

AMRITASAI INSTITUTE OF SCIENCE AND TECHNOLOGY PARITALA, 521180

AR22 REGULATION

COURSE STRUCTURE AND SYLLABUS

B.Tech ELECTRONICS & COMMUNICATION ENGINEERING

(ADVANCED COMMUNICATION TECHNOLOGY)



DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING



Amrita Sai Institute of Science & Technology **(AN AUTONOMOUS INSTITUTION)**

(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada)

AN ISO 9001: 2015 Certified Institution, Accredited by NAAC ,

Recognized by UGC Under 2(f) and 12(B) under UGC act 1956

Parital, Kanchikacherla (M), NTR Dist., A.P., India-521180

www.amritasai.org.in Tel:08678-277777 Toll Free No: 1800 1212 369



DEPARTMENT OF ELECTRONICS and COMMUNICATION ENGINEERING

INSTITUTION VISION

Contribute significantly to Technology and Management for transforming the lives of individuals and society through continuous Innovation in Technical Education, Research and Entrepreneurship.

INSTITUTION MISSION

To enrich the students to play key role in Technology and Management globally through best in class innovative methodologies developing critical thinking and problem solving, research and Entrepreneurship.

DEPARTMENT VISION

To create efficient engineers proficient with the domains related to Electronics and Communications engineering for a successful career in the service of society.

DEPARTMENT MISSION

To be able to develop sustainable solutions to problems related to Electronics and Communications Engineering as an individual or as a part of a team to maintain professional ethics, experimental learning, collaborations for research and Entrepreneurship.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To Acquire a strong background in basic science and mathematics and the ability to use these tools in Electronics & Communications Engineering.

PEO2: To develop the ability to demonstrate technical competence and develop solutions to the problems in various fields of Electronics & Communications Engineering.

PEO3: To produce graduates who ensure ethical and moral behavior.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PROFESSIONAL COMPETANCE: Apply the knowledge of Electronics and Communication Engineering principles in different domains like VLSI, Signal Processing, Communication, and Embedded Systems.

TECHNICAL SKILLS: Able to design and implement products using the state of art hardware and software tools and hence provide simple solutions to complex problems.



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PROGRAM OUTCOMES

PO1 Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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ACCREDITED BY NAAC WITH "A" GRADE

PARITALA(P), KANCHIKACHERLA(M), KRISHNA (D)-521 180(A. P.)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE FOR AR-22 REGULATION

I YEAR I SEMESTER							
S NO	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	22HS1T1	COMMUNICATIVE ENGLISH-I	HSC	3	0	0	3
2	22BS1T2	ALGEBRA & DIFFERENTIAL EQUATION	BSC	3	0	0	3
3	22BS1T3	ENGINEERING PHYSICS	BSC	3	0	0	3
4	22ES1T4	C PROGRAMMING	ESC	3	0	0	3
5	22ES1T5	BASICS OF ENGINEERING AND TECHNOLOGY	ESC	1	0	4	3
6	22HS1L1	COMMUNICATIVE ENGLISH LAB-I	HSL	0	0	3	1.5
7	22BS1L2	ENGINEERING PHYSICS & WORKSHOP LAB	BSL	0	0	3	1.5
8	22ES1L3	C PROGRAMMING LAB	ESL	0	0	3	1.5
9	22ES1MC1	LEARNING AN ART FORM	MC	2	0	0	0
TOTAL CREDITS							19.5

I YEAR II SEMESTER							
S NO	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	22HS2T1	COMMUNICATIVE ENGLISH-II	HSS	3	0	0	3
2	22BS2T2	CALCULAS AND TRANSFORMATIONS	BSC	3	0	0	3
3	22BS2T3	ENGINEERING CHEMISTRY	BSC	3	0	0	3
4	22ES2T4	PYTHON PROGRAMMING	ESC	3	0	0	3
5	22ES2T5	BASICS OF IOT	ESC	1	0	4	3
6	22HS2L1	COMMUNICATIVE ENGLISH LAB-II	HSL	0	0	3	1.5
7	22BS2L2	ENGINEERING CHEMISTRY & ITWS LAB	BSL	0	0	3	1.5
8	22ES2L3	PYTHON PROGRAMMING LAB	ESL	0	0	3	1.5
9	22ES2MC1	ENVIRONMENTAL STUDIES	MC	2	0	0	0
TOTAL CREDITS							19.5



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Proceedings of the 1st meeting of Board of Studies in Electronics and Communication Engineering
held on 18/07/2025 at 1:30 PM in Online, Amrita Sai Institute of Science and Technology, Paritala.

S. No.	Member	Signature	S. No.	Member	Signature
1	Dr. V. Ramesh Babu Professor & Head, Department of ECE, ASIST, Paritala		2	Dr. A.M. Prasad Professor, Department of ECE, JNTU, Kakinada	
3	Dr. B. Rajendra Naik Professor, Department of ECE, Osmania University, Hyderabad		4	Dr. Habibulla Khan Professor, Department of ECE, KL University, Vijayawada	
5	Mr. V. Govinda Rao CEO, Microlink Information Technologies Vijayawada		6	Dr. Samiran Chatterjee Professor, Department of ECE, ASIST, Paritala	
7	Dr. A. Vijayalakshmi Professor, Department of ECE, ASIST, Paritala		8	Dr. D. Hema Associate Professor, Department of ECE, ASIST, Paritala	
9	Mr. Abdul Azeez Assistant Professor, Department of ECE, ASIST, Paritala		10	Mrs. N. Thirumalesh Assistant Professor, Department of ECE, ASIST, Paritala	
11	Mr. B. Rama Rao Associate Professor, Department of ECE, ASIST, Paritala		12	Mr. B. Balaji Associate Professor, Department of ECE, ASIST, Paritala	
13	Mr. Anurag Sharma Assistant Professor, Department of ECE, ASIST, Paritala		14	Mrs. G. Latha Assistant Professor, Department of ECE, ASIST, Paritala	
15	Mrs. N. Visranthamma Assistant Professor, Department of ECE, ASIST, Paritala		16	Mrs. Ch. Sreelakshmi Assistant Professor, Department of ECE, ASIST, Paritala	
17	Mrs. V. Swarnalatha Assistant Professor, Department of ECE, ASIST, Paritala		18	Mrs. B. Suneetha Assistant Professor, Department of ECE, ASIST, Paritala	
19	Mrs. M. Saraswathi Assistant Professor, Department of ECE, ASIST, Paritala		20	Mrs. T. Venkata Ramana Assistant Professor, Department of ECE, ASIST, Paritala	
21	Mr. Md. Faheem Assistant Professor, Department of ECE, ASIST, Paritala		22	Mr. Sd. Nagura Vali Technical Assistant, Department of ECE, ASIST, Paritala	
23	Mr. P. Srinivasa Rao Technical Assistant, Department of ECE, ASIST, Paritala				
Special Invitees					
26	Dr. P. Chiranjeevi Professor & Director of Academics, Department of CSE ASIST, Paritala				

At the outset, the Chairperson, BOS in Electronics and Communication Engineering, welcomed all members of Board of Studies and Special invitees present in the meeting of Board of Studies for 2025-26 admitted batch in Department of Electronics and Communication Engineering and briefed about the agenda to be discussed. The following agenda was placed by the Chairperson and decisions were taken after detailed deliberations.



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Proceedings of the 4th meeting of Board of Studies in Electronics and Communication Engineering- VLSI Design and Technology (EVT) held on 17/07/2025 at 10:30 AM in Online, Amrita Sai Institute of Science and Technology, Paritala.

S. No.	Member	Signature	S. No.	Member	Signature
1	Dr. V. Ramesh Babu Professor & Head, Department of ECE, ASIST, Paritala		2	Dr. A.M.Prasad Professor, Department of ECE, JNTU, Kakinada	
3	Dr. B. Rajendra Naik Professor, Department of ECE, Osmania University, Hyderabad		4	Dr. Habibulla Khan Professor, Department of ECE, KL University, Vijayawada	
5	Mr. V. Govinda Rao CEO, Microlink Information Technologies Vijayawada		6	Dr. Samiran Chatterjee Professor, Department of ECE, ASIST, Paritala	
7	Dr. A. Vijayalakshmi Professor, Department of ECE, ASIST, Paritala		8	Dr. D. Hema Associate Professor, Department of ECE, ASIST, Paritala	
9	Mr. Abdul Azeez Assistant Professor, Department of ECE, ASIST, Paritala		10	Mrs. N. Thirumalesh Assistant Professor, Department of ECE, ASIST, Paritala	
11	Mr. B. Rama Rao Associate Professor, Department of ECE, ASIST, Paritala		12	Mr. B. Balaji Associate Professor, Department of ECE, ASIST, Paritala	
13	Mr. Anurag Sharma Assistant Professor, Department of ECE, ASIST, Paritala		14	Mrs. G. Latha Assistant Professor, Department of ECE, ASIST, Paritala	
15	Mrs. N. Visranthamma Assistant Professor, Department of ECE, ASIST, Paritala		16	Mrs. Ch. Sreelakshmi Assistant Professor, Department of ECE, ASIST, Paritala	
17	Mrs. V. Swarnalatha Assistant Professor, Department of ECE, ASIST, Paritala		18	Mrs. B. Suneetha Assistant Professor, Department of ECE, ASIST, Paritala	
19	Mrs. M. Saraswathi Assistant Professor, Department of ECE, ASIST, Paritala		20	Mrs. T. Venkata Ramana Assistant Professor, Department of ECE, ASIST, Paritala	
21	Mr. Md. Faheem Assistant Professor, Department of ECE, ASIST, Paritala		22	Mr. Sd. Nagura Vali Technical Assistant, Department of ECE, ASIST, Paritala	
23	Mr. P. Srinivasa Rao Technical Assistant, Department of ECE, ASIST, Paritala				
Special Invitees					
26	Dr. P. Chiranjeevi Professor & Director of Academics, Department of CSE ASIST, Paritala				

At the outset, the Chairperson, BOS in Electronics and Communication Engineering- VLSI Design and Technology (EVT), welcomed all members of Board of Studies and Special invitees present in the meeting of Board of Studies for 2024-25 admitted batch in Department of Electronics and Communication Engineering and briefed about the agenda to be discussed. The following agenda was placed by the Chairperson and decisions were taken after detailed deliberations.



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Proceedings of the 4th meeting of Board of Studies in Electronics and Communication Engineering- Advanced Communication Technology (ECA) held on 17/07/2025 at 10:30 AM in Online, Amrita Sai Institute of Science and Technology, Paritala.

S. No.	Member	Signature	S. No.	Member	Signature
1	Dr. V. Ramesh Babu Professor & Head, Department of ECE, ASIST, Paritala		2	Dr. A.M.Prasad Professor, Department of ECE, JNTU, Kakinada	
3	Dr. B. Rajendra Naik Professor, Department of ECE, Osmania University, Hyderabad		4	Dr. Habibulla Khan Professor, Department of ECE, KL University, Vijayawada	
5	Mr. V. Govinda Rao CEO, Microlink Information Technologies Vijayawada		6	Dr. Samiran Chatterjee Professor, Department of ECE, ASIST, Paritala	
7	Dr. A. Vijayalakshmi Professor, Department of ECE, ASIST, Paritala		8	Dr. D. Hema Associate Professor, Department of ECE, ASIST, Paritala	
9	Mr. Abdul Azeez Assistant Professor, Department of ECE, ASIST, Paritala		10	Mrs. N. Thirumalesh Assistant Professor, Department of ECE, ASIST, Paritala	
11	Mr. B. Rama Rao Associate Professor, Department of ECE, ASIST, Paritala		12	Mr. B. Balaji Associate Professor, Department of ECE, ASIST, Paritala	
13	Mr. Anurag Sharma Assistant Professor, Department of ECE, ASIST, Paritala		14	Mrs. G. Latha Assistant Professor, Department of ECE, ASIST, Paritala	
15	Mrs. N. Visranthamma Assistant Professor, Department of ECE, ASIST, Paritala		16	Mrs. Ch. Sreelakshmi Assistant Professor, Department of ECE, ASIST, Paritala	
17	Mrs. V. Swarnalatha Assistant Professor, Department of ECE, ASIST, Paritala		18	Mrs. B. Suneetha Assistant Professor, Department of ECE, ASIST, Paritala	
19	Mrs. M. Saraswathi Assistant Professor, Department of ECE, ASIST, Paritala		20	Mrs. T. Venkata Ramana Assistant Professor, Department of ECE, ASIST, Paritala	
21	Mr. Md. Faheem Assistant Professor, Department of ECE, ASIST, Paritala		22	Mr. Sd. Nagura Vali Technical Assistant, Department of ECE, ASIST, Paritala	
23	Mr. P. Srinivasa Rao Technical Assistant, Department of ECE, ASIST, Paritala				
Special Invitees					
26	Dr. P. Chiranjeevi Professor & Director of Academics, Department of CSE ASIST, Paritala				

At the outset, the Chairperson, BOS in Electronics and Communication Engineering- Advanced Communication Technology (ECA), welcomed all members of Board of Studies and Special invitees present in the meeting of Board of Studies for 2024-25 admitted batch in Department of Electronics and Communication Engineering and briefed about the agenda to be discussed. The following agenda was placed by the Chairperson and decisions were taken after detailed deliberations.



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The Chairman of the Board of Studies (BoS) in Electronics and Communication Engineering welcomed members and special invitees, briefed on the meeting's agenda, and led discussions on key topics, resulting in decisions being made after detailed deliberations:

The Agenda for the Meeting:

1. Review of ECE/EVT/ECA course structure for AR-22 regulation
2. Suggestions on preparation of M. Tech course structure for AR-25 regulation.
3. Suggestions on preparation of B. Tech course structure for AR-23 regulation.

Agenda 1: Review of ECE/EVT/ECA course structure for AR-22 regulation

The Chairman appraised the members about the Autonomous syllabus with total credit points for Electronics and Communication Engineering to obtain B.Tech degree for ECE and ECE-allied branch. The Chairman is discussing:

1. Autonomous syllabus for Electronics and Communication Engineering (ECE)
2. Total credit points required for B.Tech degree in ECE and ECE-allied branches
3. AR-22 course structure for review and approval

Resolution: The Board of Studies (BoS) went through the course structure and discussed about the opinion given in the 1st BoS proceedings has:

1. Reviewed the AR-22 course structure for ECE and ECE-allied branches
2. Discussed and incorporated feedback from previous meetings
3. Approved the course structure for 3rd year to final year (5th sem-8th sem)

Attachment: Annexure-I

Agenda 2: Suggestions on preparation of M. Tech course structure for AR-25 regulation

The Chairman has presented the M.Tech course structure under the AR-25 regulation for academic year 2025-26 admitted batch:

1. Review
2. Discussion
3. Approval

The board will provide their opinions and feedback before approving the course structure.

Resolution: The Board of Studies (BoS) went through the course structure and shared their opinion given below:

1. Reviewed the course syllabus
2. Incorporated suggested changes
3. Approved the M. Tech course structure & syllabus.

This approval finalizes the AR-25 curriculum for the M.Tech program for academic year 2025-26 admitted batch.

Attachment: Annexure-II

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Agenda 3: Suggestions on preparation of B. Tech course structure for AR-23 regulation

The Chairman has presented the B.Tech course structure under the AR-23 regulation for academic year 2025-26 admitted batch

1. Review 2. Discussion 3. Approval

The board will provide their opinions and feedback before approving the course structure.

Resolution: The Board of Studies (BoS) went through the course structure and shared their opinion given below:

1. Reviewed the course syllabus
2. Incorporated suggested changes
3. Approved the B. Tech course structure & syllabus.

This approval finalizes the AR-23 curriculum for the B.Tech program for academic year 2025-26 admitted batch.

Attachment: Annexure-III

Any other agenda

1. JNTUK expert member of BoS suggested that to follow the university curriculum and syllabus.
2. JNTUK expert member of BoS suggested the text books and reference books write as per the IEEE format.
3. Conduct Quizzes, Seminars, Guest Lectures to improve or impart extra knowledge amongst the students.
4. Suggested to include Honours subject.

There being no other agenda, the meeting was ended with a vote of thanks to the chair.

Dr. V. RAMESH BABU

Professor & Head of the Department,

BoS Chairman,

Department of ECE,

ASIST, Paritala

He *N. V. Ramesh Babu*

And

III YEAR I SEMESTER							
SN O	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	22ET5T1	MICROPROCESSORS AND MICROCONTROLLERS	PCC	3	0	0	3
2	22EA5T2	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	PCC	3	0	0	3
3	22EC5T3	VLSI DESIGN	PCC	3	0	0	3
4		PROFESSIONAL ELECTIVE COURSE -1/(SWAYAM)	PEC	3	0	0	3
5		OPEN ELECTIVE COURSE -1/(SWAYAM)	OEC	3	0	0	3
6	22ET5L1	MICROPROCESSORS AND MICROCONTROLLERS LAB	PCC	0	0	3	1.5
7	22EC5L2	VLSI DESIGN LAB	PCC	0	0	3	1.5
8	22EC5S1	VERBAL, QUANTITATIVE AND REASONING TESTING	SOC	1	0	2	2
9	22EC5MC1	CONSTITUTION OF INDIA	MC	2	0	0	0
Summer Internship 4 to 8 weeks (Mandatory) after Second Year (to be evaluated during V semester)				0	0	0	1.5
TOTAL CREDITS							21.5
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)							4

III YEAR II SEMESTER							
S NO	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	22EA6T1	OPTICAL FIBER COMMUNICATION	PCC	3	0	0	3
2	22EC6T2	INTEGRATED CIRCUIT APPLICATIONS	PCC	3	0	0	3
3	22EC6T3	ANTENNAS AND MICROWAVE ENGINEERING	PCC	3	0	0	3
4		PROFESSIONAL ELECTIVE COURSE -2/(SWAYAM)	PEC	3	0	0	3
5		OPEN ELECTIVE COURSE -2/(SWAYAM)	OEC	2	0	2	3
6	22EA6L1	ARDUINO PROGRAMMING LAB	PCC	0	0	3	1.5
7	22EC6L2	INTEGRATED CIRCUITS APPLICATIONS LAB	PCC	0	0	3	1.5
8	22EC6L3	ANTENNA DESIGN & MICROWAVE ENGINEERING LAB	PCC	0	0	3	1.5
9	22EC6S1	CODING AND TECHNICAL TRAINING	SOC	1	0	2	2
							21.5
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)							4
INTERNSHIP 4 TO 8 WEEKS (MANDATORY) DURING SUMMER VACATION							

IV YEAR I SEMESTER							
S NO	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1		PROFESSIONAL ELECTIVE COURSE -3 / (SWAYAM)	PEC	3	0	0	3
2		PROFESSIONAL ELECTIVE COURSE -4 / (SWAYAM)	PEC	3	0	0	3
3		PROFESSIONAL ELECTIVE COURSE -5 / (SWAYAM)	PEC	3	0	0	3
4		OPEN ELECTIVE COURSE -3 / (SWAYAM)	OEC	2	0	2	3
5		OPEN ELECTIVE COURSE -4 / (SWAYAM)	OEC	2	0	2	3
6	22HS7T6	HUMANITIES AND SOCIAL SCIENCE ELECTIVE	HSC	2	0	0	3
7	22EC7S1	COMMUNITY BASED PROJECT	SOC	0	0	2	2
Industrial/Research Internship 4 to 8 WEEKS (Mandatory) after Third Year (to be evaluated during VII semester)					0	3	3
TOTAL CREDITS							23
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)							4

IV YEAR II SEMESTER							
S NO	CODE	COURSE TITLE	CATEGORY	L	T	P	C
1	22EC8P1	MAJOR PROJECT/INTERNSHIP	PROJECT	0	0	0	12
TOTAL CREDITS							12

PROFESSIONAL ELECTIVE COURSES		OPEN ELECTIVE COURSES		HUMANITIES AND SOCIAL SCIENCE ELECTIVE COURSES	
1	AUDIO & VIDEO ENGINEERING	1	COMPUTER NETWORKS	1	HUMAN RESOURCE DEVELOPMENT
2	DIGITAL IMAGE AND VIDEO PROCESSING	2	INDUSTRIAL ROBOTICS	2	IPR & PATENTS
3	ELECTRONIC SWITCHING SYSTEM	3	CLOUD COMPUTING	3	ADVANCED CORPORATE STRATEGY
4	MULTICARRIER COMMUNICATION	4	GROUNDWATER MANAGEMENT	4	PROFESSIONAL ETHICS AND HUMAN VALUES
5	DSP PROCESSORS AND ARCHITECTURES	5	CYBER SECURITY	5	UNIVERSAL HUMAN VALUES
6	WIRELESS SENSOR NETWORKS	6	INTRODUCTION TO MACHINE LEARNING	6	ENGLISH FOR RESEARCH PAPER WRITING
7	RADAR & NAVIGATION SYSTEMS	7	DEEP LEARNING	7	DISASTER MANAGEMENT
8	AIR TRANSPORATION SYSTEMS	8	ETHICAL HACKING	8	SANSKRIT FOR TECHNICAL KNOWLEDGE
9	SATELLITE COMMUNICATION	9	BIG DATA TECHNOLOGIES	9	VALUE EDUCATION
10	IOT ARCHITECTURES AND PROTOCOLS	10	E-COMMERCE	10	STRESS MANAGEMENT BY YOGA
11	SPEECH PROCESSING	11	DATA STRUCTURE AND ALGORITHMS USING JAVA	11	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
12	GLOBAL POSITIONING SYSTEM	12	NATURAL LANGUAGE PROCESSING	12	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
13	ADVANCED EMBEDDED SYSTEMS	13	DATA ANALYTICS WITH PYTHON		
14	BIOMEDICAL SIGNAL PROCESSING	14	BASICS OF ARTIFICIAL INTELLIGENCE		
15	PULSE AND DIGITAL CIRCUITS	15	INTRODUCTION TO PYTHON PROGRAMMING		
16	WIRELESS MOBILE COMMUNICATION	16	PATTERN RECOGNITION AND APPLICATIONS		

SUBJECT FOR HONOURS

POOL-1: Instrumentation and Control Systems: (any four of the following subjects which are not chosen as professional electives are to be considered for Honors Degree)

S. No.	Subject	L-T-P	Credits
1	Data Acquisition systems	3-1-0	4
2	Adaptive Control Systems	3-1-0	4
3	Bio-Medical Instrumentation	3-1-0	4
4	Digital Control Systems	3-1-0	4
5	Process Control Instrumentation	3-1-0	4
6	Transducers & sensors	3-1-0	4
7	MEMS	3-1-0	4
8	Intelligent & Smart Instrumentation	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

POOL-2: Integrated circuits and Systems: (any four of the following subjects which are not chosen as professional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	VLSI Technology and Design	3-1-0	4
2	CMOS Analog IC Design	3-1-0	4
3	CMOS Digital IC design	3-1-0	4
4	Design for Testability	3-1-0	4
5	System on Chip	3-1-0	4
6	Programmable Logic Devices and ASIC	3-1-0	4
7	Scripting Language	3-1-0	4
8	Low Power VLSI Design	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

POOL-3: Communication Engineering: (any four of the following subjects which are not chosen as a professional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	Information Theory and Coding	3-1-0	4
2	Software Defined Radio	3-1-0	4
3	Data Communications & Computer Networks	3-1-0	4
4	Telecommunication System	3-1-0	4
5	5G Communications	3-1-0	4
6	Satellite communication	3-1-0	4
7	Optical Communication	3-1-0	4
8	Audio and Video Engineering	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

POOL-4: Digital Signal processing (any four of the following subjects which are not chosen as professional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	Speech Signal Processing	3-1-0	4
2	Video Signal Processing	3-1-0	4
3	Adaptive Signal Processing	3-1-0	4
4	Bio- Medical Signal Processing	3-1-0	4
5	DSP Processors and Architectures	3-1-0	4
6	Wavelet Theory	3-1-0	4
7	Multirate Systems And Filter Banks	3-1-0	4
8	Mathematical methods for signal processing	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses @ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

GENERAL MINOR TRACKS

S. No.	Subject	L-T-P	Credits
1	Electronic Devices and Basic Circuits	3-1-0	4
2	Digital Electronics	3-1-0	4
3	Principles of communication	3-1-0	4
4	Signal Analysis	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses @ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

With effect from the academic year 2022-23

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Numerical Methods and Complex Variables

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22BS3T1
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course. 2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.	On completion of the course, students will be able to 1. Calculate a root of algebraic and transcendental equations. 2. Compute interpolating polynomial for the given data. Explain relation between the finite difference operators. 3. Solve ordinary differential equations numerically using Euler's and RK method. 4. Verify analyticity of functions. 5. Calculate Taylor and Laurent series for functions by using line and contour integration to evaluate integrals, Use residues to evaluate integrals.

UNIT-I : SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method

UNIT-II: Interpolation

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's, Gauss formulae for interpolation – Interpolation with unevenly spaced points - Lagrange's Interpolation formula

UNIT-III: Numerical Differentiation and Integration

Integration by Trapezoidal and Simpson's rules; solution by Taylor's series-Picard's method of successive Approximations-Euler's Method-Runge-Kutta Methods

UNIT-IV: Functions of a complex variable

Complex function, Real and imaginary parts of Complex function, Limit and Continuity and Derivative of a complex function, Cauchy-Reimann equations, Analytic function, entire function, singular point, conjugate function, C-R equations in polar form, Harmonic functions, Milne-Thompson method

UNIT-V: Series expansion and Complex Integration

Line integral of a Complex function, Cauchy's theorem(only statement), Cauchy's integral formula, Taylor's series, Maclaurin's series expansion, Laurent's series, Residue theorem (without proof), Calculation of residues, Residue at a pole of order m

LEARNING RESOURCES

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

References:

1. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
2. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. David Kincaid, Ward Cheney, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SWITCHING THEORY AND LOGIC DESIGN
SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22BS3T2
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To provide insights of various number systems, Boolean functions and logic gates. 2. To introduce different minimization techniques. 3. To explain the design process of various combinational and sequential circuits. 4. To introduce the design of synchronous and asynchronous sequential circuits.	Upon successful completion of the course, the students will be able to 1. Convert one number system to another, analyze logic gates and Boolean theorems. 2. Analyze digital circuits using different minimization techniques. 3. Design various combinational and sequential circuits along with applications. 4. Design counters and state machines by applying the knowledge of synchronous and asynchronous sequential circuits.

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

UNIT-I : NUMBER SYSTEMS, CODES AND BOOLEAN ALGEBRA

Number Systems, Base Conversion Methods, Complements of Numbers, 4 Bit Codes-BCD, Excess-3, 2421, 8421 codes. Even and Odd parity, Hamming code, Error detecting and Error correcting codes. Fundamentals of Boolean Algebra and Logic Gates, Boolean theorems and proofs.

UNIT-II: BOOLEAN FUNCTIONS AND MINIMIZATION

Boolean SOP and POS functions-Canonical and Standard. Realization with Universal Gates Simplification of Boolean functions using Karnaugh Map (upto 6 variables) and Quine McClusky methods.

UNIT-III: COMBINATIONAL LOGIC CIRCUITS AND DESIGN

Logic Design of Combinational circuits – Binary Adder, Subtractor, Decoders, Encoders, Multiplexers, Demultiplexers, Code Convertors, Priority Encoders, Seven-segment Displays, 4-bit digital Comparators.

UNIT-IV: SEQUENTIAL LOGIC CIRCUITS AND DESIGN

RS & SR latches, clocked RS, SR, JK, T & D Flip- flops with pre-set and clear inputs. Race around problem, MS-JK-FF, Excitation tables of all Flip- Flops and conversions from one type to another. Design of Shift Registers with SIPO, SISO, PIPO and PISO modes and universal shift register. Design of Ring counters and Johnson counters.

UNIT-V: ASYNCHRONOUS AND SYNCHRONOUS SEQUENTIAL CIRCUITS

Design of Asynchronous counters (Ripple counters) for any modulus. Design of Synchronous counters using SR, JK, T and D- Flip Flops. Analysis and Design of Synchronous circuits with State Diagrams and State Reduction. Mealy to Moore conversion and vice-versa

LEARNING RESOURCES

Text Books:

1. Digital Design, Morris Mano, PHI, 3rd Edition, 2001
2. Switching and Finite Automata Theory, 2nd Edition, ZviKohavi, Tata McGraw-Hill, 1978.

References:

1. Fundamentals of Digital Circuits by A. Anand Kumar, PHI learning Pvt. Ltd
2. Fundamentals of Logic Design, Charles H Roth, Thomson Publications, 5th edition, 2009.

With effect from the academic year 2022-23

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Electronic Devices and Circuits

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 3:2:0	SEE Marks : 70	Course Code: 22EC3T3
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To learn and understand the basic concepts of semi conductor physics and Study the physical phenomena such as conduction, transport mechanism and characteristics of different diodes. 2. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed. 3. Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics. 4. To learn and understand the purpose of transistor biasing and its significance. 5. To analyze the Small signal equivalent circuit of BJT amplifiers and compare different configurations.	On completion of the course, students will be able to 1. Apply the basic concepts of semiconductor physics and understand the formation of p-n junction and how it can be used in different modes of operation. 2. Able to construct the Rectifiers and filters. 3. Understand the working and characteristics of BJT and FET with the V-I characteristics in different configurations. 4. Know the need of transistor biasing, various biasing techniques for BJT and stabilization concepts with necessary expressions. 5. Perform the analysis of the small signal model of a BJT.

CO-PO/PSO Mapping

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

UNIT - I : PN JUNCTION CHARACTERISTICS

Review of Semiconductor physics: (Intrinsic and Extrinsic semiconductors, Conduction and Fermi level in semiconductors, Drift and Diffusion currents, Hall effect),

Junction Diode Characteristics: Open circuited p-n junction, P-N junction – open circuit, Reverse-biased, and Forward-biased PN junction; diode current equation, V-I characteristics of PN-Junction diode, Effect of temperature on PN junction diode. Diode resistance, Diode capacitance. Junction Breakdown: Avalanche and Zener breakdown.

Special Semiconductor Diodes: Characteristics of Zener Diode, Varactor Diode, Tunnel Diode, Photo Diode, and LED.

UNIT - II : 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, π - Filter, comparison of various filter circuits. Zener diode as voltage regulator.

UNIT - III: TRANSISTOR CHARACTERISTICS

BJT: Junction transistor, transistor current components, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ Reach through effect.

FIELD EFFECT TRANSISTOR

FET: FET types, construction, operation, characteristics μ , g_m , r_d parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT –IV: TRANSISTOR BIASING AND THERMAL STABILIZATION

Need for biasing, operating point, load line analysis, basic stability, Stability factors, (S, S', S''), BJT biasing- methods: fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE} , I_c , and β , Bias compensation, Thermal runaway, Thermal stability.

UNIT – V: SMALL SIGNAL LOW FREQUENCY TRANSISTOR

AMPLIFIER MODEL

BJT: Two port networks and the transistor Hybrid model, Analysis of a Transistor Amplifier circuit using h- parameters, Analysis of CB, CE, and CC amplifier using exact and approximate analysis, Comparison of Transistor Amplifiers.

Learning Resources:

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.
3. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
4. Electronics devices & circuit theory-Robert L.Boylestad and Loui Nashelsky, Pearson / Prentice hall, tenth edition, 2009.

References:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuits – Bell, Oxford

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

CIRCUIT THEORY

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EE4T4
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To understand the applications of network topology to electrical circuits. 2. To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.	On completion of the course, students will be able to 1. Solve various electrical networks in presence of active and passive elements. 2. Understand network topology concepts. 3. Solve any magnetic circuit with various dot conventions. 4. Analyze & plot locus diagrams for R-L, L-C, R-C network with sinusoidal excitation. 5. Solve any electrical network by Network theorems.

UNIT-I : 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, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also

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 phasors, 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-II: 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-homogeneous, 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

UNIT-III: STEADY STATE ANALYSIS OF A.C CIRCUITS

Impedance concept, phase angle, series R-L, R-C, R-LC 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, problem solving

UNIT-IV: RESONANCE

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

Network Theorems: Thevenin's, Norton's, Millman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegen's- problem solving using dependent sources also

UNIT-V: 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, problem solving including dependent sources also.

LEARNING RESOURCES

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, McGraw Hill Company, 6th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

References:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O. Sadiku, McGraw Hill Education (India)
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications
3. Electric Circuits– (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by Kuma Rao, 5th Edition – McGraw Hill.
4. Electric Circuits by David A. Bell, Oxford publications
5. Introductory Circuit Analysis by Robert L. Boylestad, Pearson Publications
6. Circuit Theory (Analysis and Synthesis) by A. Chakrabarti, Dhanpat Rai & Co.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**
(ADVANCED COMMUNICATION TECHNOLOGY)

ANALOG COMMUNICATION

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EA3T5
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

UNIT - I : AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, 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.

UNIT - II : DSB & SSB MODULATION

Double side band suppressed carrier modulators, Generation of DSBSC Waves, Balanced Modulators, Coherent detection of DSB-SC Modulated waves, Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.

UNIT - III : ANGLE MODULATION

Basic concepts, Frequency Modulation: Single tone 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, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop. Comparison of FM & AM.

UNIT - IV : TRANSMITTER & RECEIVER

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. Communication Receivers, extensions of super heterodyne principle and additional circuits.

UNIT - V : NOISE & PULSE MODULATION

NOISE: Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

PULSE MODULATION: Types of Pulse modulation, PAM, PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

Learning Resources:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 3rd Edition, 2007.
2. Principles of Communication Systems – Simon Haykin, John Wiley, 2nd Edition, 2007.
3. Modern Digital and Analog Communication Systems – B.P. Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition,

REFERENCES:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
2. Communication Systems – R.P. Singh, SP Sapre, Second Edition TMH, 2007.
3. Electronic Communication systems – Tomasi, Pearson, fourth Edition, 2007

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

SWITCHING THEORY AND LOGIC DESIGN LAB

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EC3L1
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To outline the basics of Digital Electronics, Boolean algebra and be able to design the simple logic circuits and verify the functionality. 2. Design combinational and sequential logic circuits using digital ICs. 3. This laboratory course enables students to get practical experience in design, assembly and evaluation of switching theory and logic design. Students use a digital trainer kit and Xilinx simulator to test their electronic designs.	On completion of the course, students will be able to 1. Analyze and design basic combinational logic circuits using Digital IC's and HDL programming. 2. Implement basic sequential logic circuits using Digital IC's and HDL programming.

CO-PO/PSO Mapping

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

List of Programs : (Minimum 10 experiment)

A.HARDWARE

1. Verification of truth tables of Logic gates Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design full adder circuit and verify its functional table.
3. Verification of functional table of 3 to 8 line Decoder/De-multiplexer using IC 74138.
4. Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

5. 4 variable logic function verification using 8 to1 multiplexer IC 74151.
6. Verification of functional tables of (i) RS and SR Latch (ii) JK Edge triggered Flip-Flop (iii) D Flip-Flop
7. Design a four bit ring counter and Johnson counter using D Flip-Flops/JK Flip Flop and verify output.
8. Design and Verify Decade Counter using IC 7490.

B. Software

9. HDL code to design 8 to 3 Encoder using Xilinx Simulator.
10. HDL Code to design binary to gray code converter using Xilinx Simulator.
11. HDL code to design Universal shift Register using Xilinx Simulator.
12. HDL Code to design Mod 8 Synchronous counter using Xilinx Simulator.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Electronics Devices and Circuits Lab

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EC3L2
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To develop an understanding of the characteristics of Electronic devices and circuits with Qualitative approach.	On completion of the course, students will be able to 1. Estimate the parameters from V-I Characteristics of different diodes. 2. Design various rectifiers with different filter combinations. 3. Set up bias point of a transistor. 4. Estimate the parameters from BJT and FET characteristics. 5. Compute the bandwidth of amplifier.

CO-PO/PSO Mapping

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

List of Experiments: (Minimum of Ten Experiments has to be performed)

Study experiments:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Bread Boards, Specifications and Testing of active devices: Diodes, BJTs, JFETs, LED.
2. Study and operation of Digital Multimeter, Function Generator, Regulated Power Supply, and CRO.

CYCLE - I Experiment:

3. PN Junction Diode Characteristics.
4. Zener diode Characteristics.
5. Half-Wave Rectifier (with and without filters)
6. Full wave rectifier (with and without filters)
7. BJT Characteristics (CE Configuration)

8. BJT Characteristics (CB Configuration)

CYCLE - II Experiments:

9. FET Characteristics (CS Configuration)
10. CRO Operation and its Measurements
11. UJT Characteristics
12. Transistor Biasing
13. BJT- CE Amplifier
14. Emitter Follower-CC Amplifier

New / Additional experiments planned

1. MOSFET as a switch in Micro wind and in Multisim tools.
2. V-I Characteristics of Light Emitting Diode.

Mini Project(s)

Designing of various basic applications using devices.

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscillo scopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analogor Digital)
8. Voltmeters (Analogor Digital)
9. Active & Passive Electronic Components

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(ADVANCED COMMUNICATION TECHNOLOGY)**

Analog Communication Lab

SYLLABUS FOR B.TECH. IV – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EA3L3
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To demonstrate analog modulation and demodulation schemes for a given signal.	On completion of the course, students will be able to 1. Measure the modulated and demodulated output for analog modulation scheme. 2. Design the circuit for generation and reception for analog modulation scheme. 3. Apply the concepts of multiplexing to RF signals in time and frequency domain.

Cycle-I: HARDWARE EXPERIMENT (Minimum 8 experiments)

1. Amplitude Modulation & Demodulation
2. DSB SC - Modulation & Demodulation
3. SSB SC - Modulation & Demodulation
4. Diode Detector
5. Pre-emphasis & De-emphasis
6. Balance Modulator
7. Synchronous Detection
8. Frequency Modulation – Modulation & Demodulation
9. Pulse Amplitude Modulation & Demodulation
10. PWM, PPM – Modulation & Demodulation
11. Time division multiplexing.

Cycle-II: SOFTWARE EXPERIMENT (Minimum 3 experiments)

1. Amplitude Modulation & Demodulation (by using MATLAB CODING)
2. DSB SC - Modulation & Demodulation (by using MATLAB CODING)
3. Frequency Modulation – Modulation & Demodulation (by using MATLAB CODING)
4. Time division multiplexing. (by using SIMULINK)

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. RF Generators - 0 – 1000 M Hz./0 – 100 MHz.
5. Rated Voltmeters and Ammeters
6. Lab Experimental kits for Digital Communication
7. Discrete Components
8. Breadboards and Multimeters
9. Spectrum Analyzer
10. MATLAB

With effect from the academic year 2022-23

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Indian Traditional Knowledge

SYLLABUS FOR B.TECH III – SEMESTER

L:T:P (Hrs./week): 2:0:0	SEE Marks : 00	Course Code: 22EC3MC1
Credits : 0	CIE Marks : 00	Duration of SEE : 0 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.	On completion of the course, students will be able to 1. Understand the concept of Traditional knowledge and its importance. 2. Know the need and importance of protecting traditional knowledge. 3. Know the various enactments related to the protection of traditional knowledge. 4. Understand the concepts of Intellectual property to protect the traditional knowledge 5. Understand the traditional knowledge in different sectors.

UNIT - I : Introduction to traditional knowledge

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT - II : Protection of traditional knowledge

The need for protecting traditional knowledge Significance of TK Protection, the value of TK in the global economy, Role of Government to harness TK

UNIT - III : Legal framework and Traditional Knowledge

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR

Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT - IV : Traditional knowledge and intellectual property

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT - V : Traditional knowledge in different sectors

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Learning Resources:

Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Probability and Statistics

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22BS4T1
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering. 2. Introduce numerical techniques to solve the real world applications.	On completion of the course, students will be able to 1. Examine, analyze, and compare various Probability distributions for Discrete and Continuous random variable. 2. Test the hypothesis concerning mean, proportion and variance and perform ANOVA test. 3. Fit a curve to the numerical data and establish a relationship between two or more variables. 4. Evaluate clustering models to find useful patterns in unsupervised data. 5. Preparing different control charts and check whether the process is in control or not

UNIT-I : RANDOM VARIABLES AND DISTRIBUTIONS

Introduction-Random variables- Discrete and continuous Random variable- Distribution function-Expectation-. Binomial, Poisson and Geometric distributions, Uniform, Exponential and Normal distributions

UNIT-II: INTERPOLATION

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- Point estimation- Maximum error of estimate - Interval estimation. Introduction –Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors –Level of significance - One tail and two-tail tests- t test- ANOVA for one-way and two-way classified data

UNIT-III: CURVE FITTING AND CORRELATION

Introduction - Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares-Goodness of fit. Correlation & Covariance- Linear Regression and Multiple Regression, Generalized linear models- Poisson regression, Logistic Regression, Survival Analysis-Splines

UNIT-IV: ADVANCED STATISTICS

Classification-K-Nearest Neighbors (K-NN), Support Vector Machines (SVM), Naïve Bayes, Decision Trees, Random Forests, **Clustering**: K-Means Clustering, Hierarchical Clustering. Dimensionality reduction-Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA)

UNIT-V: STATISTICAL QUALITY CONTROL METHODS

Introduction - Methods for preparing control charts – Problems using $\bar{x}$, R charts, Sigma Chart and attribute charts.

LEARNING RESOURCES

Text Books:

1. **Jay I.devore**, Probability and Statistics for Engineering and the Sciences.8th edition, engage.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition,PHI

References:

1. **Shron L.Myers, Keying Ye, Ronald E Walpole**, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction to probability and statistics, Cengage learning.2009
3. **Sheldon, M. Rosss**, Introduction to probability and statistics Engineers and the Scientists, 4th edition, Academic Foundation,2011
4. **Johannes Ledolter and Robert V.Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition,Pearson,2010

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Electronic Circuit Analysis

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC4T2
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Familiarize with Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived 2. Familiarize with Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.. 3. Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed	On completion of the course, students will be able to 1. Design and analysis of small signal high frequency transistor amplifier using BJT. 2. Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT. 3. Know the types of feedbacks and generalized analysis of negative feedback amplifiers. 4. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. 5. Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

UNIT - I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS

Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Hybrid π conductance, Hybrid π capacitances, Validity of hybrid π model, Variation of Hybrid Parameters, CE short circuit gain, Current gain with resistive load, Single stage CE transistor amplifier response, Gain Bandwidth product.

UNIT-II: MULTISTAGE AMPLIFIERS

Classification of amplifiers, Choice of Transistor configuration in Cascade amplifier, methods of coupling, analysis of two stages RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT

UNIT-III: FEEDBACK AMPLIFIERS

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV: OSCILLATORS

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and their analysis, Crystal oscillators, Frequency and amplitude stability of oscillators

UNIT-V: POWER AMPLIFIERS

Classification of amplifiers, Class A power Amplifiers and their analysis, sClass B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers

Learning Resources:

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

REFERENCE:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

UNIT-I:

Digital Signal Processing System (DSP) - Block diagram, Advantages, Limitations and Applications of DSP system. Discrete Time Signals: Discrete time signals - Impulse, Unit Step, Unit Ramp, Rectangular, Exponential signals, Representation of discrete time signals, Operations on signals – Time shifting, Time scaling, Time reversal, Amplitude scaling, Properties of signals -Even/Odd signals, Causal/Non-Causal signals, Bounded/Unbounded signals, Periodic/Aperiodic signals.

Discrete Time Systems: Properties of discrete time systems- Linear and Nonlinear, Shift Invariant and Variant, Causal and Non-Causal, Stable and Unstable, Static and Dynamic, IIR and FIR systems. Analysis of LTI Systems through LCCDE – Natural Response, Forced Response, Response of Linear shift invariant systems-Linear Convolution Discrete Time Fourier Transform: DTFT of a sequence and system, Frequency response, Magnitude response and Phase response. Properties of DTFT- Linearity, Periodicity, Time shifting, Frequency shifting, Time reversal, Conjugate and Parseval's theorem.

UNIT-II: Z-Transform

Z-Transform of Causal, Anti-Causal and Non-Causal sequence. Region of Convergence and Properties, Properties of Z-Transform - Linearity, Time shifting, Time reversal, Multiplication by exponential sequence, Scaling in Z-domain, Conjugate, Differentiation in Z-domain, Time Convolution, Initial Value and Final Value Theorem, Inverse Z-Transform through Long Division, Partial Fractions and Residue Methods, Analysis of LTI system using z-transforms – system function, causality, stability, solution of difference equation, impulse response and step response. Realization of Discrete Systems: Direct Form-I, Direct Form-II or Canonic Form, Cascade Form and Parallel Form for IIR and FIR systems.

UNIT – III:

Discrete Fourier Transform: Frequency sampling - DFT, Computation of DFT, Computation of IDFT, Relation between DTFT and DFT, Properties of Twiddle factor, Properties of DFT- Linearity, Periodicity, Time shifting, Frequency shifting, Time reversal, differentiation in frequency domain, Conjugate, Parseval's theorem, Circular convolution, Additional DFT properties, Linear Convolution through Circular Convolution, Circular Convolution through DFT and IDFT, Linear Convolution through DFT and IDFT.

Fast Fourier Transform: Need for FFT, Radix-2 Decimation in Time FFT Algorithm, Radix-2 Decimation in Frequency FFT Algorithm, Comparison between DIT and DIF Algorithms, Inverse FFT.

UNIT – IV: IIR Filters

Design of IIR digital filters - Impulse Invariant Transformation, Bilinear Transformation. Specifications of Low Pass Filter, Analog Butterworth Filter, Design of Low Pass Digital Butterworth Filter, Analog Chebyshev Filter, Design of Low Pass Digital Chebyshev Filter, Analog Frequency Transformations.

UNIT – V: FIR Filters

Comparison between FIR and IIR Filters, Characteristics of FIR filters with linear Phase, Frequency Response Linear Phase FIR filters, Design of FIR filters - Fourier series method, Windowing Techniques-Rectangular Window, Hanning Window, Hamming Window, Kaiser Window.

LEARNING RESOURCES:

TEXT BOOK (S):

1. John G. Proakis, Dimitris G. Manolakis-“Digital Signal Processing, Principles, Algorithms & Applications”, Pearson education, 4th edition, 2008
2. Alan V Openheim, Ronald W. Schaffer- “Digital Signal Processing”, PHI learning, 1st edition, 2010.

REFERENCE (S):

1. P. Ramesh Babu, “Digital Signal Processing”, Scitech Publications, 4th edition, 2012 Pvt Ltd.
2. A. Nagoor Kani, “Digital Signal Processing”, RBA Publications, 1st edition, 2005.

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**
(ADVANCED COMMUNICATION TECHNOLOGY)

DIGITAL COMMUNICATION

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EA4T4
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

CO 1: Explain Sampling, Quantization and Encoding process in Pulse Modulation techniques of source encoding system

CO 2: Analyze the performance of baseband data transmission system in presence of noise and other interference.

CO 3: Demonstrate the mathematical background for communication system using signal space analysis.

CO 4: Analyze the different modulation & demodulation for band pass data transmission and their probability of error

CO 5: Explain the encoding & decoding for different channel encoding techniques

UNIT – I

Source Coding Systems: Introduction, sampling theorem, sampling process, Aliasing effect, quantization, quantization noise, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.

UNIT – II

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, Baseband M-array PAM transmission, Eye diagrams.

UNIT – III

Signal Space Analysis: Introduction, Geometric representation of signals, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error.

UNIT - IV

Pass band Data Transmission: Introduction, Pass band transmission model, Amplitude phase shift keying (ASK), Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals, M-array PSK, M-array quadrature amplitude modulation (M array QAM), Non-coherent orthogonal modulation schemes -Differential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Comparison of power bandwidth requirements for all the above schemes.

UNIT – V

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Convolutional Encoding, Decoding Methods.

TEXT BOOKS:

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

REFERENCES:

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
2. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010
3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Computer Architecture and Organization

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC4T5
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To understand the architecture of a modern computer with its various processing units operations. 2. To understand the memory management system of computer. 3. To Understand the concept of I/O organization mapping, various instructions, addressing modes	On completion of the course, students will be able to 1. understand the architecture of modern computer. 2. Analyze the Performance of a computer using performance equation. 3. Understand the different instruction types. 4. Calculate the effective address of an operand by addressing modes. 5. understand how computer stores positive and negative numbers with the concepts of I/O Organization and Memory systems..

CO-PO/PSO Mapping

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

UNIT - I: DATA REPRESENTATION AND COMPUTER ARITHMETIC

Fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, ripple carry adder, carry look-ahead adder, Multiplication using Booth's algorithm and Division using restoring and non restoring algorithms.

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT-II: ADDRESSING MODES

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operation

UNIT-III: INPUT / OUTPUT ORGANIZATION

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT-IV:

The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT-V:

Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

Learning Resources:

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGraw-Hill, 2011.
2. Computer Architecture and Organization, John P. Hayes 3rdEdition, McGraw-Hill, 2002.

REFERENCE:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson /PHI.
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson, 2012.
3. Fundamentals or Computer Organization and Design, – Sivaraama Dandamudi Springer Int.Edition, 2003.
4. “Computer Organization and Design: The Hardware/Software Interface” by DavidA. Patterson and John L.Hennessy, 1998.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**
Electronic Circuit Analysis Lab

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EC4L1
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To Prepare the students for finding frequency response of single stage and multi stage amplifiers	Students are able to 1. Understand the effect of capacitors on frequency response of amplifier 2. Determine the efficiency of power amplifiers 3. Generate Sinusoidal signals with different frequencies and know the difference between different Multivibrators 4. Design different feedback amplifiers.

LIST OF EXPERIMENT (MINIMUM 10 EXPERIMENT)

CYCLE - I Experiments

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier

CYCLE - II Experiments

7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Complementary Symmetry Class B Push-Pull Power Amplifier
12. Single Tuned Voltage Amplifier

Equipments Required

Software:

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

Hardware:

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



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Digital Signal Processing Lab

SYLLABUS FOR B. TECH IV - SEMESTER

L: T: P (Hrs./week): 0:0:3	SEE Marks: 35	Course Code: 22EV4L2
Credits: 1.5	CIE Marks: 15	Duration of SEE: 3 Hours

List of Experiments:

1. Generation of discrete time Signals
2. Linear Convolutions between two given Signals.
3. Circular Convolutions between two given Signals.
4. Autocorrelation for the given sequence and Cross Correlation between two given signals.
5. Computation of N-point DFT
6. Computation of N-point IDFT
7. Linear and Circular Convolution using DFT
8. Linear and Circular Convolution using IDFT
9. Power Spectral Density for sinusoidal signal
10. Design of Digital IIR Butterworth filter using Bi-linear Transformation
11. Design of Digital IIR Chebyshev filter using Bi-linear Transformation
12. Design of Digital FIR Chebyshev filters using Windowing technique

Equipment Required:

1. PC
2. MATLAB Software

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**
(ADVANCED COMMUNICATION TECHNOLOGY)

DIGITAL COMMUNICATION LAB

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 35	Course Code: 22EA4L3
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

CO 1: Analyze and implement analog to digital converters like PCM, DM, DPCM

CO 2: Visualize and practical implementation of baseband modulation techniques.

CO 3: Analyze the practical implementation of encoder and decoder of linear block code and binary cyclic code convolution code.

CO 4: Understand the practical implementation of digital modulation techniques

LIST OF EXPERIMENTS:

Part-A: HARDWARE EXPERIMENT (Minimum 7 experiments)

1. Pulse code modulation.
2. Differential pulse code modulation.
3. Delta modulation.
4. Amplitude shift keying.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding.
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code - Encoder and Decoder
12. Convolution Code - Encoder and Decoder

Part-B: SOFTWARE EXPERIMENT (Minimum 3 experiments)

1. Pulse code modulation.
2. Delta modulation.
3. Amplitude shift keying.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. Linear Block Code-Encoder and Decoder
8. Convolution Code - Encoder and Decoder

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators - 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Introduction to MATLAB Programming & PCB DESIGN

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 1:0:2	SEE Marks : 50	Course Code: 22EC4S1
Credits : 2	CIE Marks : 00	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Introduce the MATLAB software environment. 2. The students should be able to carry out any PCB design necessary for their graduation projects. 3. Students analyze single-sided and double-sided printed circuit board design, emphasizing the drawings, standards, and the processes required to layout printed circuit board and manufacturing documentation	On completion of the course, students will be able to 1. Use MATLAB effectively to analyze and visualize data. 2. Electrical, communication, computer mechatronic, energy and industrial engineering students who want to include the PCB Design experience as part of their skill set. 3. Start a career in electronics engineering. 4. create schematics from blue-prints, they will also be able to perform simple simulations

UNIT - I: MATLAB INTRODUCTION

Basics of MATLAB, MATLAB environment, MATLAB data types, MATLAB operators, MATLAB control statements, Basic command, Basic programming with simple examples

UNIT-II: PCB Design Introduction

Introduction to PCB designing concepts Introduction & Brief History, What is PCB, Difference between PWB and PCB, Types of PCBs: Single Sided (Single Layer), Multi-Layer (Double Layer), PCB Materials Introduction to Electronic design Automation (EDA), Brief History of EDA, Latest Trends in Market, How it helps and Why it requires , Different EDA tools

UNIT-III: COMPONENTS OF PCB DESIGN

Component introduction and their categories, Types of Components, Active Components, Diode Transistor, MOSFET , LED, SCR, Integrated Circuits (ICs), Passive Components, Resistor Capacitor, Inductor Transformer, Speaker/Buzzer Component, Package Types, Through Hole Packages, Axial lead o Radial Lead, Single Inline, Package(SIP), Dual Inline Package(DIP), Transistor Outline(TO), Pin Grid Array(PGA), Through Hole Packages, Metal Electrode Face(MELF), Leadless Chip Carrier(LCC), Small Outline Integrated Circuit(SOIC), Quad Flat Pack(QFP) and Thin QFP (TQFP),

Ball Grid Array(BGA), Plastic Leaded Chip Carrier(PLCC)

UNIT–IV: MATLAB PROGRAMMING PRACTICE

1. Creating matrices and arrays
2. Image import and export
3. Using scripts and functions
4. Data import and export
5. Using the graphical features

UNIT-V: PROJECT WORK ON PCB

Project work, Making the schematic of Academic and Industrial projects, PCB, Designing of these projects, Soldering and De-soldering of components as per Design, Testing and Troubleshooting Methods

Learning Resources:

1. MATLAB for Beginners: A Gentle Approach by Peter I. Kattan, Revised edition
2. Printed Circuit Boards by Khandpur
3. PCB Design : Printed Circuit Board by Michael Dsouza

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Microprocessors and Microcontrollers

SYLLABUS FOR B.Tech V SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22ET5T1
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
- To familiarize the students on 8086μp and 8051μc architecture. - To understand operation of maximum mode and minimum mode. - To understand the advanced micro processors features. - To understand the Assembly language programming with 8051. - To identify different advanced microcontrollers.	On completion of the course, students will be able to - Summarize architectural features of 8086μp. - Interface and program 8086μp with memory, PPI, timer and DMA. - Apply the knowledge of Architectural features of 8051 μc to program 8051μc. - Interface and program on chip peripherals of 8051μc. - Interface off chip peripherals with 8051μc and design a system around 8051μc based system

CO-PO/PSO Mapping

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

UNIT - I: 8086 ARCHITECTURE

8086 PIN diagrams(Minimum mode ,Maximum mode), 8086architecture, Register set, Addressing Modes, Basic Instructions set, Assembler Directives, Memory Organization, Interrupt structure of 8086

UNIT-II: :MINIMUM AND MAXIMUM MODE OPERATIONS

Minimum and Maximum mode: operations of 8086, Timing Diagrams, General bus operation (Read,Write cycles).

Assembly language programs: Involving arithmetic expressions, logical, sorting Operations,evaluation of prostring manipulation

UNIT - III: 8086 INTERFACING AND ADVANCED MICROPROCESSORS

Memory interfacing: RAM, EPROM IC Chips I/O interfacing: 8255 PPI, 8257

DMA interface Interfacing programmable interval timers – 8253/8254

ADVANCED MICROPROCESSORS:

Introduction to Advanced Micro Processors, 80386 Architecture and

Features, 80386 (Real and Protected Modes) and Features, 80386 (Segmentation & Paging Techniques), RISC & SIS features, Pentium processor Architecture

UNIT - IV: 8051 MICROCONTROLLER

Architecture of 8051, Pin configuration, Memory organization (ROM & RAM), Register set of 8051, Interrupts of 8051.

Assembly language Programming with 8051: Instruction set, Data transfer, Arithmetic, logical and Branching instructions, Addressing modes

UNIT-V: ADVANCED MICROCONTROLLERS

Block diagram of basic PIC micro controller, registers I/O ports, Addressing modes of PIC Microcontroller ARM Core Architecture,

Programming in C for PIC: Data types, I/O programming, logical operations, data conversion (BCD to ASCII, ASCII to BCD)

Learning Resources:

1. Ray A.K. and Bhurchandi K.M.- "Advanced microprocessor and peripherals", 2nd edition, TMH, 2000
2. Kamal Raj- "Microcontrollers Architecture, programming, interfacing and system Design", Pearson Education, 2005.
3. Gaonkar Ramesh S.- "Microprocessor Architecture, Programming, and Applications With the 8085", Prentice Hall PTR, 2002
4. Mazidi Ali Muhammad- "The 8051 Micro Controller and Embedded Systems Programming using Assembly and C", second edition, Pearson Education, 2007
5. Mazidi Ali Muhammad – "PIC microcontroller and Embedded Systems, Using assembly and C for PIC18"

References

1. Hall Douglas V.- "Microprocessors Interfacing", 2nd edition, 2007.
2. Triebel Walter A. and Singh Avtar- "The 8088 and 8086 Microprocessors", PHI, 4th Edition, 2003.
3. Liu and Gibson GA- "Micro-computer system 8066/8088 family Architecture, programming and Design", PHI, 2nd Edition
4. Ghoshal Subrata- "Microcontroller-Internals, Instructions, Programming and Interfacing", Pearson, 2010

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Electromagnetic waves and Transmission lines

SYLLABUS FOR B.TECH V – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EA5T2
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

To familiarize the students in the concepts of: 1. Electric field and magnetic field due to their sources. 2. To understand the electric energy and magnetic energy stored through different objects 3. Formulation of Maxwell's equations and solution in free space. 4. Propagation/reflection characteristics of uniform plane waves in dielectric/conducting media. 5. To understand the basic principles of transmission lines.	On completion of the course, students will be able to 1. Apply the fundamental of electric and magnetic field. 2. Solve for electric potential and energy density due to different charged objects. 3. Apply concepts of magnetostatics to evaluate the magnetic fields for different engineering problems. 4. Formulation of Maxwell's equations for time varying electromagnetic fields. 5. Analyze the characteristics of electromagnetic waves through the boundaries of different media and in transmission lines.
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UNIT - I

Cartesian, Cylindrical and spherical coordinate systems - Review of vector analysis – Divergence, Gradient Curl. Coulomb's Law. Electric Field Intensity. Electric field due to different charge distributions: Line of charge, sheet charge and volume charge distributions.

UNIT - II :

Electric flux, flux density, Gauss's Law and application, Energy and potential, Potential field of system of charges, Potential gradient. Energy density, Boundary conditions in static electric field, Capacitance of parallel plate capacitor, Coaxial cable, Continuity equation, current density, Poisson's equation, Laplace equation.

UNIT - III :

Steady magnetic field, Biot-Savart's law, Ampere's law, Magnetic scalar and vector potentials. Magnetic boundary conditions, Magnetomotive force, Permeability, Self and mutual inductances, Evaluation of inductance of solenoid, toroid.

UNIT - IV :

Time varying fields & Maxwell's equations: Faraday's Law, Modified Ampere's law, Displacement Current, Maxwell's Equation in Point Form, Integral Form. Wave Propagation in Free Space.

UNIT - V :

Wave Propagation in Dielectrics, Poynting's theorem and Wave Power, Propagation in good conductors, Skin Effect. Reflection of Uniform Plane waves at normal incidence and oblique incidence.

Transmission lines: Primary and secondary constants, terminated lines: open circuit, short circuit, matched load.

Learning Resources:

1. Engineering Electromagnetics, 8th Edition, William H. Hayt, Jr. John A. Buck, Tata McGraw Hill Education, 2017.
2. Principles of Electromagnetics, Mathew N.O. Sadiku and SV Kulkarni, 6th ed., Oxford Univ. Press, 2015.
3. Electromagnetics with Applications, John D Kraus and Daniel A. Fleisch, McGraw Hill, 1999.
4. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005.
5. E.C. Jordan & K.G. Balmain, Electromagnetic Waves & Radiating Systems, Prentice Hall India.
6. Umesh Sinha, "Transmission Lines and Network", Satya Prakashan Publishing Company, New Delhi, 2012.
7. John D Ryder, Networks lines and Fields, Second edition, Pearson Education India, 2015

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI Design

SYLLABUS FOR B. TECH V SEMESTER

L: T:P (Hrs./week): 3:0:0	SEE Marks: 70	Course Code: 22EC5T3
Credits: 3	CIE Marks: 30	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To understand the MOS fabrication technologies, electrical properties and develop layout of MOS circuits, subsystem, Learn the VHDL coding	On completion of the course, students will be able to 1 Acquire fundamental knowledge on MOSFET characteristics and its parameters 2 Understand basic electrical properties of MOS devices. 3 Apply the design rules and analyze the impact of scaling on MOS circuits 4 Comprehend the need of hardware description language and its features 5 Design various applications using FPGA.

CO-PO/PSO Mapping

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

UNIT-I : MOS TRANSISTOR

Introduction to MOS Transistor Theory: NMOS, PMOS Enhancement Transistor, MOSFET as a Switch, Threshold voltage, Body effect. MOS Device Design Equations, Basic DC equations, Short Channel Effects and Device Models – Scaling Theory, Threshold Voltage Variation, Mobility Degradation with Vertical Field, Velocity Saturation, Hot Carrier Effects, Output Impedance Variation with Drain-Source Voltage, MOS Device Models

UNIT-II: BASIC ELECTRICAL PROPERTIES AND CIRCUIT CONCEPTS

MOS device design equations: drain current-voltage, threshold voltage, and transconductance. NMOS Inverter and Transfer characteristics, pull up and pull-down ratios of NMOS, alternative forms of pull up, CMOS Inverter and transfer

characteristics, Latch-up in CMOS circuits.

UNIT-III: MOS and BICMOS Circuit Design Processes and scaling

VLSI circuit design process, MOS layers, Stick and layout representations of layers Lambda and Micron based Design rules, Stick and Layout diagrams. Scaling models and scaling factors, scaling factors for device parameters, limitations of scaling.

UNIT-IV: INTRODUCTION TO VHDL

Introduction to VLSI design cycle, Computer-aided design tools for digital systems, Hardware description language: VHDL, features, Data objects, Classes and data types, Operators, Subprograms, Over loading.

UNIT-V: FPGA & ADVANCED TECHNOLOGIES

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, High-k, Metal Gate Technology, Fin-FET, TFET.

LEARNING RESOURCES

Text Books:

1. Essentials of VLSI Circuits and Systems-Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian - Prentice Hall India, Private Limited, 2005 Edition.
2. Weste Neil H. E. and Eshraghian K.- "Principle of CMOS VLSI Design: A Systems Perspective" Addison Wesley, 2000.
3. Prasad K.V.K.K. Dr., Shyamala K.- "VLSI Design-Black Book", Kogent Learning Solutions Inc.,2012
4. Perry D. L. - "VHDL: Programming by Example", Tata McGraw-Hill, 2002.

References:

1. Brown S. and Vranesic Z.- "Fundamentals of Digital Logic with VHDL Design" McGraw-Hill Education, 2008.
2. Kang S. M., Leblebici Y.- "CMOS digital integrated circuits: Analysis & design", Tata McGraw-Hill, 3rd Edition, 2003.
3. Bhasker J.- "A VHDL Primer", Prentice Hall PTR, 1999
4. Fin-Fets and other multi-gate transistors, Colinge JP, Editor NewYork, Springer, 2008.

Department : ELECTRONICS AND COMMUNICATION ENGINEERING				Programme: B. Tech. (ECA & EVT)						
				Regulation : AR-22						
Subject Code	20ET5T4F			Hours / Week		Credit	Maximum Marks			
Subject	RADAR & NAVIGATION SYSTEMS			L	T	P	C	IM	EM	TM
Year & Sem	VB Tech I Semester			3	1	0	3	30	70	100
Prerequisite	Basic Knowledge in Engineering									
Objectives	To familiarize with the basic principles of RADAR and operation of different types of Radars									
	To introduce different RADAR performance factors.									
	To introduce the different radar systems									
Outcomes	At the end of this course the student can able to:									
	Understand the basic working principle of RADAR									
	Design different radar									
	Understand the need and functioning of CW, FM-CW and MTI radars									
	Known various Tracking methods.									
	Derive the matched filter response characteristics for radar receivers.									
Design application related antenna in accordance with Radar Receiver.										
UNIT – I: Introduction to Basic Types of RADAR										
Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar equation, Radar Block diagram and Operation, Radar frequencies and Applications, Radar Equation, Minimum Detectable signal										
CW AND FM-CW RADAR: Doppler Effect, CW Radar-Block Diagram, Isolation between Transmitter and Receiver; Non-zero IF Receiver, Receiver Bandwidth Requirements, FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics(Approaching/Receding Targets),FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar										
UNIT – II: MTI AND Pulse Doppler Radar										
Principle, Block diagram of MTI Radar, Delay Line Cancellers-Filter characteristics, Blind Speeds, Double Cancellation, Staggered PRFs; Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI performance, Non-coherent MTI,MTI versus Doppler Radar										
UNIT – III: TRACKING RADAR										
Tracking with radar, Sequential lobbing,Conical Scan,Mono-pulse Tracking Radar-Amplitude Comparison(one-and Two- Coordinates),Phase Comparison, Target Reflection Characteristics and Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns										
UNIT – IV: DETECTION THEORY WITH RADAR RECEIVER										
DETECTION THEORY: Receiver noise and signal to noise ratio, Integration of Radar Pulses, PRF and Range Ambiguities, System Losses, Matched Filter Receiver-Response Characteristics and Derivation, Correlation Function and Cross Correlation Receiver, Efficiency of Non-Matched Filter, Matched Filter with Non-white Noise										
RADAR RECIEVERS: Noise Figure and Noise Temperature, Different types of radar displays, Duplexers-Branch type and Balanced Type, Circulators as Duplexers, Introduction to Phased Array Antennas-Basic Concepts, Radiation pattern, Beam Steering and Beam Width Changes, Series versus Parallel Feeds, Applications, Advantages and Disadvantages										
UNIT – V: NAVIGATION SYSTEMS										
Fundamentals of Navigation: Defination, Importance, Historical overview of Navigation, Types of Navigation, Navigation Principles										
Navigation Systems: GNSS Navigation Systems, Regional Navigation Satellite Systems, Other Navigation Systems										
Navigation Applications: Air Navigation, Marine Navigation, Land Navigation										
Navigation Errors & Mitigation: GNSS Errors, Error Correction Methods										
LEARNING RESOURCES										
Text Books:										
1. Merrill I. Skolnik- “Introduction to Radar Systems”, TMH Special Indian Edition, 2ndEd., 2007										
2. Peebles Jr., P.Z.- “Radar Principles”, Wiley, New York, 1998										
3. G S RAO, Global Navigation Satellite Systems, McGraw-Hill,New Delhi, 2010.										
References:										
1. Richards Mark A., Scheer James A., Holm William A.- “Principles of Modern Radar: Basic Principles”, Yesdee, 2013.										
2. Edde Byron- “Radar: Principles, Technology & Applications”, Pearson Education, 2004.										
3. Skolnik Merrill I.- “Radar Handbook”, 3rd Ed., McGraw Hill Education, 2008										
4. Rajat Acharya, Understanding Satellite Navigation, Academic Press, 2014.										

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

DESIGN FOR TESTABILITY

Course Code: 22EV5T2

UNIT - I Introduction to Testing: Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing. Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT - II Logic and Fault Simulation: Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation: Compiled-Code, Event-Driven, Algorithms for Fault Simulation: Serial, Parallel, Deductive and Concurrent Fault Simulation, ATPG.

UNIT - III Testability Measures: SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT - IV Built-In Self-Test: The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per Scan BIST Systems, Circular Self-Test Path System, Memory BIST, Delay Fault BIST.

UNIT - V Boundary Scan Standard: Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATIONS ENGINEERING**

Pulse and digital circuits

SYLLABUS FOR B.TECH V SEMESTER (AR 22)

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC5T1
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To explain the complete response of R-C transient circuits. 2. To explain switching characteristics of Diode, transistors, design of Bistable multivibrator. 3. To understand the functioning of different types of time-base Generators.	On completion of the course, students will be able to 1. Understand the applications of diode as integrator, differentiator, Utilize the non-sinusoidal signals in many experimental research areas. 2. Understand the applications of diode and transistors in non-linear wave shaping circuits. 3. Learn various switching devices such as diode, transistor and Study different types of Logic families. 4. Apply the fundamental concepts of wave shaping for various signal generating circuits Multivibrators. 5. Analyze different time base generators.

CO-PO/PSO Mapping

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

UNIT-I : LINEAR WAVESHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator, double differentiator Attenuators, its applications in CRO probe.

UNIT-II: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, Transfer characteristics of clampers.

UNIT-III: SWITCHING CHARACTERISTICS OF DEVICES

Piecewise linear diode characteristics, Diode as a switch, Design and analysis of Transistor as a switch.

LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, CMOS Logic, Comparison of Logic Families.

UNIT-IV: MULTIVIBRATORS

Bistable Multivibrator: Analysis And Design of Fixed Bias, Self-Bias Bistable MultiVibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits.

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multivibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.

Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT-V: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, Methods of generating time base waveform - Exponential Sweep Circuits, constant current bias circuit, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

Learning Resources:

Text Books:

1. Millman J., Taub H. and Mothiki S., Rao Prakash- "Pulse, Digital and Switching Waveforms", 2Ed., 2008, McGraw Hill.
2. Bell David A.- "Pulse Switching and Digital Circuits", 5th edition 2015, OXFORD University Press

References:

1. Rao Venkata K, Sudha Rama K, Rao Manmadha G- "Pulse and Digital Circuits", Pearson, 2010
2. Kumar Anand A.- "Pulse and Digital Circuits", 2005, PHI.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Microprocessors and Microcontrollers Lab

SYLLABUS FOR B.TECH VI – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22ET5L1
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
- To enable the students with 8086μp 8051μc based programming with built in peripheral - MCU IDE 8051 Assembly Language programming	On completion of the course, students will be able to - Apply knowledge in writing the programs using MASM assembler tool for 8086 Microprocessor. - Interface on chip peripherals of 8051μc - Execute parallel and serial communication using 8051.

CO-PO/PSO Mapping

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

PART- A: (Minimum of 5 Experiments has to be performed)
8086 Assembly Language Programming using Assembler Directives

- Sorting.
- Multi byte addition/subtraction
- Sum of squares/cubes of a given n-numbers
- Addition of n-BCD numbers
- Factorial of given n-numbers

6. Multiplication and Division operations
7. Stack operations
8. BCD to Seven segment display CODES

PART- B: (Minimum of 3 Experiments has to be performed)
8086 Interfacing

1. Interfacing Stepper motor
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255
4. Interfacing of Keyboard Display Controller using Intel 8279
5. Hardware/Software Interrupt Application
6. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 3 Experiments has to be performed)
MCU IDE 8051 Assembly Language Programs

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segment Units
10. Digital Multi meters
11. ROM/RAM Interface module
12. Bread Board etc.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI Design Lab

SYLLABUS FOR B.TECH V SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EC5L2
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To perform VLSI design of CMOS circuits using EDA Tools.	On completion of the course, students will be able to 1. Demonstrate the knowledge of digital circuit designflow. 2. Analyse the process of simulation of combinational sequential circuits. 3. Validate and demonstrate the results of digital circuits.

CO-PO/PSO Mapping

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

List of Experiments:

1. Design and Implementation of Universal Gates.
2. Design and Implementation of CMOS Inverter.
3. Design and Implementation of Full Adder.
4. Design and Implementation of Full Subtractor.
5. Design and Implementation of Decoder.
6. Design and Implementation of RS-Latch.
7. Design and Implementation of D-Latch.
8. Design and Implementation asynchronous counter.
9. Design and Implementation SRAM cell.

Additional Experiments:

1. Design and Implementation of ring oscillator
2. Design and Implementation of differential amplifier
3. Design and Implementation of R-2R Ladder DAC.

Software Required:

1. Mentor Graphics Software / Equivalent Industry Standard Software.
2. Personal computer system with necessary software to run the programs and to implement.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Constitution of INDIA

SYLLABUS FOR B.TECH V SEMESTER

L:T:P (Hrs./week): 2:0:0	SEE Marks : 00	Course Code: 22EC5MC1
Credits : 2	CIE Marks : 00	Duration of SEE : 0 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective 2 To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism 3 To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution	On completion of the course, students will be able to 1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics 2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. 3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. 4 Discuss the passage of the Hindu Code Bill of 1956

UNIT-I :

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble, Salient Features

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women

LEARNING RESOURCES

Text Books:

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

Department : ELECTRONICS AND COMMUNICATION ENGINEERING					Programme: B. Tech. (ECE)						
					Regulation : AR-22						
Subject Code	22EA6T1				Hours / Week		Credit	Maximum Marks			
Subject	OPTICAL FIBER COMMUNICATION				L	T	P	C	IM	EM	TM
Year & Sem	IV B Tech I Semester				3	1	0	3	30	70	100
Prerequisite	Basic Knowledge of Microwave Devices, Semiconductor Physics										
Objectives	The properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.										
	the principles of single and multi-mode optical fibers and their characteristic.										
	Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems										
	The models of analog and digital receivers with power budget calculations.										
Outcomes	At the end of this course the student can able to:										
	Measure the basic parameter calculations of optical fiber.										
	Able to measure the different fiber losses for different optical fiber with all fiber materials.										
	Analyze different optical sources and detector for optical fiber communication.										
	Choose the proper connector for optical fiber with point to point links.										
	Calculate the fiber power for optical fiber.										
UNIT – I: INTRODUCTION											
Overview of optical fiber communication, Historical development, general system, advantages and applications of optical fiber communications, Optical fiber wave guides- Introduction, types of rays, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, 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 – II: FIBER LOSSES											
Fiber materials: - Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems											
UNIT – III: OPTICAL SOURCES											
Optical sources- Direct and indirect Band gap materials, LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED & ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems											
UNIT – IV: FIBER CONNECTOR & OPTICAL SYSTEM DESIGN											
FIBER CONNECTOR: Optical fiber Connectors-Preparation of optical fiber for connection, Connector types, lensing schemes ,Connector return loss, Fiber Splicing- Splicing techniques, Fiber misalignment and joint loss- Multimode fiber joints, single mode fiber joints											
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											
UNIT – V: FIBER POWER											
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											
LEARNING RESOURCES											
Text Books:											
1. Keiser Gerd- “Optical Fiber Communications”, Mc Graw-Hill International edition, 3rd Edition, 2000											
2. Senior John M.- “Optical Fiber Communications”, PHI, 2nd Edition, 2002											
3. Agarwal Govind P.- “Fiber Optic Communication Systems”, John Wiley, 3rd Ediition, 2004.											
References:											
1. Senior John M.- “Optical Fiber Communication Principles and Practice”, Pearson Publication, 3rd Edition, 2015.											
2. Mynbaev D.K., Gupta S.C. and Scheiner Lowell L.- “Fiber Optic Communications”, Pearson Education,2005.											
3. Gupta S.C.- “Text Book on Optical Fiber Communication and its Applications”, PHI, 2005											
4. Palais Joseph C.- “Fiber Optic Communications”, 4th Edition, Pearson Education, 2004											

IC APPLICATIONS

Course Code: 22EC6T2

REGULATIONS: AR-22

L	T	P	C
3	0	0	3

ABOUT THE COURSE:

The objective of this course is to impart thorough understanding of operational amplifiers. After completing this course, the students would be able to design and implement various signal conditioning operations involved in instrumentation, signal processing and communication systems.

PREREQUISITES: Electronic Devices and Circuits, Basic Circuit Theory

INDUSTRY SUPPORT: All Analog VLSI industries

COURSE OUTCOMES: At the end of the Course the student shall be able to

- CO1** Understand the basic building blocks of Op-Amp.
- CO2** Illustrate DC and AC performance characteristics of Op-Amp.
- CO3** Analyze linear and non-linear applications of Op-Amp.
- CO4** Analyze the operation & characteristics of data converters.
- CO5** Examine various 74XX ICs.

UNIT-I

12 Lectures

OPERATIONAL AMPLIFIER

Block diagram of Op-Amp, equivalent circuit, Op-Amp Characteristics (ideal and practical) – DC and AC Characteristics, open and closed loop configurations- Inverting, Non-Inverting, Differential Amplifier.

Learning outcomes: At the end of this unit, the student will be able to

1. understand ideal and practical Op-Amps (L2)
2. understand internal blocks and characteristics of Op-Amp (L2)
3. understand performance of Op-Amp in open loop and closed loop configurations (L2)

UNIT-II

12 Lectures

APPLICATIONS OF OP-AMP

Summing, scaling and averaging amplifiers, V-I and I-V converters, Differentiators and Integrators, Comparators, Schmitt Trigger, **Waveform Generators:** Triangular and Square wave, **Active filters:** Design of First order active Low-pass and high pass filters, Band pass, Band stop and All Pass Filters.

Learning outcomes: At the end of this unit, the student will be able to

1. illustrate the amplifiers using Op-Amp (L3)
2. demonstrate waveform generators using Op-Amp (L3)
3. determine the output equations for each application of an Op-Amp (L3)

UNIT-III

14 Lectures

IC APPLICATIONS

Specialized IC applications: **555 Timer:** Block Schematic, Functional Diagram, Description of Individual Blocks & Applications, Monostable and Astable Operations, Introduction to VCO and PLL. **Voltage Regulators:** Introduction, IC voltage regulators, 723 general purpose regulators.

Learning outcomes: At the end of this unit, the student will be able to

1. understand the operation of Op-Amp based filters (L2)
2. describe internal circuit operation of 555 timer (L2)
3. Demonstrate voltage regulator using Op-Amp. (L3)

UNIT-IV

10 Lectures

DATA CONVERTERS

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

Learning outcomes: At the end of this unit, the student will be able to

1. explain operation principles of different A/D & D/A converters (L2)
2. demonstrate different types of A /D & D/A converter circuits (L3)
3. evaluate ADC & DAC specifications to select the right converter for an application (L4)

UNIT-V

12 Lectures

COMBINATIONAL & SEQUENTIAL LOGIC DESIGN

Combinational Logic Design: Decoder(74x138), Priority Encoder(74x148), Multiplexer(74x151), Sequential Logic Design: D flip-flop (IC7474), JK Flip-flop(IC7476), shift register using IC7474, Universal shift Register(IC74X194), synchronous counters using flip-flops, Decade counter using IC 7476 .

Learning outcomes: At the end of this unit, the student will be able to

1. describe internal circuit operation of different Combinational ICs (L2)
2. demonstrate Sequential circuits using 74XX ICs (L3)
3. describe Flip-flops & their conversions (L2)

TEXT BOOKS:

1. Ramakanth A. Gayakwad, *Op-Amps & Linear ICs* , 4th Edition , Pearson, 2017.
2. Wakerly J.F. *Digital Design: Principles and Practices*, 4th Edition, Pearson India, 2008.

REFERENCES:

1. D. Roy Choudhury, *Linear Integrated Circuits*, 2nd Edition, New Age International Private Limited, 2003.
2. R. P. Jain, *Modern Digital Electronics*, McGraw Hill Education (India Private Limited), 4th edition, 2012.
3. Sergio Franco, *Design with Operational Amplifiers & Analog Integrated Circuits*, 3rd edition, McGraw Hill, 1988.
4. Gray and Meyer, *Analysis and Design of Analog Integrated Circuits* , Wiley International, 2005.

SUBJECT EXPERT	HEAD OF THE DEPARTMENT	BOS MEMBER-1	BOS MEMBER-2

With effect from the academic year 2022-23

AMRITA SAI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A' GRADE
PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

ANTENNA and Microwave Engineering

SYLLABUS FOR B.TECH VI SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC6T3
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis. 2. Learn the basic fundamentals of microwave theory with detailed analysis. 3. Measure the S-Matrix of microwave devices	On completion of the course, students will be able to 1. Summarize the basic concepts of antenna parameters. 2. Use the concept of electromagnetic theory for design of various antennas and able to design microstrip antennas for various applications. 3. Design antenna array systems. 4. Apply the knowledge of microwave physics for different microwave devices. 5. Able to measure S-matrix for microwave devices

UNIT-I : ANTENNA BASICS AND DIPOLE ANTENNA

ANTENNA BASICS: Introduction, Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Related Problems.

Quarterwave Monopole and Half-wave Dipole & Loop Antennas – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Directivity, Effective Area and Effective Height. Illustrative Problems. - Introduction, Small Loop, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment). Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics,

UNIT-II: VHF, UHF AND MICROWAVE ANTENNAS

Helical Antennas - Helical geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna

Horn Antennas - Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns

Microstrip Antennas - Introduction, Rectangular Patch Antennas - Geometry and Parameters, Characteristics of Microstrip Antennas. **Paraboloidal Reflectors** - Geometry, Pattern Characteristics, Feed Methods, Reflector Types - Related Features, Log Periodic array antenna

UNIT-III: ANTENNA ARRAYS

Point Sources - Definition, Pattern, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Broadside Arrays, Endfire Arrays, BSAs with Non-uniform Amplitude Distributions - General Considerations and Binomial Arrays, Illustrative Problems..

UNIT-IV: MICROWAVE THEORY, TUBES

MICROWAVE INTRODUCTION: Applications of Microwave, General solution for TEM, TE and TM waves, Parallel plate waveguide, and rectangular waveguide, Wave guide parameters, .

Microwave Tubes: Limitations and Losses of conventional Tubes, Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Power Output, Efficiency, Magnetrons –Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Gunn Diodes – Principle, RWH Theory, Modes of Operation - Gunn Oscillation Modes,

UNIT – V: SCATTERING MATRIX

Waveguide Attenuators – Different Types, Waveguide Multiport Junctions - E plane and H plane Tees. Scattering Matrix Properties, Directional Couplers – 2 Hole, s-matrix of Magic Tee and Circulator.

LEARNING RESOURCES

Text Books:

1. Kraus John D., Marhefka R. J., and Khan Ahmad S.- “Antennas for All Applications”, TMH, New Delhi, 4th ed., (Special Indian Edition) 2010.
2. Jordan E.C. and Balmain K.G.- “Electromagnetic Waves and Radiating Systems”, PHI, 2nd ed., 2000
3. Liao Samuel Y.- “Microwave Devices and Circuits”, Pearson, 3rd Edition, 2003

References:

1. Balanis C.A.- “Antenna Theory” John Wiley & Sons, 3rd ed., 2005.
2. Prasad K.D.- “Antennas and Wave Propagation”, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Pozar David M.- “Microwave Engineering”, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3r ed., 2011 Reprint
4. Raghuvanshi G.S.- “Microwave Engineering”, Cengage Learning India Pvt. Ltd., 2012
5. Das Annapurna, Das Sisir K- “Microwave Engineering”, TMH Publication, 2nd, 2010.

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PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING**Digital Image and Video Processing**

(Professional Elective)

SYLLABUS FOR B.TECH

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EA6T4E
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Students will gain knowledge on Digital Image and Video Processing techniques.	On completion of the course, students will be able to 1. Describe the basic concepts of Image Processing 2. Apply spatial and Frequency transform domain techniques to process images 3. Analyze different color modeling and restoration techniques 4. Analyze different morphological Image processing Techniques. 5. To understand the Basic Steps of Video Processing

CO-PO/PSO Mapping

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

UNIT - I:

Fundamentals of Image Processing and Image Transforms:- Introduction to digital image processing,

Fundamental steps in digital image processing, components of an image processing system, Image sensing and acquisition, Representing digital images, Some basic relationships between pixels

Need for Image transforms, DFT with one variable and two variables, Properties of 2D Discrete Fourier transform, Basics of intensity transformations and spatial filtering.

UNIT - II:

Image Processing Techniques: Image Enhancement, Spatial Domain methods: Histogram Processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening Spatial filters.

Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening.

Image Restoration: Degradation Model, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration

UNIT - III:

Color image processing: Color fundamentals, color models, pseudo color image processing, and basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color

UNIT - IV:

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, The Hit or miss transformation, Some basic morphological algorithms, Gray scale morphology, Some basic gray scale morphological algorithms.

UNIT - V:

Basic Steps Of Video Processing: Analog video, Digital video, Time varying image formation model, Geometric image formation, formation, sampling of video signal.

Learning Resources:

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata McGraw-Hill Education, 2011.
3. Video Processing and Communications Yao Wang, Jorn stermann, and Ya-QinZhang Prentice Hall, 2002 (Published September 2001).

REFERENCE BOOKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Online Resources:-

1. <https://nptel.ac.in/courses/117/105/117105135/>
2. <https://nptel.ac.in/courses/117/105/117105079/>

Syllabus

UNIT - I:

Fundamentals of Image Processing and Image Transforms:- Introduction to digital image processing, Fundamental steps in digital image processing, components of an image processing system, Image sensing and acquisition, Representing digital images, Some basic relationships between pixels
Need for Image transforms, DFT with one variable and two variables, Properties of 2D Discrete Fourier transform, Basics of intensity transformations and spatial filtering.

UNIT - II:

Image Processing Techniques: Image Enhancement, Spatial Domain methods: Histogram Processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening Spatial filters.
Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening.
Image Restoration: Degradation Model, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration

UNIT - III:

Color image processing: Color fundamentals, color models, pseudo color image processing, and basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color

UNIT - IV:

Basic Steps Of Video Processing: Analog video, Digital video, Time varying image formation model, Geometric image formation, formation, sampling of video signal

UNIT - V:

Introduction to Machine learning: History of Machine Learning, Types of Machine Learning, Applications of Machine Learning, Supervised Learning: Linear Regression, Logistic Regression, Decision Trees, Random Forests, Support Vector Machines (SVM) Unsupervised Learning: K-means clustering, Hierarchical Clustering
Future of Machine Learning

Learning Resources:

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata McGraw-Hill Education, 2011.
3. Video Processing and Communications Yao Wang, Jorn stermann, and Ya-QinZhang Prentice Hall, 2002 (Published September 2001).

REFERENCE BOOKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009..
3. Bhagirath Bhatt, Anjali Sandep Gaikwad, G uganya "The Fundamentals of Machine Learning " Lap

Lambert Academic Publicating

Online Resources:-

1. <https://nptel.ac.in/courses/117/105/117105135/>
2. <https://nptel.ac.in/courses/117/105/117105079/>

Department : ELECTRONICS AND COMMUNICATION ENGINEERING					Programme: B. Tech. (ECE)						
					Regulation : AR-22						
Subject Code	22EC6T4B				Hours / Week		Credit	Maximum Marks			
Subject	DIGITAL IC DESIGN				L	T	P	C	IM	EM	TM
Year & Sem	III B Tech II Semester				3	1	0	3	30	70	100
Prerequisite	Basic Knowledge of Analog Electronics, VLSI										
Objective	To understand the MOS Design.										
	To study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.										
	To motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications										
Outcome	At the end of this course the student can able to:										
	Design basic CMOS inverter.										
	Analyze the concept of Combinational & Sequential MOS circuits.										
	Design dynamic logic circuits.										
	Understand various interconnect techniques										
UNIT – I: MOS Design											
Basic Electrical Properties of MOS circuits, MOS transistor threshold voltage, MOS switch and inverter, sheet resistance and area capacitances of layers, wiring capacitances; Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, CMOS Inverter logic.											
UNIT – II: COMBINATIONAL MOS LOGIC CIRCUITS											
MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.											
UNIT – III: SEQUENTIAL MOS LOGIC CIRCUITS											
Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip flop. Dynamic, Short Circuit and Leakage power – Stacking Effect, Asymmetric gate, Skewed gates, Multipliers – Signed and Unsigned arithmetic, Carry Save Multiplier implementation											
UNIT – IV: DYNAMIC LOGIC CIRCUITS											
Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits. Gate sizing and Buffering											
UNIT – V: SEMICONDUCTOR MEMORIES											
Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.											
LEARNING RESOURCES											
Text Books:											
1. Rabaey Jan M., Chandrakasan Anantha, Nikolic Borivoje-“Digital Integrated Circuits – A Design Perspective”- 2nd Ed., PHI.											
2. Martin Ken-“Digital Integrated Circuit Design”, Oxford University Press, 2011.											
References:											
1. Kang Sung-Mo, Leblebici Yusuf-“CMOS Digital Integrated Circuits Analysis and Design” – TMH, 3rd Ed., 2011.											
2. Weste Neil H.E, Harris David, Banerjee Ayan-“CMOS VLSI Design”-3rd Edition, Pearson											

Note: The Question paper shall have **two** sections:

- **Section A** shall consist of one question with 5 sub-questions of two (02) marks each.
- **Section B** shall consist of five questions with internal choice of ten (10) marks each, out of which five questions are required to be attempted by the candidate.

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Global Positioning System

(Professional Elective-I)

SYLLABUS FOR B.TECH VI – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC6T1C
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To study basics of mathematics and science related to GNSSconstellations 2 To understand the different coordinates for representation user position. 3 To study the different errors of GPS 4 To understand the GPS data formatsfor use of different applications 5 To acquire the knowledge of augmentation systems.	On completion of the course, students will be able to 1 Apply the knowledge of basic mathematics and science to understand the different GNSS constellations 2 Use of different coordinate systems used in user position estimation 3 Identifying the various errors of GPS. 4 Interpret the GPS data for different applications. 5 Importance of augmentation systems in various diversified applications.

CO-PO/PSO Mapping

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

UNIT - I :

GPS Fundamentals: GPS Applications , GPS Constellation, Principle of operation, GPS Orbits, Orbital mechanics and satellite position determination, Time references, Geometric Dilution of Precision: Geometrical dilution of Precision, Vertical dilution of precision, Position dilution of precision.

UNIT - II :

Coordinate Systems and errors: Geometry of ellipsoid, geodeticreference system. Geoid, Ellipsoid, Global and Regional datum, World

geodetic system- 84, Different coordinate systems, Various error sources in GPS: Satellite and receiver clock errors, Ephemeris error, Atmospheric errors, Receiver measurement noise and User Equivalent Range Error.

UNIT - III :

GPS measurements: GPS signal structure, C/A and P-codes, Code and carrier phase measurements, position estimation with pseudo range measurements, Spoofing and anti spoofing, GPS navigation and observation data formats.

UNIT - IV :

GPS Augmentation systems: Code-based and carrier based Differential GPS(DGPS) Techniques, DGPS errors, Wide area augmentation system-architecture, GAGAN, Local area augmentation system concept.

UNIT - V :

GPS Modernization and other satellite navigation systems: Future GPS satellites, New signals and their benefits, Hardware and Software improvements, GPS integration – GPS/Geo Information System, GPS/Inertial Navigation System, GPS/pseudolite, GPS/cellular, GLONASS, Galileo System.

Learning Resources:

- 1 Pratap Misra and Per Enge, "Global Positioning System Signals, Measurement, and Performance," Ganga- Jamuna Press, 2/e, Massachusetts, 2010.
- 2 G.S.Rao, Global Navigation Satellite Systems, Tata Mc Graw-Hill, 2010.
- 3 Satheesh Gopi, "Global positioning system: Principles and Application", TMH, 2005.
- 4 B.Hofmann-Wellenhopf, H.Lichtenegger, and J.Collins, "GPS Theory and Practice," Springer Verlag, 2008.
- 5 Bradford W.Parkinson and James J. Spilker, "Global Positioning System: Theory and Application," Vol.II, American Institution of Aeronautics and Astronautics Inc., Washington, 1996.
- 6 <https://nptel.ac.in/syllabus/105107062/>

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PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

DSP Processors and Architectures

(Professional Elective-I)

SYLLABUS FOR B.TECH VI – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC6T2E
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To give an exposure to the fixed point point DSP architectures and to implement various signal processing algorithms using TI DSPs.	On completion of the course, students will be able to 1 Differentiate between DSP Processors and General Purpose processors. 2 Apply different number formats on DSP processors 3 Understand the architecture details of fixed point & floating point DSPs. 4 Illustrate the features of on-chip peripherals and its interfacing with DSP processors. 5 Design and implement signal processing algorithms on DSP processors.

CO-PO/PSO Mapping

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

UNIT - I : Number Format Representation and Source of Errors

Introduction, Digital signal processing system, Differences between DSP and other micro processor architectures. Fixed point, Floating point and block Floating point formats, IEEE-754 Floating point, Dynamic range and precision, Sources of error in DSP implementations, A/D Conversion errors, D/A Conversion Errors, Q-notation.

UNIT - II : Architectures for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Special addressing modes, Address Generation Unit, Programmability and Program Execution, Speed Issues, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects.

UNIT - III : 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.

UNIT - IV : Floating point DSPs

Types of Floating point DSPs, Features of TMS320C67XX Processors, Architecture of 'C67X Processor-CPU, General Purpose Registers files, Functional Units and Operation, Data paths, Control Register File, Addressing modes-Register, Linear & Circular addressing modes, Instructions set-Fixed and Floating point instructions, Pipelining and on-chip peripherals.

UNIT - V : Implementations of Basic DSP Algorithms & Interfacing of 'C54xx

FIR Filters, IIR Filters, 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 Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example, An Image Processing System.

Learning Resource:

1. Avtar Singh, S. Srinivasan "Digital Signal Processing Implementations: Using DSP Microprocessors--With Examples from TMS320C54xx", Cengage Learning (2004)
2. B. Venkataramani, M. Bhaskar, "Digital Signal Processors, Architecture Programming and Applications", Tata Mc Graw Hill, 2013.
3. Lapsley et al. "DSP Processor Fundamentals, Architectures & Features", S. Chand & Co, 2000.
4. Rulph Chassaing, "Digital Signal Processing and Applications with the C6713 and C6416 DSK", John Wiley & sons, 2005.
5. Digital Signal Processing: A practical approach, Ifeachor E. C., Jervis B. W Pearson Education, PHI/ 2002
6. "Architectures for Digital Signal Processing", Peter Pirsch John Wiley, 2007.
7. Jonatham Stein, "Digital Signal Processing", John Wiley, 2005.
8. <https://nptel.ac.in/courses/108102045/8>

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

ARDUINO Programming Lab

SYLLABUS FOR B.TECH IV – SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EA6L1
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To Prepare the students to familiarize students with Arduino as IDE, programming language & platform	1. Perform basic programming on electronic components like LED, LCD etc. 2. Measure rotation and temperature measurement 3. Design security system for different applications. 4. Measure soil moisture control.

LIST OF EXPERIMENT (MINIMUM 12 EXPERIMENT)

CYCLE - I Experiments

1. Electrical Circuit by using ARDUINO UNO
2. Blinking LED
3. LED Intensity Control
4. Relay Control
5. 16 x 2 LCD Display
6. Rotation Measurement
7. Voice Operated ON/OFF control circuit.

CYCLE - II Experiments

8. Ultra Sonic Distance Measurement
9. Speed Control of Hybrid Vehicles using PWM Technique
10. Drunk and Drive Detection
11. Temperature Measurement
12. Women Security System using GPS & GSM
13. Soil Moisture Control
14. Auto Intensity controlled LED

New / Additional experiments planned

1. LED Blinking of 25 times
2. Theft Alarm Circuit
3. IoT based Light Monitoring System
4. GSM pollution monitoring
5. Thermistor

Equipments

1. Computer
2. ARDUINO IDE version 2.3.3

AMRITA SAI INSTITUTE OF SCIENCE AND TECHNOLOGY

(AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A' GRADE

PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Integrated Circuit Applications Lab

SYLLABUS FOR B.TECH VI SEMESTER

L:T:P (Hrs./week): 0:0:3	SEE Marks : 35	Course Code: 22EC6L2
Credits : 1.5	CIE Marks : 15	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Students will Design and verify circuits using IC's for the given specifications.	On completion of the course, students will be able to 1. Implementing and Testing Various Op-Amp based circuits. 2. Design and verify the combinational and sequential circuits. 3. Examine the performance of various filters and 555 timer Applications. 4. Design & verify regulator using IC 78XX,79XX for given specifications.

CO-PO/PSO Mapping

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

CYCLE - I Experiments

1. Measurement of parameters of Op-Amp. Voltage Follower, Inverting and Non Inverting Amplifiers, Level Translators using Op-Amp.
2. Arithmetic Circuits: Summer, Integrator Differentiator Op-Amp.
3. Active filters: LP, HP -1st order using Op-Amp.
4. Triangle and Square wave Generator using Op-Amp.
5. IC Regulators – IC 7805, IC 7809, IC 7812.
6. Astable multivibrator using IC 555 Timer.

CYCLE – II

The following experiments are to be simulated using VHDL/ Verilog Software

1. Full adder, Full subtractors
2. 3 to 8 Decoder -74138
3. 8 x 1 Multiplexer-74151
4. 4- Bit comparator-7485

5. D Flip-Flop-7474
6. Decade counter -7490

General Note:

1. At least 5 experiments from each part.
2. A total of not less than 10 experiments must be carried out during the semester.

New / Additional experiments planned:

1. Design and implement a RC phase shift oscillator using IC 741 for any given frequency.
2. Design and implement Pseudo random sequence generator using IC7495 shift register.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components: IC 741, IC 555, IC7805, IC 7809, IC 7912 and other essential components.
8. Analog IC Tester

Software required:

1. Xilinx Vivado software / Equivalent Industry Standard Software
2. Personal computer system with necessary software to run the programs and Implement.

Department : ELECTRONICS AND COMMUNICATION ENGINEERING						Program: B. Tech. (ECE)						
						Regulation : AR-20						
Subject Code	20EC6L3					Hours / Week		Credit	Maximum Marks			
Subject	ANTENNA DESIGN AND MICROWAVE ENGINEERING LAB					L	T	P	C	IM	EM	TM
Year & Sem	III B Tech II Semester					0	0	3	1.5	15	35	50
Prerequisite	Basic knowledge of co-ordinate systems											
Objectives	To understand the measurement of antenna parameters											
	To design printed antenna using antenna simulation software											
	To understand characteristics of reflex klyatron and gunn diode											
	To understand the measurement of S-parameters											
Outcomes	At the end of this course the student can able to:											
	Design the slotted microstrip antenna											
	Measure the radiation pattern for different antenna											
	Measure the characteristics of reflex klyatron and gunn diode											
	Calculate the S-parameters.											

List of experiments: (Minimum 10 experiments to be conducted)

PART-A (HARDWARE PART): [Minimum 6 experiments to be conducted]

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. VSWR Measurement
4. Scattering parameter of E-Plane
5. Scattering parameter of H-Plane
6. Scattering parameter of Magic Tee
7. Scattering parameter of Circulator
8. Radiation pattern measurement for different types of antennas

PART-B (SOFTWARE PART): [Minimum 4 experiments to be conducted]

The following experiments are to be simulated using IE3D/HFSS Softwares

1. Design and measurement of Basic rectangular & circular Microstrip antenna radiation pattern
2. Design of antenna by using different feeding methods
3. Design of slotted Antenna with calculation of size reduction factor
4. Design of 2 element array microstrip antenna and measure its Bandwidth and Polarization
5. VSWR Measurement of microstrip antenna

Equipment required for Laboratories:

1. Reflex Klystron Microwave Bench Setup
2. Gunn Diode Microwave Bench Setup
3. Microwave Components: E-Plane Tee, H-Plane Tee, Magic Tee, Circulator, Directional Coupler, Attenuator
4. Horn Antenna
5. Antenna Trainer Kit/System- Scientech 2262A

Software required:

1. MoM based IE3D Software / HFSS Software/Equivalent Industry Standard Software
2. Personal computer system with necessary software to run the programs and Implement.

Department : ELECTRONICS AND COMMUNICATION ENGINEERING					Programme: B. Tech. (ECA)						
					Regulation : AR-22						
Subject Code	22EA7T1B				Hours / Week		Credit	Maximum Marks			
Subject	MULTICARRIER COMMUNICATION SYSTEMS				L	T	P	C	IM	EM	TM
Year & Sem	IV B Tech I Semester				3	1	0	3	30	70	100
Prerequisite	Basic Knowledge of Communication and Multiplexing Techniques										
Objectives	To provide an overview of OFDM and wireless channel characteristics										
	To understand the basic concepts of synchronization and channel impairment in OFDM										
Outcomes	At the end of this course the student can able to:										
	Understand the basics of OFDM and wireless channel characteristics										
	Learn the concepts of synchronization and channel impairment in OFDM										
UNIT – I: INTRODUCTION											
Multi carrier and OFDM system fundamentals, OFDM system model, Single carrier communication, Comparison with other multi carrier modulation scheme, Channel capacity											
UNIT – II: SPECTRUM OF OFDM											
FFT implementation, Power spectrum, Impairments of wireless channels to OFDM signals, Synchronization in OFDM, Timing and Frequency Offset in OFDM, Synchronization & system architecture											
UNIT – III: OFFSET ESTIMATION & CHANNEL ESTIMATION											
OFFSET ESTIMATION: Timing and Frequency Offset estimation, Pilot and Non pilot based methods, Joint Time & Frequency Offset estimation											
CHANNEL ESTIMATION: Channel Estimation in OFDM systems, Differential and Coherent detection, and Pilot symbol aided estimation, Block type and Comb type pilot arrangement											
UNIT – IV: MIMO CHANNEL ESTIMATION											
Decision directed channel estimation, MMSE estimation using time and frequency domain, correlation, MIMO channel estimation- basic concepts, Concepts of Time and Frequency domain equalization											
UNIT – V: PROPERTIES OF OFDM											
Clipping in Multi carrier systems, Power amplifier non linearity, Error probability analysis, Performance in AWGN channel, PAPR properties of OFDM signals, PAPR reduction techniques with signal distortion, Techniques for distortion less PAPR reduction, Selective mapping and Optimization techniques											
LEARNING RESOURCES											
Text Books:											
1. Stuber Y. Li. G.- “OFDM for Wireless Communication”, Springer, 2006											
2. Prasad R.- “OFDM for Wireless Communication”, Artech House, 2006											
References:											
1. Bahai Ahmad R.S., Saltzberg B.R., Ergen M.- “ Multi carrier Digital Communications Theory and Applications of OFDM”, Second Edition, Springer											

Note: The Question paper shall have **two** sections:

- **Section A** shall consist of one question with 5 sub-questions of two (02) marks each.
- **Section B** shall consist of five questions with internal choice of twelve (12) marks each, out of which five questions are required to be attempted by the candidate.

Department : ELECTRONICS AND COMMUNICATION ENGINEERING				Programme: B. Tech. (ECA)						
				Regulation : AR-22						
Subject Code	22EA7T3B			Hours / Week		Credit	Maximum Marks			
Subject	SATELLITE COMMUNICATION			L	T	P	C	IM	EM	TM
Year & Sem	IV B Tech I Semester			3	1	0	3	30	70	100
Prerequisite	Basic Knowledge of Communication Systems									
Objectives	Prepare students to excel in basic knowledge of satellite communication principles									
	Provide students with solid foundation in orbital mechanics and launches for the satellite communication									
	Train the students with a basic knowledge of link design of satellite with a design examples									
	Provide better understanding of multiple access systems and earth station technology									
	Prepare students with knowledge in satellite navigation and GPS & and satellite packet communications									
Outcomes	At the end of this course the student can able to:									
	Understand the historical background, basic concepts and frequency allocations for satellite communication									
	Exhibit orbital mechanics, launch vehicles and launchers									
	Demonstrate the design of satellite links for specified C/ N with system design examples.									
	Visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems and Understand the various multiple access systems for satellite communication systems and satellite packet communications									
	Gain knowledge about satellite navigation system with GPS technology									
UNIT – I: COMMUNICATION SATELLITE										
Orbit and Description: A Brief history of satellite Communication, Satellite Frequency Bands, Satellite Systems, Applications, Orbital Mechanics and Launchers: Orbital Mechanics, Look Angel Determinations, Orbital Period and Velocity, effects of Orbital Inclination, Coverage angle and slant Range, Eclipse, Orbital Perturbations, Placement of a Satellite in a Geo-Stationary orbit. Orbital Determination, Launches and Launch Vehicles, Orbital Effects in Communication Systems Performance, Future Trends of Satellite Communications										
UNIT – II: SUB-SYSTEMS AND LINK DESIGN										
Satellite Sub-Systems: Attitude and Orbit Control system, TT & C subsystem, Attitude Control subsystem, Power systems, Communication sub-systems, Satellite Antenna Equipment, Equipment Reliability and Space Qualification.										
Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic UP/DOWN Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use), Link Budget										
UNIT – III: PROPAGATION EFFECTS AND MULTIPLE ACCESS										
Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.										
Multiple Access: Frequency Division Multiple Access (FDMA) – Inter-modulation, Calculation of C/N, Time Division Multiple Access (TDMA) - Frame Structure, Burst Structure, Satellite Switched TDMA, On-board Processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception										
UNIT – IV: LEO, GEO WITH SATELLITE PACKET SYSTEMS										
LOW EARTH ORBIT: Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.										
GEO-STATIONARY SATELLITE SYSTEMS: Orbit Considerations Coverage and Frequency Consideration, Delay and Throughput Considerations, Systems Considerations, Operational NGSO Constellation Designs										
SATELLITE TRANSMISSION: Packet Communications: Message Transmission by FDMA: M/ G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm										
UNIT – V: SATELLITE NAVIGATION AND GLOBAL POSITIONING SYSTEM										
Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS										
LEARNING RESOURCES										
Text Books:										
1. Pratt Timothy, Bostian Charles, Allnutt Jeremy- "Satellite Communications", 2nd Edition, 2003, John Wiley & Sons.										
2. Pritchard Wilbur L., Nelson Robert A. and Suyderhoud Heuri G.- "Satellite Communications Engineering", 2nd Ed., Pearson Publications										
3. Ha Tri.T.- "Digital Satellite Communications", 2nd Edition, 1990, Mc.Graw Hill										
References:										
1. Roddy Dennis- "Satellite Communications", 2nd Edition, 1996, McGraw Hill.										

2. Richcharia M.- "Satellite Communications: Design Principles", 2nd Ed., BSP, 2003.
3. Rao Raja K. N.- "Fundamentals of Satellite Communications", PHI, 2004
4. Agarwal D.C.- "Satellite Communications", khanna Publications,5th Edition

Note: The Question paper shall have **two** sections:

- **Section A** shall consist of one question with 5 sub-questions of two (02) marks each.
- **Section B** shall consist of five questions with internal choice of ten (10) marks each, out of which five questions are required to be attempted by the candidate.

Course Code 22EC7T2A	Wireless Mobile Communication	L	T	P	C
	Maximum expected contact hours : 64	3	1	--	3
	Prerequisites : Fundamentals of <i>Communication Systems</i>				
PURPOSE: students will understand the mobile technologies and communications					
INSTRUCTIONAL COURSE OBJECTIVES					
1	To understand the basic cellular system concepts				
2	To have an insight into the various propagation models and the speech coders used in mobile communication.				
3	To understand the multiple access techniques and interference reduction techniques in mobile communication.				
COURSE OUTCOMES :					
1	Discuss cellular radio concepts.				
2	Identify various propagation effects				
3	Acquire knowledge of mobile system specifications				
4	Classify multiple access techniques in mobile communication.				
5	Analyze various methodologies to improve the cellular capacity.				

UNIT I: BASICS OF ANALOG CELLULAR SYSTEMS:

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells.

ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN:

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT II: CHANNEL INTERFERENCE AND CELL COVERAGE

INTERFERENCE: Introduction to Co -Channel Interference, real time Co-Channel interference, Adjacent-Channel measurement, Antenna parameters and their effects, non co-channel interference- different types.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, and near and long distance propagation antenna height gain, form of a point to point model.

UNIT III: HAND-OFF AND BASICS OF DIGITAL CELLULAR SYSTEMS

HAND-OFF: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, Handoff, types of handoff , dropped calls and cell splitting.

2G-NETWORK: GSM, GSM Architecture, GSM channel and channel modes, multiple access schemes, channel coding and Interleaving

UNIT IV: DIGITAL CELLULAR SYSTEMS APPLICATION

CDMA: Terms of CDMA, Modulation Characteristics, Call Processing

GPRS: GPRS, GPRS architecture, GPRS network architecture, GPRS transmission plane & signaling plane, GPRS traffic performance.

UNIT –V: B2G SYSTEMS WITH 3G TECHNOLOGY

B2G SYSTEMS: EDGE: network architecture, network control, HSCSD: iDEN.

3G Technology: UMTS architecture, description, WCDMA, CDMA2000 - architecture, bandwidth requirement, characteristics

TEXTBOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES:

1. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Mobile Cellular Communication – G Sasibhushana Rao Pearson
4. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
5. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

Department : ELECTRONICS AND COMMUNICATION ENGINEERING				Programme: B. Tech. (EVT & ECA)				
				Regulation : AR-22				
Subject Code	22EC7T3E			Hours / Week		Credit	Maximum Marks	
Subject	IOT ARCHITECHTURE & PROTOCOL			L	T	P	C	IM
Year & Sem	VII B Tech I Semester			3	1	0	3	70
Prerequisite	Basic Knowledge of IOT device, architecture & communication models							
Objectives	Understand IoT applications and IoT Architectures.							
	Learn about IIoT devices and event driven analysis							
	Understand and analyze IoT.							
	Understand safety and security testing of IoT systems							
Outcomes	At the end of this course the student can able to							
	Demonstrate the revolution of internet in mobile and cloud.							
	Examine the architecture and operation of IoT.							
	Explore various tools and programming paradigms for IoT applications.							
	Develop an IoT prototype for real time scenario.							
Use IoT Data Link Layer, Network Layer IoT, Transport & Session Layer Protocols								
UNIT – I: THE IOT LANDSCAPE								
Definition of IoT, Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems.								
IoT System Architectures: Introduction, Protocols Concepts, IoT oriented Protocols, Databases, Time Bases, Security.								
UNIT – II: IOT- AN ARCHITECTURAL OVERVIEW & ARCHITECTURE-STATE OF THE ART								
IoT- An Architectural Overview: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.								
IoT Architecture-State of the Art: Introduction, State of the art, Reference Model and architecture,								
IoT Reference Model - IoT Reference Architecture, Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.								
UNIT – III: INDUSTRIAL INTERNET OF THINGS & SECURITY AND SAFETY								
Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges.								
Security and Safety: Introduction, Systems & Security, Network Security, Generic Application Security, Application Process Security and Safety								
UNIT – IV: IOT DATA LINK LAYER								
IoT Data Link Layer: PHY/MAC Layer (3 GPPMTC, IEEE 802.11, IEEE 802.15),Wireless HART, Z Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH 7								
UNIT – V: Network Layer Protocols & IOT Transport & Session Layer Protocols								
Network Layer Protocols: Network Layer- IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP								
IOT Transport Protocols: Transport Layer(TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS)								
IOT Session Layer Protocols: Session Layer- HTTP, CoAP								
LEARNING RESOURCES								
Text Books:								
1. Dimitrios Serpanos, Marilyn Wol, “Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies”, ISBN 978-3-319-69714-7.								
2. Danial Minoli, “Building the Internet of Things with IPv6 and M IPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications, 2016								
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”,1st Edition, Academic Press, 2015.								
References:								
1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5e- ISBN978-3-642-19157-2, Springer, 2016.								
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.								
3. Internet of Things– A hands-on approach, Arshdeep Bahga, Vijay Madiseti, Universities Press, 2015.								
4. The Internet of Things– Key applications and Protocols, Olivier Hersent, David oswarthick, Omar Elloumi and Wiley, 2012								
E-Resources:								
1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA1408.pdf								
2. https://www.studocu.com/in/document/jawaharlal-nehru-technological-university-anantapur/iot-communication-protocols/unit-iii-iot-notes/65078702								

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PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Advanced Embedded Systems

(Professional Elective-V)

SYLLABUS FOR B.TECH VII – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC7T5A
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Define and classify embedded system and to interpret design process and challenges. 2 Summarize the RISC concepts and describe the ARM architecture, Interpret serial and parallel bus communication protocols. 3 Describe system design and co-design issues along with various laboratory, IDE tools and design case studies.	On completion of the course, students will be able to 1 Define embedded system & describe the embedded system product design life cycle and challenges. 2 Analyse the ARM Core embedded design and its programming model. 3 Apply knowledge to design networked embedded systems using serial, parallel and wireless communication protocols. 4 Justify the importance of hardware software co-design and models involved. 5 Acquire the knowledge of embedded IDEs to design and specify debugging techniques.

CO-PO/PSO Mapping

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

UNIT – I :

Embedded System Design: Introduction, Trends, Definition, Classifications; Embedded Product Development Life Cycle. CPU selection– hardware, software, memories, and I/O. Challenges in designing Embedded System; Design Metric of Embedded System.

UNIT - II:

ARM Processor Fundamentals: Nomenclature; Core Architecture; AMBA Bus; Registers; operating modes; Pipeline; Thumb Mode; Exceptions, OBD using JTAG; Overview of ARM Assembly Instructions

(Data processing & Branching); ARM Core features Comparisons.

UNIT - III:

Embedded Networking: Traditional Networking Vs Embedded Networking; Networking through serial protocols: UART, I2C, SPI, CAN, IEEE1394 and USB; Porting of TCP/IP – Socket selection; HTTP client-server model; Design Considerations.

UNIT - IV:

Hardware Software Codesign: Comparison of Co-Design Approaches; Formulation of the HW/SW scheduling, Optimization of Design Metric: Case study of Embedded Adaptive Cruise Control Design.

Embedded Software Architectures: Round Robin, RR with Interrupt driven and Functional Queue architectures.

UNIT - V:

Embedded Development tools: Host and Target machines, Instruction packing: Big-endian ISA Vs Little Endian ISA; Intel Vs Motorola Modes.

Debugging Methods: Testing on Host–Instruction set Simulators, native tools–IDEs; cross-compilers; ICE, JTAG, laboratory tools: Multi meter, CRO, Logic Analyzer & protocol sniffers.

Learning Resource:

- 1 Tony Givargis Frank Vahid "Embedded System Design: A Unified Hardware/Software Introduction" Wiley Student Edition, 2006
- 2 Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Morgan Kaufmann Publishers In, 2004
- 3 Marilyn Wolf, "Computers as Components: Principles of Embedded Computing Systems Design", Elsevier; Third edition (2013)
- 4 MOOCs: https://nptel.ac.in/noc/individual_course.php?id=noc19-cs22

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PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Biomedical Signal Processing

(Professional Elective-IV)

SYLLABUS FOR B.TECH VII – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC7T4C
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 To introduce the fundamentals of probability theory and random processes with biomedical signals applications. 2 To equip students with the fundamental tools that are used to describe, analyze and process biomedical signals. 3 To acquire the knowledge on fundamental principles in the analysis and design of filters, power spectral density estimation and non-stationary signal processing techniques with cardiological and neurological signals.	On completion of the course, students will be able to 1 Apply the probability theory and random processes techniques in analyzing biological signals. 2 Determine to best class of compression techniques to use for a particular bio medical signal to compress. 3 Possess the basic mathematical, scientific and computational skills necessary to analyze and process cardiological signals as per the requirement. 4 Ability to formulate and solve basic problems in biomedical signal analysis. 5 Possess the basic mathematical, scientific and computational skills necessary to analyze and process neurological signals as per the requirement.

CO-PO/PSO Mapping

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

UNIT – I

Discrete and continuous Random variables: Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, noise figure of systems.

UNIT – II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DCT and the K L transform.

UNIT – III

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia Detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis. Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling. Adaptive Noise Cancelling with the LMS Adaptation Algorithm. Noise Cancelling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

UNIT – IV

Signal Averaging, polishing – mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction. Yule – walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT-V

Neurological Signal Processing: Modelling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modelling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modelling.

Learning Resources:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques – D.C.Reddy, 2005, TMH.
3. Digital Bio signal Processing – Weitkunar R, 1991, Elsevier.
4. Biomedical Signal Processing – Akay M, IEEE Press.
5. Biomedical Signal Processing –Vol. I Time & Frequency Analysis – Cohen.A, 1986, CRC Press.
6. Biomedical digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI.
7. <https://nptel.ac.in/courses/108105101/> Biomedical Signal Processing – by Prof.Sudipta Mukhopadhyay. IITKGP
8. <http://www.ecdept.iitkgp.ac.in/index.php/home/faculty/smukho>

Department : ELECTRONICS AND COMMUNICATION ENGINEERING					Programme: B. Tech. (EVT)						
					Regulation : AR-22						
Subject Code	22EV7T1A				Hours / Week		Credit	Maximum Marks			
Subject	FIELD PROGRAMMABLE GATE ARRAY (FPGA) ARCHITECTURE				L	T	P	C	IM	EM	TM
Year & Sem	IV B Tech I Semester				3	1	0	3	30	70	100
Prerequisite	Basic Knowledge of Communication and Multiplexing Techniques										
Objectives	To familiarize the students with the architectural aspects of FPGA's and testing technologies of FPGA's.										
Outcomes	At the end of this course the student can able to:										
	Differentiate between ROM, PAL, PLA, SPLD, CPLD, and FPGA.										
	Apply the working of building blocks of FPGA to compare area and power efficiency.										
	Compare the features of Various FPGAs in terms of their Architecture, Configurable logic block.										
	Gain knowledge on placement and routing algorithms adopted in FPGAs.										
	Test a particular PLD using various techniques like design validation, Timing verification.										
UNIT – I: INTRODUCTION TO PLD'S AND PGA'S											
Memory- Read-only memory, read/write memory - SRAM and DRAM. Programmable Logic Devices-PLAs, PALs and their applications; Sequential PLDs and their applications; State- machine design with sequential PLDs; Programmable gate arrays (pgas), Introduction to field programmable gate arrays (FPGAs), design flow using FPGA, programming technologies.											
UNIT – II: FPGA ARCHITECTURAL ASPECTS											
Field Programmable Gate Arrays: Organization of FPGAs, Programmable Logic Block Architectures, Programmable Interconnect, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs											
Applications of FPGAs: Logic Block Architectures: Logic block functionality versus area-efficiency, Logic block area and routing model, Impact of logic block functionality on FPGA performance, Model for measuring delay.											
UNIT – III: FPGA ARCHITECTURES AND COMPARISON											
FPGAs: Field Programmable Gate Arrays – Logic blocks, routing architecture, Logic cells and features of commercially available FPGA's- XILINX XC-4000, vertex-II FPGA's, XILINX SPARTAN-II, Alteras Act-1, Act-2, Act-3 FPGA's, Actel FPGA's, AMD FPGA.											
UNIT – IV: PLACEMENT AND ROUTING ALGORITHM IN FPGA ARCHITECTURES											
PLACEMENT: objectives, placement algorithms: Mincut-Based placement, iterative improvement placement, simulated annealing.											
ROUTING: objectives, segmented channel routing, Maze routing, Routability estimation, Net delays, computing signal delay in RC tree networks.											
UNIT – V: TESTING METHODS IN FPGA ARCHITECTURES											
Digital Front End and back End tools for FPGAs & ASICs, FPGA implementation steps. Verification: introduction, logic simulation, design validation, timing verification. Testing concepts: failures, mechanisms and faults, fault coverage, ATPG methods, and programmability failures.											
LEARNING RESOURCES											
Text Books:											
1. S. Brown, R. Francis, J. Rose, Z.Vransic, "Field Programmable Gate array", BSP, 2007											
2. P.K. Chan & S. Mourad, "Digital Design Using Field Programmable Gate Array", Pearson Education 2009.											
References:											
1. Spartan-3A/3AN FPGA Starter Kit Board User Guide, 2010											
2. S. Trimberger, Edr., "Field Programmable Gate Array Technology", Kluwer Academic Publications, 1994.											
3. https://nptel.ac.in/syllabus/117108040/prof.Kuruvilla Varghese IISC Bangalore											

Note: The Question paper shall have **two** sections:

- **Section A** shall consist of one question with 5 sub-questions of two (02) marks each.
- **Section B** shall consist of five questions with internal choice of twelve (12) marks each, out of which five questions are required to be attempted by the candidate.

AMRITA SAI INSTITUTE OF SCIENCE AND TECHNOLOGY

(AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A' GRADE
PARITALA, KANCHIKACHERLA – 521180

DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Electronic Instrumentation

(Professional Elective-I)

SYLLABUS FOR B.TECH VII – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC7T1B
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1 Explain basic concepts and definitions in measurement. 2 Elaborate discussion about the importance of signal generators and analyzers in Measurement. 3 provide a brief knowledge of measurements and measuring instruments related to engineering	On completion of the course, students will be able to 1 Identify different characteristics of instruments and errors in measurements. 2 To use modern instruments for measurements. 3 Demonstrate working principle and usage of medical instruments. 4 Modeling of various applications in virtual instrumentation. 5 Analyze various voltmeters, CRO, spectrum analyzer.

CO-PO/PSO Mapping

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

UNIT – I

Accuracy, Precision, Resolution and Sensitivity. Errors and their types. Standards of measurement, classification of standards, IEEE standards, Elements of ISO 9001, Quality management standards.

UNIT – II

Transducers: classification, factors for selection of a transducer, transducers for measurement of velocity, acceleration, force, radio activity, Hot wire anemometer. Passive electrical transducers- Strain gauges and strain measurement, LVDT and displacement measurement, capacitive transducer and thickness measurement. Active electrical transducers: Piezo electric, photo conductive, photo voltaic and photo emissive transducers.

UNIT – III

Characteristics of sound, pressure, power and loudness measurement. Microphones and their types. Temperature measurement, resistance wire thermometers, semiconductor thermometers and thermocouples. Humidity measurement, resistive capacitive, aluminum oxide and crystal Hygrometer types.

UNIT – IV

Block diagram, specification and design considerations of different types of DVMs. Digital LCR meters, Spectrum analyzers. The IEEE488 or GPIB Interface and protocol.

Delayed time base oscilloscope, Digital storage oscilloscope, and mixed signal oscilloscope. Introduction to virtual instrumentation, SCADA. Data acquisition system block diagram

UNIT-V

Biomedical Instrumentation: Human physiological systems and related concepts. Bio-potential electrodes Bio-potential recorders - ECG, EEG, EMG, X- ray machines and CT scanners, magnetic resonance and imaging systems, Ultrasonic Imaging systems.

Learning Resources:

- 1 Albert D. Helfric, and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 2010.
- 2 H S Kalsi, "Electronic Instrumentation", 3/e, TMH, 2011.
- 3 Nakra B.C, and Chaudhry K.K., "Instrumentation, Measurement and Analysis", TMH, 2004
- 4 Khandpur. R.S., "Handbook of Bio-Medical Instrumentation", TMH, 2003.
- 5 <https://nptel.ac.in/courses/108105064>

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DEPARTMENT OF **ELECTRONICS AND COMMUNICATION ENGINEERING**

Wireless Sensor Networks

(Professional Elective-II)

SYLLABUS FOR B.TECH VII – SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 70	Course Code: 22EC7T2C
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
- Differentiate WSNs and mobile ad-hoc networks and illustrate the single node computational blocks and design challenges narrating WSN fundamental entities. - Analyze and Summarize the MAC (L-2) and Routing (L-3) protocols along with the physical transceiver radio design. - Describe WSN topology, localization along with existing hardware support and software simulators and programming models.	On completion of the course, students will be able to - Analyze Wireless Sensor Network Characteristics and its challenges; and, differentiate WSN with other ad-hoc networks. - Illustrate architecture of Single WSN mote with Energy consumption mathematical models of a single mote both during the transmission and reception. - Apply Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks and their comparisons - Analyze different topology control and clustering schemes with localization concepts. - Describe some of the widely used WSN simulation tools and platforms with engineering case studies.

CO-PO/PSO Mapping

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

UNIT - I : OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks Characteristics requirements- required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks- Enabling Technologies for Wireless Sensor Networks

UNIT - II : ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concept

UNIT - III : NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, Zigbee: IEEE 802.15.4 MAC Layer, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT - IV : INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT - V : SENSOR NETWORK PLATFORMS AND TOOLS

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Learning Resource:

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks," John Wiley, 2005.
2. Feng Zhao and Leonidas J. Guibas, "Wireless Sensor Networks - An Information Processing Approach," Elsevier, 2007.
3. Kazem Sohrawy, Daniel Minoli, and Taieb Znati, "Wireless Sensor Networks- Technology, Protocols and Applications," John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs," John Wiley, 2003.
5. <https://nptel.ac.in/courses/106105160/21>

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

HUMAN RESOURCE DEVELOPMENT

SYLLABUS FOR B.TECH VII– SEMESTER

L:T:P (Hrs./week): 04	SEE Marks : 70	Course Code: 20HS7T6
Credits : 3	CIE Marks : 30	Duration of SEE 3hrs

COURSE OBJECTIVES	COURSE OUTCOMES
provide a conducive environment that holistically engages students through an all-encompassing knowledge impartation and comprehensive practical applications.	HRD helps to improve the skills, knowledge, and abilities of employees, which leads to improved performance and productivity. It helps to create a positive work environment that fosters continuous learning and development
Mould students into future visionaries and management leaders that are benevolent yet efficacious, versed in the leading business and human resource practices of the world and equipped to the hilt to implement themselves and adapt to the mutable global business environment.	Students shall gain an in-depth knowledge and analytical skills which will enable them to effectively and efficiently carry out various human resource and
student will learn the importance of Coaching and performance improvement and gain knowledge of mentoring	HRD's main goal is to help employees gain knowledge, learn new concepts, and improve existing abilities. HRD's main goal is to improve the quality of the workforce by establishing an atmosphere that encourages continuous learning and mentoring
Develop managerial knowledge and strategic agility, providing students with a broader skill set and a fresh perspective and encouraging them to seek out bold, innovative solutions for today's business and societal challenge.	Students shall gain an in-depth knowledge and analytical skills which will enable them to effectively and efficiently carry out various human resource and organizational development operations of an organization in the emerging globalized environment
Offer a deep dive into various facets of human resources management and organizational development by integration of cross-cutting issues relevant	(HRD) Programme is mainly oriented towards professional augmentation taking place in the global as well as domestic business arena and the

to gender, environment and sustainability,	curriculum thus intends to reduce the gap between industry and academia, with the right blend of theory and practice,
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UNIT-I:

Concept of HRD-objectives-Structure-Need-Scope- HRD in selected industrial organisations- significance-HRD functions-Framework-Techniques-Attributes of a HRD manager.

UNIT – II:

HRD Strategies:- An Overview - Strategies - Training and Development - Methods - Evaluation of training programmes. HRD Process Model: Methods of Implantation, Evaluation of HRD programmes .Identification of HRD needs and Design and development of HRD programmes.

UNIT – III:

HRD interventions: Mentoring for employee development: Concepts of Mentoring-Perspectives-Mentoring relationship-Outcomes of Mentoring programmes-Design and implementation of formal-mentoring programmes- Barriers to mentoring-Role of mentoring in development, understanding the role and responsibilities of mentor, mentee-Special issues in Mentoring.

UNIT – IV:

Intellectual capital (IC),: its measurement and management: Components of IC, measurement models of IC, IC index and challenges for HR

UNIT – V

Employee counselling for HRD: Overview of counselling programmes, employee assistance programme, stress management, employee wellness and health promotion. Career Planning, management, and development: Career development stages and activities, role of individual and organization in career planning, Issues in career management.

UNIT-VI

The future of HRD and HRD Ethics: Research, practice and education of HRD for innovation and talent development and management, Role of HRD in developing ethical attitude and behaviour and development, Ethical problems with HRD roles. Applications of HRD: HRD Climate, HRD for managing organizational change, HRD for Workers (blue collar employees), HRD Audit.

References:

1. Arun Monappa; Personnel Management;
2. Rudrabasava Raj M.N. : Dynamic Personnel Administration
Management of Human Resources;
3. Udai Pareek, Human Resource Development;
4. S. Ravishankar & R.K. Mishra (Ed). : Management of Human
Resources in Public Enterprises;
5. Haribson F, Educational Planning and Human Resources Development,
International Institute for Education, UNESCO, Paris;
6. Bell DJ, Planning Corporate' Manpower, Longman; 7, Walker James
W'. Human Resource Planning, MGH.