and concepts of multi rate signal processing.

On Completion of the course, students will be able to	
CO1:	Interpret, represent and process discrete/digital signals and systems.
CO2:	Understand frequency domain analysis of discrete time signals and systems using DTFT, DFT and FFT.
CO3:	Design and implement FIR and IIR filters using different methods, and how to test, analyze and refine design.

CO4:	Realize the basic structures of FIR and IIR systems.
CO5:	Acquire the basics of multi rate digital signal processing.

UNIT – 1 Introduction to Digital Signal Processing

Review of Discrete time Signals and systems, Linear Time-Invariant (LTI) systems and its properties, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems (DTFT) and its properties.

UNIT – 2 DFT and FFT

Discrete Fourier Transform (DFT) and Properties of DFT, Linear and circular convolution using DFT, Computation of DFT using Fast Fourier transforms (FFT) – Radix-2 Decimation in Time and Decimation in Frequency FFT Algorithms – Inverse FFT.

UNIT – 3 Digital IIR Filters

Analog filter Approximations - Butterworth and Chebyshev filters, Frequency Transformations of Low pass IIR filters, Design of IIR Digital filters from analog filters using Impulse Invariant and Bilinear Transformation Methods, Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT – 4 Digital FIR Filters

Characteristics of FIR Filters with linear phase, Frequency response of linear phase FIR filters, Design of Digital FIR Filters using Windowing technique (Rectangular, Triangular, Raised Cosine, Hanning, Hamming), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT – 5 Multirate Signal Processing

Introduction, Decimation, Interpolation, Sampling rate conversion, Implementation of sampling rate conversion and its applications.

Text Books:

4. Discrete Time Signal Processing: A.V. Oppenheim and Ronald W. Schaffer, PHI 4th Edition, 2017.
5. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis and Dimitris G. Manolakis, Pearson Education, PHI, 2013.
6. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006.

Reference Books:

4. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.

5. Digital Signal Processing, A Computer Based Approach: Sanjit K.Mitra, Mc Graw Hil,2011.
6. Digital Signal Processing: P. Ramesh Babu, 7th Edition, SciTech Publications,2017.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-' : No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROWAVE ENGINEERING				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites	EM waves & Transmission lines, Antennas and Wave Propagation	3	-	-	3

Course Objectives:

- To understand fundamentals of rectangular waveguides and circular waveguides through electromagnetic field analysis.
- To understand the waveguide components and multiport junction concept.
- To understand the working principle and characteristics of microwave tubes.
- To understand the M-type tubes with their characteristics.
- To understand the function, design, and integration of the major microwave components like oscillator, modulator in building a Microwave test bench setup for measurements.

On Completion of the course, students will be able to	
CO1:	Apply electromagnetic theory regarding Rectangular and circular waveguides.
CO2:	Apply the concept to multiport junction to calculate the scattering parameters.
CO3:	Analyse the types of microwave tubes.
CO4:	Distinguish between M-type and O-type tubes and modern tools.
CO5:	Analyse and measure microwave parameters using microwave bench.

UNIT – 1 Microwave Transmission Lines

Introduction, Microwave Spectrum and Bands, Applications of Microwaves, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode.

Circular waveguides- Introduction, Characteristic Equation, Dominant and Degenerate Modes. Microstrip Lines– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor. Cavity Resonators–Types, Resonant Frequencies, Q factor and Coupling Coefficients, Related Problems.

UNIT – 2 Waveguide Components and Applications

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities –Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters– Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for Two-port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers –2Hole, Bethe Hole

types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT – 3 Microwave Tubes

Limitations and Losses of conventional tubes at microwave frequencies, Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning, Related Problems.

UNIT – 4 Helix TWTs

Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants.

M-type Tubes- Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics,

O-type tubes : 2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency

UNIT – 5 Microwave Solid State Devices

Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

Microwave Measurements-Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

Text books:

4. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
5. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
6. Microwave and Radar Engineering – M.Kulakarni, 4th Edition.

Reference Books:

6. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
7. Microwave Engineering- David M. Pozar, John Wiley, 4th edition, 2012.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	WIRELESS AND MOBILE COMMUNICATION (Professional Elective-II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Analog and Digital Communications		3	-	-	3

8. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
9. Microwave Engineering – G S N Raju, I K International.
10. Microwave and Radar Engineering – G Sasibhushana Rao, Pearson.

Web Links:

5. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
6. <http://www.iienet2.org/>
7. <http://www.ilo.org/global/publications/lang--en/index.htm>
8. <http://nptel.ac.in/courses>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

6. To understand the fundamental characteristics and classifications of cellular generation.
7. To understand the core technology used in current wireless communication.
8. To understand the fundamental characteristics of cellular concepts.
9. To develop expertise in multiple access methodology.
10. To understand various wireless standards.

On Completion of the course, students will be able to	
CO1:	Understand the fundamentals of latest wireless communication and its modelling.

CO2:	Understand the key technologies for current wireless communication technology.
CO3:	Understand the basic cellular concepts.
CO4:	Choose proper multiple accessing methods depending on channel model
CO5:	Understand the various wireless standards and its application.

UNIT-1 An Overview of Wireless Systems

Introduction to 3G/4G/5G Wireless Communications: Introduction, 2G Wireless Standards, 3G Wireless Standards, 4G Wireless Standards, Overview of Cellular Service Progression Principles of Wireless Communications: The Wireless Communication Environment, Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh Fading Wireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER in Wireless Communication System, Rayleigh BER at High SNR. Channel Estimation in Wireless Systems, Diversity in Wireless Communication. Introduction to 5G.

UNIT-2 Key Technologies in Wireless Communication

Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and Multicarrier Basics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect of Frequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR). MIMO: Introduction to MIMO Wireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMO MMSE Receiver.

UNIT-3 Cellular concepts and Mobile Radio Propagation

Introduction to cellular concept, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of service, Improving Coverage and Capacity in Cellular Systems.

Introduction to Radio wave propagation, Free Space Propagation Model, Reflection, Diffraction, Scattering, Outdoor propagation models, Indoor propagation models. Small scale fading, Rayleigh and Rician Distributions.

UNIT-4 Multiple Access Techniques for Wireless Communications

Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum Multiple Access – FHMA, CDMA, SDMA; Packet radio, Pure ALOHA, Slotted ALOHA, CSMA, Reservation ALOHA, PRMA - Capacity of Cellular Systems.

UNIT-5 Wireless systems and standards

GSM features, Architecture, Radio subsystem, Bluetooth, Zigbee, WCDMA, WiMAX, LTE, RFID.

Satellite based wireless system: Introduction, Satellite Orbits, Use of Satellites for Communication, Satellites and Transponders.

Text books:

5. Principles of Modern Wireless Communication Systems – Aditya K Jagannathan, Mc Graw Hill publishers, 2017
6. Theodore S Rappaport, “Wireless Communications Principles and Practice”, Prentice Hall.

Reference Books:

6. Stallings, *Wireless Communications and Networks*, Prentice Hall.
7. Schwartz, *Mobile Wireless Communications*, Cambridge University Press.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			-	-	1	2	2	-	-		-	-
CO2	2	3	-	-	2	2	1	-	-		-	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DIGITAL SYSTEM DESIGN USING VERYLOG (Professional Elective – II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Logic Design, Pulse and Digital Circuits		3	-	-	3

CO3	2	2	-	-	2	2	1	-	-		-	-
CO4	1		-	-	2	-	2	-	-		-	-
CO5	2	2	-	-	3	2	2	-	-		-	2

Course Objectives:

- To design digital circuits using Verilog HDL
- To design and analyze combinational circuits using Verilog HDL
- To design and analyze synchronous and asynchronous sequential circuits using Verilog HDL
- To write HDL code for combinational and sequential circuits using Verilog HDL
- To develop behavioral and RTL modeling of digital circuits using Verilog HDL

On Completion of the course, students will be able to	
CO1:	Design the digital systems as an activity in a larger system design context.
CO2:	Study the design and operation of semiconductor memories frequently used in application specific digital system.
CO3:	Inspect how effectively ICs are embedded in package and assembled in PCBs for different applications.
CO4:	Design and diagnosis of processors and I/O controllers used in embedded systems.
CO5:	Describe Verilog model for sequential circuits and test pattern generation.

UNIT – 1 Introduction to Verilog HDL

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools. Language Constructs and Conventions- Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

UNIT – 2 Gate Level Modeling & Dataflow

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution, Net Types, Design of Basic Circuit, Modeling at Dataflow Level- Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vector, Operators.

UNIT – 3 Behavioral Modeling

Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Design at Behavioral Level, Blocking and Non-Blocking Assignments, The 'Case' Statement, Simulation Flow, 'If' and 'if-Else' Constructs, 'Assign- De-Assign' Constructs, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, Force-Release, Construct, Event.

UNIT–4 Switch Level Modeling

Basic Transistor Switches, CMOS Switches, Bi-Directional Gates, Time Delays with Switch Primitives, Instantiation with 'Strengths' and 'Delays', Strength Contention with Tri-reg Nets.

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT – 5 Sequential Models

Sequential Models - Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.

Components Test and Verification: Test Bench, Combinational Circuits Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

Text books:

4. Design Through Verilog HDL, T.R. Padmanabhan, B Bala Tripura Sundari, Wiley 2009.
5. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
6. Verilog Digital System Design, Zainalabdien Navabi, TMH, 2nd Edition.

Reference Books:

5. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
6. Advanced Digital Logic Design using Verilog, State Machines & Synthesis for FPGA - Sunggu Lee, Cengage Learning, 2012.
7. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
8. Advanced Digital Design with Verilog HDL - Michel D. Ciletti, PHI, 2009

Web Links:

3. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	CONTROL SYSTEMS				
Teaching	Total Contact Hours - 50	L	T	P	C

4. <http://www.iienet2.org/>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Prerequisites complex variables and Laplace transform	3	-	-	3
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Course Objectives:

11. To understand the operation of Neural Networks and their essentials
12. To provide adequate knowledge about supervised and unsupervised learning.
13. To provide adequate knowledge about fuzzy set theory.
14. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic.
15. To understand different optimization techniques

On Completion of the course, students will be able to	
CO1:	Demonstrate an understanding of the fundamentals of (feedback) control systems
CO2:	Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
CO3:	Determine the (absolute) stability of a closed-loop control system
CO4:	Apply root-locus technique to analyze and design control systems.
CO5:	Express and solve system equations in state-variable form (state variable models).

UNIT – 1 Mathematical Modeling of Control Systems

Introduction of control systems, Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, Transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor, AC Servo motor, Synchro-transmitter and Receiver, Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT – 2 Time Response Analysis

Standard test signals, Time response of first order systems, Time response of second order systems, Time domain specifications, Steady state errors and error constants, Effects of proportional derivative, proportional integral systems.

UNIT – 3 Stability and Root Locus Technique

The concept of stability, Routh's stability criterion, limitations of Routh's stability, The root locus concept, Construction of root loci (Simple problems).

UNIT – 4 Frequency Response Analysis

Introduction, Frequency domain specifications, Bode diagrams, Transfer function from the Bode Diagram, Phase margin and Gain Margin, Stability Analysis from Bode Plots, Polar Plots, Nyquist plots, Lag, Lead, Lag-Lead Compensators and pole-zero plot, Design of compensators using Bode plots.

UNIT – 5 State Space Analysis of Continuous Systems

Concepts of state, State variables and State model, State space representation of transfer function, Diagonalization, Solving the Time invariant state Equations, State Transition Matrix and its Properties, Concepts of Controllability and Observability.

Text Books:

3. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
4. Automatic Control Systems, Benjamin C.Kuo, Prentice Hall of India, 2nd Edition

Reference Books:

5. Control Systems, Manik Dhanesh N, Cengage publications.
6. Control Systems principles and design, M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
7. Control Systems Engineering, S.Palani, Tata Mc Graw Hill Publications.
8. Control system engineering by A. Nagoorkani by R.B.A Publications.4th Edition.

Web Links:

5. <http://www.digimat.in/nptel/courses/video/108102043/L38.html>
6. <http://www.iienet2.org/>
7. <https://freevideolectures.com/course/3116/control-engineering-i>
8. https://swayam.gov.in/nd1_noc19_ee42/preview

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	TELECOMMUNICATION SWITCHING SYSTEMS & NETWORKING (Professional Elective – II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of basic Telecommunication Systems and Networking		3	-	-	3

Course Objectives:

6. To understand the basic concepts of Tele communication switching systems
7. To understand the principles of electronic switching systems.
8. To understand the concept of Traffic engineering and blocking network probabilities.
9. To understand the operation of signaling techniques in Telecommunication.
10. To understand the principles of ISDN and their architecture.

On Completion of the course, students will be able to	
CO1:	Understand the basics of telecommunication and its switching systems.
CO2:	Understand the concepts of electronic switching systems and their types.
CO3:	Understand the telephone traffic engineering and their parameters.
CO4:	Understand the basics of signaling techniques and their classifications.
CO5:	Understand the integrated services digital network and its classification.

UNIT-1 Introduction

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of

Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT – 2 Electronic Space Division Switching

Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Two-Stage Networks, Three-Stage Networks, N-Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching, N-Stage Combination Switching.

UNIT – 3 Telephone Networks

Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular Mobile Telephony.

Signaling: Customer Line Signaling, FDM Carrier Systems, PCM Signaling, Inter-Register Signaling, Common Channel Signaling Principles, CCITT Signaling System no.6, CCITT Signaling System no.7, Digital Customer Line Signaling.

UNIT – 4 Telecommunications Traffic

The Unit of Traffic, Congestion, Traffic Measurement, Lost-call systems, Queuing Systems.

Packet Switching: Statistical Multiplexing, Local Area and Wide Area networks, Large Scale Networks, Broadband Networks.

UNIT – 5 Integrated Services Digital Network

Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User Network Interfaces, Signaling, Numbering and Addressing, Interworking, ISDN Standards, Broadband ISDN, Narrowband ISDN, Voice Data Integration and SONET concept. Introduction to server-based telephone exchange.

Text books:

3. Thiagarajan Viswanathan, “Telecommunication Switching Systems and Networks” PHI 2000.
4. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education, 2006.

Reference Books:

4. J. Bellamy, “Digital Telephony”, 2nd Edition, John Wiley, 2001.
5. Achyut S. Godbole, “Data Communications and Networks”, TMH, 2004.
6. B. A. Forouzan, “Data Communication & Networking” 3rd Edition, TMH, 2004

Web Links:

6. [http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%](http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Roorkee/emwaves%20)
7. <http://www.iienet2.org/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)
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8. <http://www.ilo.org/global/publications/lang--en/index.htm>
9. <http://nptel.ac.in/courses/Webcoursecontents/IITROORKEE/INDUSTRIALENGINERRING/>
10. <http://nptel.ac.in/courses>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-' : No Correlation

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

Course Code	DIGITAL SIGNAL PROCESSING LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Linear system theory and Fourier Transforms, Digital Signal Processing, Basic Knowledge of MATLAB and C Programming		0	0	3	1.5

Course Objectives:

4. Knowledge to represent real world signals in digital format and understand transform-domain (Fourier and z-transforms) representation of the signals.
5. Learn to apply the linear systems approach to signal processing problems using high-level programming language.
6. Learn the basic architecture of microprocessors and digital signal processors and to learn about to implement linear filters in real-time DSP chips.

On Completion of the course, students will be able to	
CO1:	Design and implement a DSP system using tools like MATLAB
CO2:	Analyze and describe the functionality of a real world DSP system
CO3:	Work in teams to plan and execute the creation of a complex DSP system
CO4:	Apply DSP system design to real world applications

List of experiments

35. Linear Convolution
36. Circular convolution
37. Impulse and Step response of given LTI system
38. N point DFT and IDFT
39. Convolution using DFT and IDFT
40. a) FIR low Pass Filter b) FIR high pass filter
41. Analog IIR low pass filter – Butterworth & Chebyshev
42. Digital IIR low pass filter – Impulse Invariant & Bilinear
43. Study of Sampling theorem.
44. Power Spectral density
45. Auto and Cross Correlation of the given signals
46. Linear convolution using CC studio
47. Circular convolution using CC Studio
48. Impulse response of first and second order system using CC studio
49. N-point DFT using CC Studio

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	MICROPROCESSORS AND MICROCONTROLLERS LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Basic knowledge of 8086 Microprocessors, Assembly & C Programming		0	-	3	1.5

CO1	3	3	2	3	-	3	-	3	3	-	-	-
CO2	3	2	2	3	2	3	2	3	3	-	-	-
CO3	3	2	2	3	2	3	2	3	3	2	2	-
CO4	3	2	2	3	2	3	2	3	3	2	2	-

Course Objectives:

9. Understand the basic concepts of 8086 programming and Interfacing.
10. Learn architecture of AVR Microcontroller, Importance of Bit addressability, function of Special registers and basic concepts of Assembly Language program
11. Learn the concepts of Embedded C Programming and Interfacing
12. Learn basic concepts of AVR Microcontroller Interfacing with real world through different device.

On Completion of the course, students will be able to	
CO1:	Develop Assembly Language Programme for various arithmetic and logical operations.
CO2:	Develop Assembly Language Programme for various string related operations.
CO3:	Develop 'C' programme for interfacing of various peripherals to 8086 microprocessors.
CO4:	Develop 'C' programme for interfacing of various peripherals to AVR microcontrollers.

EXPERIMENTS TO BE DONE USING DIGITAL IC

MASM programs:

5. Arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division- Signed and using arithmetic operation, ASCII- Arithmetic operation.
6. Logical Shifting Operations-Left shift, Right shift, rotate left, rotate right, converting packed BCD to Unpacked BCD, BCD to ASCII conversion.
7. Using string operation and Instruction prefix: Move Block, Reverse string, Inserting, Deleting of string.
8. String sorting: Ascending order, Descending order, String comparison, Length of the string.

INTERFACING WITH 8086

7. Stepper motor interfacing
8. DC motor interfacing
9. Seven segment Display
10. Traffic light interfacing
11. Analog to Digital converter
12. LCD Display

INTERFACING WITH AVR MCU

6. Stepper motor interfacing
7. DC motor interfacing
8. Seven Segment Display
9. Analog to Digital converter
10. LCD display

Text books:

3. Ray and Burchandi, “Advanced Microprocessors and Interfacing”, Tata McGraw–Hill.
4. M.A.Mazidi,S.Naimi and S.Naimi, “The AVR Microcontroller and Embedded Systems Using Assembly and C”, 1stEdition Pearson Publications, 2013.

References:

4. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press, 2010.
5. Krishna Kant, “Microprocessors and Microcontrollers”, PHI Publications, 2010.
6. Dhananjay V. Gadre,” Programming and Customizing the AVR Microcontroller”, TATA McGraw Hill publications, 2012.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)
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CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	DIGITAL COMMUNICATION LAB				
Teaching	Total Contact Hours - 45	L	T	P	C
Prerequisites: Knowledge of digital modulation and demodulation techniques, multiplexing of signals, Information coding and MATLAB		0	-	3	1.5

Course Objectives:

9. Implementation of different digital modulation techniques using hardware.
10. Implementation of different digital modulation techniques using MATLAB.
11. Comparison of different digital modulation schemes.
12. Implementation of Spread Spectrum Modulation Techniques.

On Completion of the course, students will be able to	
CO1:	Implement different digital modulation and demodulation techniques.
CO2:	Compute and Analyze different source coding techniques.
CO3:	Analyze the performance of different multiplexing schemes
CO4:	Analyze performance of different digital modulation techniques.

List of Experiments:

21. PCM and DPCM Encoding and Decoding using MATLAB and hardware kit
22. Study of Time Division Multiplexing and Demultiplexing using hardware kit
23. Study of Delta modulation and Adaptive Delta Modulation using hardware kit
24. LINEAR BLOCK CODE-Encoder and Decoder
25. BINARY CYCLIC CODE- Encoder and Decoder
26. CONVOLUTION CODE- Encoder and Decoder
27. Study of ASK, FSK, PSK using MATLAB and hardware kit
28. Study of BPSK, QPSK modulation and demodulation techniques.
29. Study of QAM modulation and demodulation technique.
30. Plot the BER curve for various Digital modulation techniques

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	3	-	3	3	-	-	-
CO2	3	2	2	3	2	3	2	3	3	-	-	-
CO3	3	2	2	3	2	3	2	3	3	2	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 th Semester)			
Course Code	VLSI DESIGN				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Analog & Digital Electronic Circuits.		3	-	-	3

CO4	3	2	2	3	2	3	2	3	3	2	2	-
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Course Objectives:

1. To develop understanding of CMOS digital electronics circuits, including logic components and their interconnects.
2. To learn various fabrication steps of IC and basic electrical properties of MOSFET.
3. To understand CMOS technology-specific layout rules in the placement and routing of transistors.
4. To understand the concepts of modern integrated circuit design and testing.
5. To develop static CMOS combinational and sequential logic at the transistor level, including mask layout.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Analyze the fabrication process of CMOS digital circuits.
CO2:	Apply the concept of design rules during the layout of a circuit.
CO3:	Analyze the architectural issues of subsystem design.
CO4:	Implement circuit through various design styles (Semi-Custom, Full Custom).
CO5:	Apply the clock mechanism, demonstrate the architectural of FPGA.

UNIT – 1 CMOS and Bi-Polar Technology

Introduction to IC Technology, Basic MOS transistors, Enhancement and Depletion modes of MOS transistor, IC production process, CMOS Fabrication processes, Bi-CMOS Technology, Comparison between CMOS and Bipolar technologies. Current and voltage relations of MOS circuit, Aspects of MOS transistor threshold voltage, MOS transistor transconductance and output conductance. NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and Bi-CMOS Latch-up Susceptibility.

UNIT – 2 MOS and Bi-CMOS Circuit Design Process

MOS Layers, Stick Diagrams, Design Rules and Layout, λ -based design rules, 2 μ m Double Metal double Poly design rules, CMOS/Bi-CMOS rules, 1.2 μ m Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

UNIT – 3 Basic Circuit Concepts and Scaling Factors

Sheet resistance of MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Fan-in and fan-out characteristics, Realization of gates using NMOS, PMOS and CMOS technologies. Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

UNIT – 4 Subsystem Design

Architectural issues, Switch logic, Gate logic, Examples of structured design, Clocked sequential circuits, System considerations, General considerations of subsystem design process, An illustration of design process.

UNIT – 5 VLSI Design Issues and FPGA

VLSI Design issues and design trends, Design for testability, Power calculations, Package selection, Clock mechanisms, Mixed signal design, ASIC design flow, FPGA design flow, Introduction to SoC design. Basic FPGA architecture, FPGA configuration modes, FPGA design flow, FPGA families, FPGA design examples - Stack, Queue and Shift register implementation using VHDL, Step-by-step approach of FPGA design process on Xilinx environment.

Text Books:

5. Essentials of VLSI Circuits and Systems by Kamran Eshraghian, Douglas and A. Pucknell and Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
6. Principles of CMOS - Weste and Eshraghian, Pearson education, 1999.

Reference Books:

1. Advanced Digital Design with the Verilog HDL, Michael D. Ciletti, Xilinx Design Series, Pearson Education.
2. VLSI Design - Black Book by Dr. K. V. K. K. Prasad, Kattula Shyamala, Kogent Learning Solutions Inc. 2012 Edition.
3. Digital Integrated Circuits - John M Rabaey, PHI, 1997.

Web References

9. www.pa.msu.edu
10. www.tutorvista.com
11. www.globalspec.com
12. www.ee.bilkent.edu.tr
13. NPTEL online courses.

Prerequisites: Electromagnetic Fields and waves, Fundamentals of Photonics	3	-	-	3
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Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion, SM fibers.
3. To learn the various optical sources, materials and fiber splicing.
4. To learn the fiber optical receivers and noise performance in photo detector.
5. To learn link budget and WDM.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
CO2:	Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers
CO3:	Describe the principles of optical sources and power launching-coupling methods
CO4:	Compare the characteristics of fiber optic receivers
CO5:	Design a fiber optic link based on budget and choose necessary components required in modern optical communication systems.

UNIT – 1 Overview of Optical Fiber Communication

Historical development, The general system, Advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems

UNIT – 2 Fiber Materials & Characteristics

Glass, Halide, Active glass, Chalcogenide glass, Plastic optical fibers. Signal distortion in optical fibers - Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay.

UNIT – 3 Optical Fiber Connectors

Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

Optical Sources and Detectors:

Optical sources - LEDs, Structures, Materials, Quantum efficiency, Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Resonant frequencies, Optical Detectors - Physical principles of PIN and APD, Comparison of Photo detectors, Related problems.

UNIT - 4 Power Launching & Optical Receiver

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

UNIT – 5 Optical System Design

Point-to-point links - Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Edition, 2004.
3. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-' : No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	DIGITAL IMAGE PROCESSING				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Signals and Systems, Digital Signal Processing		3	-	-	3

CO5	3	2	-	-	-	-	-	-	-	2	-	-
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Course Objectives:

1. To understand the fundamental concepts and applications of Image Processing.
2. To understand the concepts of Intensity Transformations and Spatial Filtering.
3. To understand Image Restoration and Reconstruction.
4. To understand the concepts of Color image processing.
5. To understand Morphological image processing, Image segmentation.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Understand the fundamental steps in digital image processing.
CO2:	Examine various types of images, intensity transformations and spatial filtering.
CO3:	Develop Fourier transform for image processing in frequency domain.

CO4:	Evaluate the methodologies for image restoration and segmentation.
CO5:	Perform all morphological operations on images and image segmentation.

UNIT – 1 Digital Image Fundamentals

Digital Image Fundamentals: Fundamental steps in DIP, Components of digital image processing, elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, Image sensing and acquisition, Sampling and quantization of images, Representation of digital image, Spatial and gray level resolution, zooming and shrinking, some basic relationships between pixels.

UNIT – 2 Image Enhancement in Spatial & Frequency Domain

Gray Level Transformations, Piecewise linear transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filters, Use of first order and second order derivative in enhancement. Two-dimensional Fourier Transform, some properties of 2-D Discrete Fourier transform, correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters, Homomorphic Filtering.

UNIT – 3 Image Restoration

A model of the image Degradation/Restoration process, Noise models, Restoration in the presence of noise only - Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear Position Invariant Degradations, Estimation of the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering.

UNIT-4 Colour Image Processing

Color fundamentals, color models, pseudo color image processing, basics of full-color image processing, color transforms, smoothing and sharpening, color segmentation

UNIT – 5 Morphological Image Processing and Image Segmentation

Preliminaries, Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, Gray scale morphology.

Image Segmentation: Detection of Discontinuities (point, line and edge), Edge Linking and Boundary Detection, Thresholding, Basic global thresholding, Adaptive Thresholding, Region-Based Segmentation, region growing, splitting and merging.

Text books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

Reference Books:

1. B. Chanda and D. Dutta Majumdar, “Digital Image Processing and Analysis” PHI,2003.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. II Sem (8 semester)			
Course Code	BIOMEDICAL INSTRUMENTATION (Professional Elective – III)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Electronic measurements and Instrumentation, Digital image processing.		3	-	-	3

Course Objectives:

1. To understand the fundamentals of Electrodes and Transducers.
2. To understand the concepts cardiovascular system and measurements.
3. To understand the instruments used in the ICU & Respiratory system.
4. To understand the components bio telemetry system and their applications.
5. To understand the modern imaging systems used in the medical laboratories.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Analyze several signals that can be measured from human body.
CO2:	Discuss the working of several instruments used to acquire signals from living systems.
CO3:	Analyze the functioning of physiological cardiac system and respiratory system.
CO4:	Understand how the signals are digitized and stored in a computer or presented on an output display.
CO5:	Understand the various instruments used in modern imaging systems and shock hazards in the hospitals.

UNIT – 1 Sources of Bioelectric potentials and Electrodes

Resisting and Action Potentials, Propagation of Action Potentials, the Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to biomedical signals.

UNIT – 2 The Cardiovascular System

The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardiovascular Measurements, Electrocardiography (ECG), Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, detection of dicrotic notch in the carotid pulse, Analysis of

exercise ECG, Analysis of event related potentials, Correlation analysis of EEG channels, Correlation of muscular contraction.

UNIT – 3 Patient Care & Monitoring equipment

Elements of Intensive Care Monitoring, Diagnosis, Calibration and reparability of Patient Monitoring equipment, Other instrumentation for monitoring patients, Pace makers, Defibrillators, Physiology of respiratory system, Tests and instrumentation for mechanics of breathing, Respiratory theory equipment, Analysis of respiration.

UNIT – 4 Biotelemetry and Instrumentation

Introduction to biotelemetry, Physiological parameters adaptable to biotelemetry, Components of biotelemetry system, Implantable units, Applications of telemetry in patient care – The blood, Tests on blood cells, Chemical test, Automation of chemical tests.

UNIT – 5 X-ray and Radioisotope instrumentation

Generation of Ionizing radiation, Instrumentation for diagnostic X-rays, Special techniques, Instrumentation for the medical use of radioisotopes, Radiation therapy - Physiological effects of electrical current, Shock Hazards from electrical equipment, Methods of accident prevention.

Modern Imaging Systems: Tomography, Magnetic Resonance Imaging (MRI) System, Ultrasonic Imaging System, Medical Thermography.

Text Books:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer. – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John Wiley & Sons Inc.

Reference Books:

1. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
2. Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.
3. Principles of Applied Biomedical Instrumentation – by L.A. Geddes and L.E. Baker, John Wiley and Sons.
4. Biomedical Equipment Technology – Carr & Brown, Pearson.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)
Course Code	EMBEDDED SYSTEM DESIGN (Professional Elective – III)	

CO1	3	2	2	-	-	-	-	-	-	2	-	-
CO2	3		2	-	2	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	2	-	-	-	-	2	-	-
CO5	3		-	-	2	-	-	-	-	2	-	-

Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of A/D Converters, D/A Converters, Compilers, linkers, Debuggers, Microprocessors, Microcontrollers.		3	-	-	3

Course Objectives:

1. To understand the basics in typical embedded system design.
2. To understand the communication devices and basic integrated circuit design.
3. To understand concepts of firmware design approaches, ISR concept and interrupt servicing.
4. To understand the basics of operating system and concept of choosing an RTOS.
5. To understand concepts of integrated development environment, compiler, debugger.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO2:	Understand different I/O devices and peripherals used in embedded networking.
CO3:	Develop programming skills in embedded systems for various applications.
CO4:	Choose and operating system, and learn how to choose an RTOS.
CO5:	Acquire knowledge about Life cycle of embedded design and its testing.

UNIT – 1 Introduction to Embedded Systems

Embedded System - Definition, History, Classification, application areas and purpose of embedded systems, the typical embedded system - Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT – 2 Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT – 3 Embedded Firmware Design

Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT – 4 Real Time Operating System

Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS.

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT – 5 Embedded System Development

The integrated development environment, Types of files generated on cross-compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Text Books:

1. Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008.
2. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
3. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications.

Reference Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications, 2005
2. Embedding system building blocks By Labrosse, CMP publisher.
3. An Embedded Software Primer - David E. Simon, Pearson Education.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	DIGITAL SIGNAL PROCESSORS AND ARCHITECTURE (Professional Elective – III)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Computer Architecture & Organization, Microprocessors and Microcontrollers.		3	-	-	3

Course Objectives:

1. To present overview of key digital signal processing concepts.
2. To give insight into the computational accuracy of algorithms when implemented using programmable DSP device.
3. To understand the architecture and programming of commercially available programmable DSP devices.
4. To teach the instruction set and implement basic DSP algorithms like convolution, correlation and filtering so on.
5. To impart knowledge in identifying the suitable programmable DSP devices for various application areas and to design systems around these DSP devices.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Recall sampling process, DFT, FFT and digital filtering concepts.
CO2:	Identify the computational accuracy involved in real time DSP implementations.
CO3:	Describe the architectural features of Programmable Digital Signal Processors.
CO4:	Develop assembly level programs for TMS320C54XX processors using various addressing

	modes and instructions.
CO5:	Develop the interface to connect the memory and parallel I/O peripherals to programmable DSPs.

UNIT – 1 Review of Digital Signal Processing

Introduction, A Digital Signal Processing System, The sampling process, Discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time Invariant (LTI) systems, Digital filters, Decimation and Interpolation - Analysis and design.

UNIT – 2 Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT – 3 Architectures for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Parallelism and Pipelining.

UNIT – 4 Programmable Digital Signal Processors

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors, overview of developmental tools.

UNIT – 5 Interfacing Memory and I/O Peripherals

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA), A multi-channel buffer serial port – MCBSP.

Text Books:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP processor fundamentals - Architectures and features - Phil Lapsley, Jeffbier, Amit shoham, Edward Lee Wiley-IEE press.
3. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.

Reference Books:

1. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	WIRELESS SENSOR NETWORKS (Professional Elective – III)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Computer Networks, Routing Protocols and Security.		3	-	-	3

Course Objectives:

1. To understand the basics of wireless sensor networks and concepts of various topologies used in the sensor networks.
2. To understand design constraints of Ad-hoc Protocols with different mechanisms.
3. To understand various routing protocols and mechanisms.
4. To understand transport layer and various design constraints of transport layer.
5. To understand various security algorithms and requirements of network platforms and tools.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Identify major issues and challenges associated with wireless sensor networks.
CO2:	Identify the requirement of protocols for wireless ad-hoc networks as compared to the existing wired network.
CO3:	Explore network layer technologies by researching key areas such as algorithms, protocols, hardware, and applications.
CO4:	Discuss the concepts of transport layer protocols for wireless ad-hoc networks.
CO5:	Understand security requirements, Issues and Challenges involved in wireless ad-hoc networks.

UNIT – 1 Overview of Wireless Sensor Networks

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints and challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks, Applications of Wireless sensor networks. Networking Technologies: Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), Hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT – 2 MAC Protocols for WSN

Issues in designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention Based Protocols, Contention Based Protocols with reservation Mechanisms, Contention Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, IEEE Standards: 802.11a, 802.11b, 802.11g, 802.15, 802.16, HIPERLAN.

UNIT – 3 Routing Protocols

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

UNIT – 4 Transport Layer Protocols

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – 5 Security & Sensor Network Platforms

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Sensor Network Platforms: TinyOS - Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS using nesC, TOSSIM, Contiki - Structure, Communication Stack, Simulation environment - Cooja Simulator, Programming.

Text Books:

1. Ad-hoc Wireless Networks: Architectures and Protocols, C. Siva Ram Murthy and B. S. Manoj, 2004, PHI.
2. Wireless Ad-hoc and Sensor Networks: Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press.
3. Protocols and Architectures for Wireless Sensor Networks, Holger Karl & Andreas Willig, John Wiley, 2005.

Reference Books:

1. Wireless Sensor Networks-Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli & Taieb Znati, John Wiley, 2007.
2. Wireless Sensor Networks-An Information Processing Approach, Feng Zhao & Leonidas J. Guibas, Elsevier, 2007.
3. Ad-hoc Mobile Wireless Networks: Protocols & Systems, C. K. Toh, 1st ed., Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
5. Wireless Sensor Networks – S Anandamurugan, Lakshmi Publications.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 th Semester)			
Course Code	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION LABORATORY				
Teaching	Total Contact Hours – 45	L	T	P	C
Prerequisites: Basic knowledge of microwave engineering and fiber optic communication		0	0	3	1.5

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Objectives:

- To learn the characteristics of Microwave components.
- To gain hands on experience by exposing the students to various microwave components.

Course Outcomes:

On Completion of the course, students will be able to

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 th Semester)			
Course Code	VLSI LABROTARY				
Teaching	Total Contact Hours – 45	L	T	P	C
Prerequisites: Basic knowledge of CMOS technology, Logic design and Digital system design		0	0	3	1.5

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

Course Objectives:

1. To observe the design the schematic diagrams using CMOS logic
2. To observe the layout diagram using design rules
3. To observe the transmission gates and pass transistor logic
4. To observe the different amplifier techniques using CMOS logic
5. To observe the Simulation process using EDA tools (Mentor graphics/Tanner)

Course Outcomes:

On Completion of the course, students will be able to	
CO 1:	Identify and describe operation of CMOS logic
CO 2:	Apply CMOS logic to design logic gates
CO 3:	Draw the stick diagrams
CO 4:	Analyze layout methods for integrated circuits
CO 5:	Understand and Simulate different devices using Mentor graphics

List of Experiments:

1. Design and implementation of an inverter

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. II Sem (8 semester)
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2. Design and implementation of universal gates
3. Design and implementation of Half adder
4. Design and implementation of full adder
5. Design and implementation of Half subtractor
6. Design and implementation of full subtractor
7. Design and implementation of Pass Transistor
8. Design and implementation of Transmission Gate
9. Design and implementation of Common Source Amplifier
10. Design and implementation of Common Drain Amplifier
11. Design and implementation of Decoder
12. Design and implementation of D-latch

Equipment required for Laboratory:

8. Desktop Computers
9. EDA tool (Mentor graphics)

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Course Code	EMI & EMC (Professional Elective – IV)				
Teaching	Total Contact Hours- 50	L	T	P	C
Prerequisites: Vector Calculus, EM Field Theory, RF and Microwave Engineering		3	-	-	3

Course Objectives:

1. To understand the root causes for Electromagnetic Noise (EMI), its sources.
2. To understand the effects of EMI and the required precautions to be taken.
3. To understand the different measurement techniques of EMI (for conducted and normal) and their influences in detail.
4. To understand different compatibility techniques (EMC) to reduce/suppress EMI.
5. To understand different standards being followed across the world in the fields of EMI/EMC.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Distinguish effects of Electromagnetic interference.
CO2:	Model non-ideal behavior of electronic components.
CO3:	Understand and evaluate the sources of electrostatic discharge, radiated emission and conducted emissions.
CO4:	Understand legal and quality aspects of limiting commercial product emissions.
CO5:	Design for reduction of EMC interference using proper shielding and grounding.

UNIT – 1 Introduction

Sources of conducted and radiated EMI, EMC standardization and description, measuring instruments, conducted EMI references, EMI in power electronic equipment: EMI from power semiconductor circuits. Noise suppression in relay systems: AC switching relays, shielded transformers, capacitor filters, EMI generation and reduction at source, influence of layout and control of parasites.

UNIT – 2 EMI filter elements and EMI filter design for insertion loss

Capacitors, choke coils, resistors, EMI filter circuits. Ferrite beads, feed through filters, bifilar wound choke filter, EMI filters at source, EMI filter at output Worst case insertion loss, design method for mismatched impedance condition and EMI filters with common mode choke-coils, IEC standards on EMI.

UNIT - 3 EMI in Switch Mode Power Supplies

EMI propagation modes, power line conducted-mode inference, safety regulations (ground return currents), Power line filters, suppressing EMI at sources, Line impedance stabilization network (LISN), line filter design, common-mode line filter inductors - design & example, series mode inductors and problems, EMI measurements.

UNIT – 4 Faraday Screens for EMI prevention

Faraday screens as applied to switching devices, Transformers faraday screen and safety screens, faraday screens on output components, reducing radiated EMI on gapped transformer cores, metal screens, electrostatic screens in transformers.

UNIT – 5 EMC standards - National / International

Introduction, Standards for EMI and EMC, MIL-Standards, IEEE/ANSI standards, CISPR/IEC standards, FCC regulations, Euro norms, British Standards, EMI/EMC standards in JAPAN, Conclusions.

Text Books:

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
2. Introduction to Electromagnetic Compatibility, 2nd Ed., C. R. Paul, John Wiley and Sons, New York, USA, 2006.
3. Electromagnetic Interference and Compatibility IMPACT series, IIT – Delhi, Modules 1 – 9.

Reference Books:

1. Laszlo Tihanyi: Electromagnetic Compatibility in Power Electronics, IEEE Press.
2. Keith H Billings, Handbook on Switch-Mode power supplies, McGraw-Hill Publisher, 1989.
3. R. F. Ficchi: Practical Design for Electromagnetic Compatibility, Hayden Book Co.

Web Links:

1. <https://nptel.ac.in/courses/108106138/>
2. <https://nptel.ac.in/courses/117103065/>
3. <https://www.eeupdate.com/2019/03/electromagnetic-compatibility-emc-nptel.html>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

[illegible]

Prerequisites: Knowledge of Electronics Devices and Circuits, Switching Theory and Logic Design.	3	-	-	3
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Course Objectives:

6. To understand the basics of MOS design.
7. To explain the design of combinational MOS logic circuits.
8. To explain the design of sequential MOS logic circuits.
9. To facilitate understanding of semiconductor memories and RAM array organization.
10. To understand different testability techniques.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Design different logic circuits using MOS.
CO2:	Design and analyze several combinational and sequential logic using MOS circuits.
CO3:	Extend the digital IC design to different applications.
CO4:	Design semiconductor memories, Flash Memory, RAM array organization.
CO5:	Perform analysis of various MOS devices using different testability techniques.

UNIT – 1 Introduction

VLSI design methodologies, VLSI design flow, Design Hierarchy, Concepts of regularity, modularity and locality, VLSI design styles: full custom, semi-custom, FPGA, Gate array MOS Transistor: MOS structure, MOS system under external bias, threshold voltage, V-I characteristics, derivation of drain current, channel length modulation, substrate bias effect.

UNIT – 2 CMOS Inverter

Resistive load inverter, Enhancement/depletion load inverter (circuit diagram, advantages and disadvantages); Static CMOS inverter: Voltage transfer characteristics, Calculation of V_{IL} , V_{IH} and V_{TH} , Noise margin concepts and their evaluation, Power consumption.

UNIT – 3 Logic Circuits

Combinational Logic: CMOS logic design, Stick diagram and layout design; CMOS transmission gate logic. Sequential Logic: Timing metric for sequential circuits, Static latches and registers: bi-stability principle, MUX based latches, Static SR flip-flops, Master-Slave edge-triggered register. Dynamic latches and registers: CMOS D-latch, Edge triggered flip flop, Dynamic Transmission-Gate Edge-triggered Registers. C²MOS Dynamic logic Circuits: Pass transistor, ratioed logic, Dynamic CMOS logic, Domino logic, NORA CMOS logic BiCMOS: Electrical characteristics, Comparison with CMOS, Design of basic gates.

UNIT – 4 Memory

Memory classification, Non-volatile memory: design of NAND and NOR based ROM; DRAM: design (1T, 2T, 3T), read and write operations and operating modes; SRAM (6T): design and operation; Flash Memory: design, data programming and erasing techniques; Peripheral

circuitry: address decoder, sense amplifier, voltage references; Memory reliability: Signal to noise ratio; memory yield.

UNIT – 5 Design for Testability

Fault types and models; controllability and observability; Design for testability: Ad Hoc testing; structured design for testability, Self-test and Built-In self-Test (BIST) Techniques.

Text Books:

3. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
4. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
5. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson.

Reference Books:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. Modern VLSI Design - Wayne Wolf, fourth edition, copyrights 2009.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19		Godavari Institute of Engineering & Technology (Autonomous)										IV B.Tech. II Sem (8 th Semester)			
Course Code		SPEECH PROCESSING (Professional Elective – IV)													
Teaching		Total Contact Hours - 50										L	T	P	C
Prerequisites: Knowledge of Signals and Systems, Digital Signal Processing.												3	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	2	-	2		

Course Objectives:

1. To understand the basics of speech processing.
2. To understand the time domain models for speech processing.
3. To learn the basic principles of linear predictive coding and its applications.
4. To understand homomorphic speech processing and speech enhancement techniques.
5. To develop expertise in speech patterns, representation and recognition.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Lear the fundamentals of speech processing system.

CO2:	Develop time domain models for speech processing.
CO3:	Describe the basic principles linear predictive coding analysis.
CO4:	Discuss the speech enhancement techniques used in speech processing.
CO5:	Learn representation of speaker verification and identification systems.

UNIT – 1 Fundamentals of Digital Speech Processing

Anatomy & Physiology of speech organs, The process of speech production, Acoustic phonetics, Articulator phonetics, The acoustic theory of speech production - Uniform lossless tube model, Effect of losses in vocal tract, Effect of radiation at lips, Digital models for speech signals.

UNIT – 2 Time Domain Models for Speech Processing

Introduction, Window considerations, Short-time energy, Short-time average magnitude, Short-time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT – 3 Linear Predictive Coding (LPC) Analysis

Basic principles of Linear Predictive Coding Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT – 4 Homomorphic Speech Processing

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach: Spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

UNIT – 5 Automatic Speech and Speaker Recognition

Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit recognition system, Continuous digit recognition system. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS.

[illegible]

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	NETWORK SECURITY AND CRYPTOGRAPHY (Professional Elective – IV)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Computer Networks and Number Theory.		3	-	-	3

Course Objectives:

1. To understand the fundamentals of Cryptography.
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks.
5. To design security applications in the field of Information technology.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Identify and utilize different forms of cryptography techniques.
CO2:	Understand various Encryption algorithms
CO3:	Understand various cryptographic algorithms and Describe public-key cryptosystem
CO4:	Incorporate authentication and security in the network applications.
CO5:	Distinguish among different types of threats to the system and handle the same.

UNIT – 1 Introduction

Security attacks, Services and Mechanisms, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption Standard, Strength of DES, Block Cipher Design Principles and Modes of operations.

UNIT – 2 Number Theory & Encryption Algorithms

Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, The Chinese remainder theorem, Discrete logarithms. Encryption Algorithms: Triple DES, International Data Encryption Algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers.

UNIT – 3 Conventional Encryption & Public Cryptography

Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation. Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

UNIT – 4 Message Authentication and Hash Functions

Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs, Hash and MAC Algorithms MD File, HMAC. Digital signatures, Authentication Protocols.

Electronic mail Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT – 5 IP & Web Security

Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Intruders, Viruses and Worms, Fire Walls: Fire wall Design Principles, Trusted systems.

Text books:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education

Reference Books:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

Web Links:

1. <https://nptel.ac.in/courses/106105031>
2. https://swayam.gov.in/nd1_noc20_cs21/preview
3. <https://www.cse.iitm.ac.in/slides>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

[illegible]

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. II Sem (8 th Semester)			
Course Code	RADAR SYSTEM ENGINEERING (Professional Elective – V)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Signals and Systems, Signal Processing and Antenna Theory.		3	-	-	3

Course Objectives:

1. To understand the Radar fundamentals and analyze the radar signals.
2. To understand the basic concepts of CW Radar, FM-CW Radar and their applications.
3. To learn various radars like MTI, Doppler and tracking radars and their comparison.
4. To understand various technologies involved in the design of radar transmitters and receivers.
5. To understand the concept of tracking radar and utilization of radar antenna.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Understand the radar fundamentals and radar signals.
CO2:	Explain the working principle of pulse Doppler radars, their applications and limitations.
CO3:	Describe the working of various radar transmitters and receivers.
CO4:	Discuss different types of tracking radar systems and their application.
CO5:	Analyze the range parameters of pulse radar system which affect the system performance.

UNIT – 1 Basics of Radar

Introduction, Maximum Unambiguous Range, Radar Waveforms, Definitions with respect to pulse waveform - PRF, PRI, Duty Cycle, Peak Transmitter Power, Average transmitter Power. Simple form of the Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of Radar, The Origins of Radar, Illustrative Problems.

UNIT – 2 Radar Equation and Cross Section of Targets

Prediction of Range Performance, Detection of signal in Noise, Minimum Detectable Signal, Receiver Noise, SNR, Modified Radar Range Equation, Envelope Detector — False Alarm Time and Probability, Probability of Detection, Radar Cross Section of Targets: Simple targets – sphere, cone-sphere, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT – 3 MTI and Pulse Doppler Radar

Introduction, Principle, Doppler Frequency Shift, Simple CW Radar, Sweep to Sweep subtraction and Delay Line Canceler, MTI Radar with – Power Amplifier Transmitter, Delay Line Cancelers — Frequency Response of Single Delay, Line Canceler, Blind Speeds, Clutter Attenuation, MTI Improvement Factor, N- Pulse Delay-Line Canceler, Digital MTI Processing – Blind phases, I and Q Channels, Digital MTI Doppler signal processor, Moving Target Detector-Original MTD.

UNIT – 4 Tracking Radar

Tracking with Radar - Types of Tracking Radar Systems, Monopulse Tracking - Amplitude Comparison Monopulse (one-and two-coordinates), Phase Comparison Monopulse. Sequential Lobing, Conical Scan Tracking, Block Diagram of Conical Scan Tracking Radar, Tracking in Range, Comparison of Trackers.

UNIT – 5 Radar Antenna and Receiver

Functions of The Radar Antenna, Antenna Parameters, Reflector Antennas and Electronically Steered Phased Array Antennas. The Radar Receiver, Receiver Noise Figure, Super Heterodyne Receiver, Duplexers and Receivers Protectors, Radar Displays.

Text Books:

1. Introduction to Radar Systems- Merrill I Skolink, 3e, TMH, 2001.
2. Radar Principles, Technology, Applications — Byron Edde, Pearson Education, 2004.

Reference Books:

4. Radar Principles – Peebles. Jr, P.Z. Wiley. New York, 1998.
5. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm. Yesdee, 2013

Web References

3. NPTEL online courses.
4. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

Course Code	LOW POWER VLSI DESIGN (Professional Elective – V)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Electronics Devices and Circuits, VLSI Design, Switching Theory and Logic Design.		3	-	-	3

Course Objectives:

1. To understand the basics of low Power VLSI design.
2. To understand state-of-the art approaches to power estimation and reduction.
3. To discuss various power reduction and estimation methods.
4. To familiarize with power dissipation at all layers of design hierarchy from technology, circuit, logic, architecture and system.
5. To understand the importance of low-voltage, low-power memories and its future development.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Describe different sources of power dissipation.
CO2:	Perform power analysis using several simulation techniques.
CO3:	Discuss techniques that would reduce power consumption in circuits.
CO4:	Estimate power dissipation in clock distribution and suggest methods to reduce.
CO5:	Learn the design techniques low voltage and low power CMOS circuits for various applications.

UNIT – 1 Fundamentals of Low Power VLSI Design

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects – Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT – 2 Simulation Power Analysis

SPICE circuit simulators, Gate level logic simulation, Capacitive power estimation, Static state power, Gate level capacitance estimation, Architecture level analysis, Monte Carlo simulation. Probabilistic power analysis: Random logic signals, Probability & Frequency, Probabilistic power analysis techniques, Signal entropy.

UNIT – 3 Low Power Techniques

Circuit level: Power consumption in circuits. Flip Flops & Latches design, High capacitance nodes, Low power digital cells library Logic level: Gate reorganization, Signal gating, Logic encoding, State machine encoding, Pre-computation logic.

UNIT – 4 Low Power Clock Distribution

Power dissipation in clock distribution, Single driver Vs Distributed buffers, Zero skew Vs Tolerable skew, Chip & Package co-design of clock network. Algorithm & Architectural level methodologies: Introduction, Design flow, Algorithmic level analysis & Optimization, Architectural level estimation & Synthesis.

UNIT – 5 Low-Voltage Low-Power Memories

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Text Books:

6. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.
7. Practical Low Power Digital VLSI Design- Gary K. Yeap, Kluwer Academic, 1998.
8. Low Power Design Methodologies- M. Rabaey, Massoud Pedram, Kluwer Academic, 2010.

Reference Books:

6. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
7. Low power digital CMOS design, A. P. Chandrasekaran and R. W. Brodersen, Kluwer Academic, 1995.
8. Low power VLSI CMOS circuit design, A Bellamour and M I Elmasri, Kluwer Academic, 1995.

Web References

5. NPTEL online courses.
6. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	-	-	-	-	2	-	-
CO2	3	2	-	-	2	-	-	-	-	2	-	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. II Sem (8 th Semester)			
Course Code	MULTIMEDIA COMMUNICATION (Professional Elective – V)				
Teaching	Total Contact Hours - 50	L	T	P	C

CO3	3	2	-	-	2	-	-	-	-	2	-	-
CO4	3	2	-	-	2	-	-	-	-	2	-	-
CO5	3	2	-	-	2	-	-	-	-	2	-	-

Prerequisites: Knowledge of A/D Converters, D/A Converters, Compilers, linkers, Debuggers, Microprocessors, Microcontrollers.	3	-	-	3
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Course Objectives:

11. Gain fundamental knowledge in understanding the basics of different multimedia networks and applications.
12. Understand digitization principle techniques required to analyze different media types.
13. Analyze compression techniques required to compress text and image.
14. Analyze compression techniques required to compress audio and video.
15. Gain fundamental knowledge about multimedia communication across different networks.

Course Outcomes:

On Completion of the course, students will be able to	
CO1:	Understand basics of different multimedia networks and applications.
CO2:	Learn different compression techniques used to compress text and image.
CO3:	Describe different compression techniques used to compress audio and video.
CO4:	Analyse different media types to represent them in digital form.
CO5:	Describe resource and process management techniques used in multimedia systems.

UNIT – 1 Multimedia Communications

Introduction, Multimedia information representation, Multimedia networks, Multimedia applications, Application and Networking terminology, Network QoS and Application QoS, Digitization principles, Text, Images, Audio and Video.

UNIT – 2 Text and Image Compression

Introduction, Compression principles, Text compression- Run length encoding, Huffman, LZW, Document Image compression using T2 and T3 coding, Image compression - GIF, TIFF and JPEG.

UNIT – 3 Audio Compression

Introduction, Audio compression - Principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders. video compression, video compression principles

UNIT – 4 Video Compression

Introduction, Video compression principles, Video compression standards: H.261, H.263, MPEG, MPEG-1, MPEG-2, MPEG-4 and Reversible VLCs, MPEG-7: Standardization process of Multimedia Content Description, MPEG-21 Multimedia Framework.

UNIT – 5 Multimedia Systems

Notion of synchronization, Synchronization requirements, Reference model for synchronization, Introduction to SMIL (Synchronized Multimedia Integration Language),

Multimedia operating systems, Resource and Process management techniques.

Text Books:

1. Multimedia Communications, Fred Halsall, Pearson education, 2001.
2. Multimedia: Computing, Communications and Applications, Raif Steinmetz, Klara Nahrstedt, Pearson education, 2002.

Reference Books:

1. Multimedia Communication Systems, K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Pearson education, 2004.
2. Multimedia: An Introduction, John Billamil, Louis Molina, PHI, 2002.

Web References

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

Regulation GRBT-19		Godavari Institute of Engineering & Technology (Autonomous)										IV B.Tech. II Sem (8 th Semester)			
Course Code		INTERNET OF THINGS (Professional Elective – V)													
Teaching		Total Contact Hours - 50										L	T	P	C
Prerequisites: Knowledge of Microprocessor, Microcontroller and Communication Protocols.												3	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-		

Course Objectives:

1. To understand the concepts of IoT development infrastructure.
2. To understand the types of measurement errors and sensors.
3. To understand the principles of wired and wireless communication protocols.
4. To understand the security issues & cloud computing in the development of IoT.
5. To understand design and development of IoT platform.

Course Outcomes:

On Completion of the course, students will be able to

CO1:	Describe the IoT development cycle, challenges and requirements.
CO2:	Understand types of measurement errors and its impact on measurement and various sensor operation and construction mechanism.
CO3:	Learn about wired and wireless communication Protocols implementation.
CO4:	Discuss privacy and security challenges present in IoT and IoT clouds.
CO5:	Develop IoT applications using Arduino uno board and sensor libraries.

UNIT – 1 Fundamentals of IoT

Internet of things definition, Block diagram for IoT, Functional view of IoT, Design methodology of IoT, IoT vision, Fundamental characteristics of IoT, IoT Layered Architecture, Potential success factors of IoT, Applications and use case scenarios, Resource management for IoT.

UNIT – 2 Sensors and Measurement Errors

Sensors: Classification of sensors, Classification of actuators, Resistive Sensors, Capacitive Sensors and Inductive Sensors, Temperature Sensor, Humidity Sensor, Ultra-Sonic Sensor, Gas Sensor.

Measurement Errors: Classification of errors, Accuracy, Precision, Resolution, Significant Figure, Basics of Statistical Analysis.

UNIT – 3 Communication Protocols for IoT

Wired Communication Protocols: RS232, RS485, Ethernet, UART, USART, USB. Wireless Communication Protocols: Bluetooth, ZigBee, NFC, Application Protocols: MQTT, CoAP, HTTP.

UNIT – 4 Security & Cloud Computing

Security Engineering for IOT Development: Building Security into design and development. Secure Design: Safety and Security Design. IOT Cloud: Necessity of Cloud, Concept of Cloud, Models of Cloud, Functions of Cloud, Your Organization and Cloud Computing, Cloud Computing Services (IaaS, PaaS and SaaS). Case Study: Thing Speak Cloud and Blynk Cloud.

UNIT – 5 Development Platform and Case Studies

Hardware: Arduino Uno Board, Node MCU Board. Software Tools: Arduino IDE, Compilers, Cross Compilers, Linkers, Libraries, Debuggers, Serial Monitor. Arduino Programming Structure, Data Types, Operators, Control Statements (If, If-Else, While, Do-While, For, Switch-Case, Switch-Case-Break, Switch-Case-Continue) and Precompiled Functions. Case Studies: Home Automation and Agriculture

Text Books:

1. Internet of Things-From Research and Innovation to Market Deployment, O. Vermesan, P. Friess, River Publishers, 2014.
2. Introduction to Instrumentation and Measurement, R. B. Northrop, Second Edition, CRC Taylor and Francis 2005.
3. Practical Internet of Things Security, B. Russell and D. Van Duren-Pack Publishing, 2016.
4. Cloud Computing – A Practical Approach, A. T. Velte, T. J. Velte, R. Elsenpeter, Tata McGraw Hill, 2010.

Reference Books:

1. C Programming for Arduino, J.Balye, Packt Publication, 2013.
2. Introduction to Embedded Systems, K.V. Shibu, Tata McGraw Hill, First Edition, 2009.
3. Internet of Things- A Hands on Approach by Vijay Mediseti, Arshdeep Bahga.
4. Internet of Things with Arduino and Bolt by Ashwin Pajankar.

Web References

1. <https://thingspeak.com>
2. <https://www.blynk.cc/getting-started>
3. <https://www.arduino.cc>
4. <https://mqtt.org>

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

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

