SR ENGINEERING COLLEGE

(Autonomous institution)

Hand Book

III-B.Tech I-Sem

Electronics and Communication Engineering

RA-15 Regulation

Course Accredited by NBA, Accredited by NAAC with 'A' Grade, Approved by AICTE, Affiliated to JNTU, Hyderabad

Ananthasagar, Warangal, Telangana – 506 371

I Semester: 12-06-2017 to 13-10-2017

SR Educational Group

The thirst for knowledge and the enthusiasm to go beyond and think 'out of the box' is something that S R group encourages, nurtures and supports among our students.

S R Engineering College, Warangal was established in 2002 by S R Educational Society. It is located on Warangal-Karimnagar highway at about 15 KM away from Warangal City. The college is affiliated to JNTU, Hyderabad. It is running 5 undergraduate (B.Tech) and 7 postgraduate (M.Tech) engineering programs besides, Master of Business Administration (MBA). Three undergraduate engineering programs are accredited by the National Board of Accreditation (NBA) within a short span of six years of its establishment. The college was recently sanctioned with two new integrated programs; a 5-year dual degree program in Management (BBA+MAM) and a 5½ year dual degree program in engineering (B.Tech+MTM). The college is granted Autonomous Status by University Grants Commission (UGC) in 2014.

S R Engineering College (SREC) is an autonomous and accredited institution valuing and encouraging creativity and quality in teaching and research. The staff and the students take on new and interesting activities to acquire ability to think uniquely and independently. The college is in a position to attract and develop outstanding faculty to actively participate and interactively support an open academic climate in the campus. It adopts innovative approaches for continuous improvement by strategic planning, benchmarking and performance monitoring. The policy is to establish a system of quality assurance of its graduates by continuously assessing and upgrading teaching and learning practices.

Through active industry cooperation, SREC has established centers like CISCO Networking Academy, Microsoft Innovation Centre, IBM Centre of Excellence and NEN Centre for Entrepreneurship Development for nurturing specific skill sets for employability. To shape and transform the graduates to meet challenging and complex engineering tasks globally, the college has built and fostered relationship with reputed universities like University of Massachusetts, Saint Louis University, University of Missouri and Wright State University. To align with ABET system of outcome based curriculum, many reforms have been implemented in the course structure with due stress on basic sciences and humanities, interdisciplinary and core engineering including projects and seminars in line with AICTE guidelines.

The college is striving to create and support academic and research activities in thrust areas like energy and environment. The institute has reliable, flexible and scalable technology infrastructure for networking and web services which provides crucial support for improved functioning and timely service to students and faculty. The centre for student services and placements (CSSP) actively pursues training and campus placements by keeping in touch with industry for internships and employment. The faculty is highly motivated to advance their knowledge and qualifications through sponsored research. The digital library provides the necessary resources and e-learning services. Regular seminars, webinars, workshops and conferences and faculty development programs are conducted to encourage participation from students and faculty from neighboring colleges.

S R Engineering College is implementing a strategic action plan with specific focus on:

1. Novel technology enabled teaching and learning techniques,
2. Strengthen existing PG programs through modernization of laboratories and training of faculty and staff,
3. Identify and start new PG programs in current areas of research with immediate relevance to the state and the country,
4. Attract funding for sponsored research from DST, MNRE, AICTE and UGC,
5. Strengthen functional areas like governance and administration, infrastructure, finance etc.,
6. Network with industry and institutes of repute through academic partnership for expanding avenues for internships and research.

Our Vision

To be among the Top 20 Private Engineering Institutes in India by 2020

Our Mission

♦ Design and implement curriculum that equips students with professional and life skills

♦ Recruit, develop and retain outstanding faculty to achieve academic excellence

♦ Promote and undertake quality research in thrust areas of science and Technology

♦ Collaborate with industry and academia to meet the changing needs of society

♦ Foster innovation and cultivate the spirit of entrepreneurship among students

About The Department

The Department of ECE is one of the biggest department in the college with highly experienced, qualified, dedicated, and trained faculty with deep sense of commitment towards the Students and Institution. The department has 56 staff members, 5 of whom are Doctorates and 12 faculties are pursuing their higher qualifications from various universities besides this most of the faculty were executing research projects from various funding agencies like AICTE,DST and UGC The main research of the department is in the area of VLSI, Embedded Systems and Communications. The department has four major projects from Department of Science and Technology and one minor project from UGC. The department of ECE has well equipped and state of the art laboratories for both UG & PG programs. To cater the needs of the students several technical talks, workshops, personality development programs, soft skills and entrepreneurial activities are regularly conducted under professional societies besides the curriculum. The Department has an Active IEEE student branch and IETE Student forum.

The department has its own Vision and Mission at par with the Vision and Mission of the Institute.

VISION

To be the leading Electronics and Communication Engineering Department in promoting quality education, research and consultancy

MISSION

- Design curriculum that provides effective engineering education by promoting innovating teaching-learning practices
- Establish centers of excellence in core areas and take up consultancy and research
- Interact and work closely with industries, research organizations to accomplish technology transfer
- Impart necessary skills and promote professional practices to enhance placement and entrepreneurship

Program Educational Objectives(PEOs)

PEOs (Program Educational Objectives) relate to the career and professional accomplishments of students after they graduate from the program. Consequently, assessment and evaluation of the objectives requires assessment tools that can be applied after graduation.

I. Enhance the skill set of students by providing strong foundation in basic sciences, mathematics, engineering and use necessary tools to solve engineering problems..
II. Equip students with ethical, professional behavior and mould them to become successful qualified engineers.
III. Inculcate necessary aptitude and ability to equip students to use their knowledge as a foundation for lifelong learning.
IV. Build team work skills and develop abilities to communicate and deal with different professionals both nationally and globally.

ProgrammeOutcomes(POs):

Engineering Graduates will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. 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.
4. 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.
5. 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.
6. 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.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. 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.

11. 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.
12. 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.
13. (PSO1)An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex system
14. (PSO2)An ability to apply project management techniques to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

Academic Calendar for II - IV B. Tech. I & II Semester

Academic Year 2017 – 18

I Semester

S. No.	Description	*Schedule*	*Duration*
1	**Commencement of Class work**	**12.06.2017**	--
2	1st Spell of Instruction	12.06.2017 to 05.08.2017	*8 Weeks*
3	1st Mid Examinations *Timings:* FN: 10.00 am to 11.30 am : AN:2.00 pm to 3.30 pm	08.08.2017 to 10.08.2017	3 Days
4	2nd Spell of Instruction (Includes Dasara Holidays)	11.08.2017 to 11.10.2017	9 Weeks
6	2nd Mid Examinations *Timings:* FN: 10.00 am to 11.30 am **:** AN:2.00 pm to 3.30 pm	12.10.2017 to 16.10.2017	3 Days
7	End Semester Regular Examinations / Supplementary Examinations (Theory & Practical)	17.10.2017 to 02.12.2017	7 Weeks
8	Commencement of Class work for **II, III, IV B.Tech. II Sem**. for the academic year 2016-2017	**04.12.2017**	--

COUSE STRUCTURE

III Year I Semester

S. No.	Course Code	Course	Hours / Week			
			L	T	P/D	C
1	OE	***Open Elective – 1***	3	-	-	3
2	HS106	Technical Writing	2	-	-	2
3	EE109	Control Systems	3	-	-	3
4	EC111	Analog Communication	3	-	-	3
5	EC112	Microprocessors and Microcontrollers	3	-	-	3
6	EC113	Antenna and Wave Propagation	4	1	-	4
7	EC120	Analog Communication Lab	-	-	3	2
8	EC121	Microprocessors and Microcontrollers Lab	-	-	3	2
9	EC123	Media Project	-	-	-	2
Total						**24**

Dept. of Electronics & Communication Engg.

SR Engineering College, Ananthasagar, Warangal

CLASS TIME TABLE

Academic Year 2017-18

Class: III-ECE-A **Room No: 2201** **w.e.f. 12-06-2017**

Day	9:30-10:20	10:20-11:10	11:10-11:20	11:20-12:10	12:10-1:00	1:00-1:40	1:40-2:30	2:30-3:15	3:15-4:00
	I	II	BREAK	III	IV	LUNCH BREAK	V	VI	VII
MON	AWP	AC/MPMC Lab					OE 1		
TUE	MPMC	AC	BREAK	AWP	MPMC		AWP	TW	
WED	CS	T&P					AC	CED / OE 2	
THU	AWP	CS	BREAK	TW	AC		MPMC	CS	AWP
FRI	MPMC	CS		AC	OE 1		AC/MPMC Lab		
SAT	MPMC	AC		CS	AWP		Library	Sports	

Class Teacher : Mr. Y. Shekar

Subjects:

AC(EC111) : Analog Communications: Dr.Syed Musthak Ahmed / Ms. Jaspreet Kukreja

MP&MC (EC112):Microprocessors & Microcontrollers:Y.Shekhar

CS (EE109) : Control Systems: Ms. Sowmya

TW (HS106) :Technical Writing: Mr.Sreekiran

AWP (EC113): Antenna and Wave Propagation : Mr. K. Raj Kumar

Open Elective:

1. Psychology (OE102): Mr. Benson
2. Fundamentals of Data Base Management Systems (OE116) :
3. Introduction to Operating Systems (OE117) :
4. Open Elective
5. Open Elective

T&P (Respective Class Room) : Mr. Y. Venakata Rama Rao

CED:Center for Enterpreurship Development:(Drawing hall block-I) Dr. N. Suman Kumar/Mr. G.Sathish Raj

Labs:

AC Analog Communications (EC120) : Dr. Syed Musthak Ahmed / N.Swetha

MP&MC (EC121) : Microprocessors & Microcontrollers: Y.Shekhar / Ms. Jaspreet Kukreja

Dept. of Electronics & Communication Engg.

SR Engineering College, Ananthasagar, Warangal

CLASS TIME TABLE

Academic Year 2017-18

Class: III-ECE-B **Room No: 2202** **w.e.f. 12-06-2017**

Day	9:30-10:20	10:20-11:10	11:10-11:20	11:20-12:10	12:10-1:00	1:00-1:40	1:40-2:30	2:30-3:15	3:15-4:00
	I	II	BREAK	III	IV	LUNCH BREAK	V	VI	VII
MON	AC	AWP		MPMC			OE 1		
TUE	AWP	AC/MPMC Lab					AC	CS	
WED	CS	T&P					AWP	CED / OE 2	
THU	AWP	AC	BREAK	TW	CS		AC/MPMC Lab		
FRI	MPMC			AWP	OE 1		AC	TW	TW
SAT	MPMC	CS		AC	AWP		Library	Sports	

Class Teacher : Ms. G. Renuka

Subjects:

AC(EC111) : Analog Communications: Ms.G.Renuka

MP&MC (EC112):Microprocessors & Microcontrollers: Dr.J.Tarun Kumar

CS (EE109) : Control Systems: Mr. Ritesh

TW (HS106) :Technical Writing: Ms. Sabitha

AWP (EC113): Antenna and Wave Propagation : Dr. A. Subbarao

Open Elective:

1. Psychology (OE102): Mr. Benson

2.Fundamentals of Data Base Management Systems (OE116) :

3. Introduction to Operating Systems (OE117) :

4. Open Elective

5. Open Elective

T&P (Respective Class Room) : Mr. Y. Venakata Rama Rao

CED:Center for Enterpreurship Development:(Drawing hall block-I) Dr. N. Suman Kumar/Mr. G.Sathish Raj

Labs:

AC AnalogCommunications (EC120) :Ms. G.Renuka /Ms. N. Swetha

MP&MC (EC121) : Microprocessors & Microcontrollers: Mr. B.Goverdhan / Ms. P. Anjali

Dept. of Electronics & Communication Engg.

SR Engineering College, Ananthasagar, Warangal

CLASS TIME TABLE

Academic Year 2017-18

Class: III-ECE-C **Room No: 2203** **w.e.f.12-06-2017**

Day	9:30-10:20	10:20-11:10	11:10-11:20	11:20-12:10	12:10-1:00	1:00-1:40	1:40-2:30	2:30-3:15	3:15-4:00
	I	II		III	IV		V	VI	VII
MON	MPMC		BREAK	AC	AWP		OE 1		
TUE	AC	AWP		CS			AC/MPMC Lab		
WED	CS	AC/MPMC Lab					MPMC	CED / OE 2	
THU	AWP	T&P					AC	AWP	TW
FRI	TW		BREAK	MPMC	OE 1		AWP	AC	CS
SAT	MPMC	AC		CS	AWP		Library	Sports	

LUNCH BREAK

Class Teacher : Mr. S. Srinivas

Subjects:

AC(EC111) : Analog Communications: Mr.S.Srinivas

MP&MC (EC112):Microprocessors & Microcontrollers: Mr.M.Sampath Reddy

CS (EE109) : Control Systems: Mr .Rajamallaiah

TW (HS106) :Technical Writing: Mr. T. Sathya Narayana

AWP (EC113): Antenna and Wave Propagation : Mr. Rohith Kumar

Open Elective:

1. Psychology (OE102): Mr. Benson
2. Fundamentals of Data Base Management Systems (OE116) :
3. Introduction to Operating Systems (OE117) :
4. Open Elective
5. Open Elective

T&P (Respective Class Room) : Mr. Y. Venakata Rama Rao

CED:Center for Enterpreurship Development:(Drawing hall block-I) Dr. N. Suman Kumar/Mr. G.Sathish Raj

Labs:

AC Analog Communications (EC120) : Mr.S.Srinivas / Ms. I. Ramadevi

MP&MC (EC121) : Microprocessors & Microcontrollers: Mr. Y.Shekhar / Ms. A. Priyanka

(HS106) TECHNICAL WRITING

(Common to all Branches)

The Course Description

Technical writing for III year engineering students is an essential ingredient of the curriculum. They will be ready within a time span of about fourteen months to face the industry and society. Hence, they are ought to be trained as industry ready products which will make them employable and productive citizens of the society.

In this context, the teachers focus both on oral and written communication such as Technical Writing, Paraphrasing and Note making etc,. Students are also encouraged to focus on drafting professional documents which help them to communicate inter and intra officers. Technical professional can blossom only with the proficiency at project reports and presenting research papers which bring innovative ideations into lime light. Technical students can be potential only through Business and technical reports and this in turn help them to develop interpersonal communication. Thus the course covers all the essential requirements to hone the technical and business skills of the students.

Overall, the course is an impetus to give holistic development to a technical student to face the highly challenged global employment scenario.

COURSE OBJECTIVES:

Students will be able to

1. Recall basics of communication and correspondence methods.
2. Paraphrase the technical writing process.
3. Distinguish and the various types of correspondence techniques.
4. Prioritize the importance of various presentation techniques.
5. Construct professional documents as per the requirement of forthcoming technology.

COURSE OUTCOMES:

At the end of the course, the students will develop ability to

1. Recognize the importance of professional documents.
2. Paraphrase an idea and construct a standard document.
3. Distinguish the various structures of drafting professional documents.
4. Compile techniques of drafting various documents as per the needs of industry.
5. Construct the documents according to the industrial needs.
6. Evaluate the significance of inter personal and intrapersonal communication.
7. Design various reports as per the requirement.
8. Design professional documents according to the situation.

LECTURE PLAN

Sl. No.	Topics in syllabus Modules and Sub modules	Activity	Lecture No.	Suggested books with Page Nos.
	UNIT – I (No. of Lectures – 07)			
1	**UNIT-I: Introduction to Communication and Correspondence- Introduction:** Basics of Communication	Activity-1	L1	Auditing & Business Communication by R.G. Sexena, Kastoori Srinivas & Rai &Rai **Page Nos.243-261**
2	Types of Communication	Activity-2	L2	Auditing & Business Communication by R.G. Sexena, Kastoori Srinivas & Rai &Rai **Page Nos:** 262-268
3	Barriers to Communication	Activity-3	L3	Auditing & Business Communication by R.G. Sexena, Kastoori Srinivas & Rai &Rai **Page Nos:** 281-291
4	Overview of Technical Writing Process		L4	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos.284-285**
5	Stages of Technical Writing		L5	Hand book of Technical Writing by Gerald J.Alfred, Charles.T.Brusaw & Walter.E.Oliu **Page Nos:527-580**
6	Effective Writing-Paraphrasing	Activity-4	L6	English Language Skills-II by Aruna Koneru **Page Nos:88-92**
7	Note Making-Note Taking		L7	Note Making : Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos:235** Note Taking :Hand book of Technical Writing by Gerald J.Alfred, Charles.T.Brusaw & Walter.E.Oliu **Page Nos:406-407**
	UNIT –II (No. of Lectures – 03)			
8	**Drafting Professional Documents-I: Introduction**		L8	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos.349**
9	Basics of Professional Documents Office Correspondence-Letters-Types	Activity-5	L9	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos.352-389**
10	Styles Drafting Official and Business Letters	Activity-6	L10	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos.359-361**
11	Practice.			

	UNIT –III (No. of Lectures – 07)			
12	**Drafting Professional Documents-II: Introduction**		L11	
13	Drafting Notice-Circular	Activity-7	L12	Notice: Enriching Speaking and Writing Skills by E.Suresh Kumar **Page Nos:41**
14	Agenda-Minutes of Meeting	Activity-8	L13	Hand book of Technical Writing by Gerald J.Alfred, Charles.T.Brusaw & Walter.E.Oliu **Page Nos:374-378**
15	Memo-Emails	Activity-9	L14	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos:392-401**
16	Proposals		L15	Technical Report Writing Today by Daniel G.Riordan and Teven E.Pauley **Page Nos:419-423**
17	Building Resume-Contrast between Resume and Curriculum Vitae	Activity-10	L16&17	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos:160-169**
	UNIT –IV (No. of Lectures – 07)			
18	**Report writing and Research Papers: Introduction**		L18	
19	Types-Drafting Technical Reports	Activity-11	L19	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos:427-433**
20	Business Reports	Activity-12	L20	Business Communication Stratergies by Matthukutty M.Monippally **Page Nos:206-221**
21	Project Reports	Activity-13	L21	Technical Report Writing Today by Daniel G.Riordan and Teven E.Pauley **Page Nos:42-54**
22	Overview of Research Papers	Activity-14	L22	Technical Communication Principles and Practice by Meenakshi Raman & Sangeeta Sharma **Page Nos:420-421**
23	Dissertations		L23	https://www.google.co.in/search?q=dissertation+format&oq=disseerta&aqs=chrome.4.69i57j0l5.11836j0j1&sourceid=chrome&ie=UTF-8
24	Drafting Techniques	Activity-15	L24	Enjoying Every day English by A.Rama Krishna Rao **Page Nos:7,38 and 69**
	UNIT – V (No. of Lectures –07)			
25	**Business Presentation and Interpersonal Communication: Introduction**		L25	The Complete Manager Life Skills For Success from The ICFAI University **Page No:347**
26	Defining situation-Designing Presentation-Opening and	Activity-16	L26 &	Effective Communication and

	closing thoughts		27	Public Speaking **Page Nos:20-33;** Business Communication by M.K.Sehgal and Vandana Khetarpal. **Page No:187**
27	Use of Visual Aids	Activity-17	L28	Communication for Professional Success by E.Suresh Kumar & B.Sandhya **Page Nos:66-72**
28	Introduction and Importance of Techniques in Interpersonal Communication	Activity-18	L29	The Complete Manager Life Skills For Success from The ICFAI University **Page Nos:347**
29	Communication techniques in Professional life	Activity-19	L30	Effective Communication and Public Speaking **Page Nos:122-137**

Note: As per the curriculum, topics cannot be found in one specific textbook.

Review Questions

UNIT- I
Introduction to Communication and Correspondence

1. Define Communication.
2. What are the basics of communication?
3. How many types of communications are there?
4. What are the barriers of communication?
5. Give an overview of Technical Writing process.
6. Explain the stages of Technical Writing.
7. What is an effective writing?
8. What is Paraphrasing and explain it with an example.
9. What are the techniques of Note -Making?
10. What are the techniques of Note- Taking?

UNIT- II
Drafting Professional Documents-I

1. What are the technical qualities in drafting Professional Documents?
2. Draft a letter to the Kakathiya Urban Development Authorities (KUDA) about the sanitation in Hasanparthi.
3. How many types of letters are there?
4. What are the different styles used in drafting Official Letters?
5. Describe the styles in Business Letters.

UNIT –III
Drafting Professional Documents-II

1. Define a Notice.
2. Define a Circular.
3. What is an Agenda?
4. What are the elements in Minutes of Meeting?

5. What is a Memo?
6. What are the advantages of Emails?
7. What are the etiquettes of an Email?
8. What is a proposal?
9. Write a Proposal Letter to the Union Grant Commission (UGC) about a project.
10. What are the elements in a Resume?
11. What is the difference between a Resume and Curriculum Vitae?
12. Draft a Resume for the post of the Project Manager in TCS, Bangalore.

UNIT –IV
Report writing and Research Papers

1. What is a Report?
2. How many types of Reports are there?
3. How to draft a Technical Report?
4. What is a Business Report?
5. What is the difference between Technical Report and a Business Report?
6. Give the structure of a Research Paper.
7. Write about a Dissertation?
8. What are the drafting techniques that should be adapted in writing a Research Paper.
9. What is the structure of a Project Report?

UNIT –V
Business Presentation and Interpersonal Communication

1. What is the difference between Professional and Technical Presentations?
2. What is a Grapevine Communication?
3. How registrars differ in professional and technical presentations?
4. What are the factors to be considered to give a Presentation?
5. What are audio and visual aids?
6. How non-verbal communication is important for presentation?
7. How many types of public speaking are there?
8. What is the importance of interpersonal communications?
9. What are the techniques that are to be considered in

(EE109) CONTROL SYSTEMS

Course Description:

This subject will introduce you to the principles and practice of feedback control systems, and outlines their role in modern society. You will learn about dynamic system modeling and controller synthesis as two key elements in the development of a modern control system, and the subject will emphasize the usage of transform theory to facilitate both of these elements. This subject will also introduce techniques for the practical implementation of the synthesized controller.

Topics that are covered in this subject include: introduction to feedback, system modeling using Laplace transform and state space representations, non-linear system models, prototype controllers based on proportional + integral + derivative elements, root locus techniques, Nyquist and Bode techniques, compensation strategies, feed-forward and cascaded loops, and practical realization issues.

COURSE OBJECTIVES:

Students will be able to

1. Apply various mathematical principles (from calculus and linear algebra) to solve control system problems.
2. Obtain mathematical models and derive transfer functions for mechanical, electrical and electromechanical systems.
3. Perform system's time and frequency-domain analysis with response to test inputs for a given system.
4. Design controllers and compensators for the suitable applications.
5. Analyze the system's stability using state space model

COURSE OUTCOMES:

At the end of the course, students will develop ability to

1. Produce concepts and compare different types of control systems
2. Derive the transfer functions of AC and DC servo meters.
3. Draw the root locus plots and analyze the effect of adding zeros and poles
4. Perform the frequency response analysis and derive the specifications of control systems with transfer function.
5. Perform stability analysis in time and frequency domains
6. Design PID controllers and lag-lead compensators
7. Solve the time invariant state equations using state space approach
8. Calculate state variables and obtain controllability and observability of system

UNIT – I

Introduction and Transfer Function Representation: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems. Transfer Function of DC Servo motor - AC Servo motor- Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT II

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems (P, PI, PID controllers).

UNIT-III

Stability Analysis in S-Domain and Frequency Domain: The concept of stability – Routh's stability criterion –qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Introduction to frequency domain analysis, Frequency domain specifications-Bode diagrams-Determination of frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Plots.

UNIT – IV

Classical Control Design Techniques: Compensation techniques – Lag, Lead, Lead-Lag Controllers design with bode plot.

UNIT – V

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 5th ed., New Age International (P) Limited, 2009.
2. Katsuhiko Ogata, "Modern Control Engineering", 3rd ed., Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS:

1. Norman S Nise, "Control Systems Engineering", 4th ed., John Wiley Publishers, 2007.
2. B. C. Kuo, "Automatic Control Systems", 9th ed., John Wiley and Son's, 2014.
3. Narciso F. Macia and George J. Thaler, "Modelling and Control of Dynamic Systems", Thomson Publishers.
4. N.K.Sinha, "Control Systems", 3rd ed., New Age International (P) Limited, 1998.

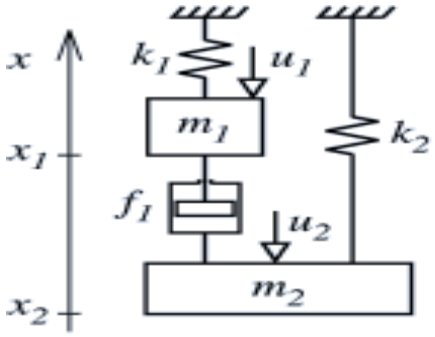
LECTURE PLAN

Sl. No.	Topics in syllabus Modules and Sub modules	Lecture No.	Suggested books with Page Nos.
UNIT – I (No. of Lectures – 12)			
1	**UNIT-I: INTRODUCTION AND TRANSFER FUNCTION-**Concept of control system, open loop and close loop system	L1 L2	T2, 1-6
2	Classification of control system	L3	T1, 11-14
3	Feedback characteristics and effect of feedback	L4	T1, 18-20
4	Mathematical model, different equation, impulse response and transfer function	L5 L6	T2, 55-58
5	Translational and rotational mechanical system considering electrical system with examples	L7 L8	T2, 85-90, 90-103
6	Block diagram representation	L9 L10	T2, 104-112
7	SFG reduction using meson's gain formula	L11 L12	T2, 104-112
UNIT –II (No. of Lectures – 13)			
8	**TIME RESPONSE ANALYSIS-** Standard test signals	L13	T2, 219
9	Time response of first order system characteristics equation of feedback control system.	L14 L15 L16	T2, 221-223
10	Transient response of second order system	L17 L18 L19	T2, 224-238
11	Steady state response ,steady state error and error constant	L20 L21 L22	T2, 288-290
12	Effect of proportional derivative	L23	T2, 681
13	Proportional integral system(P,PI,PID CONTROLLER)	L24 L25	T2, 681-699
UNIT –III (No. of Lectures – 15			
14	**STABILITY ANALYSIS IN S-DOMAIN AND FREQUENCT DOMAIN:-** The concept of stability	L26	T2,337
15	Routh's stability criteria	L27 L28	T1,
16	Limitation of routh's stability criteria	L29 L30	T1,
17	Root locus concept & Construction of root loci	L31 L32 L33	T2,339-350
18	Effect of adding pole and zero to G(s)H(s) on root loci	L34	T1,
19	**INTRODUCTION TO FREQUENCY DOMAIN ANALYSIS:-**Frequency domain specification-Bode diagram	L31 L32 L33	T2,492

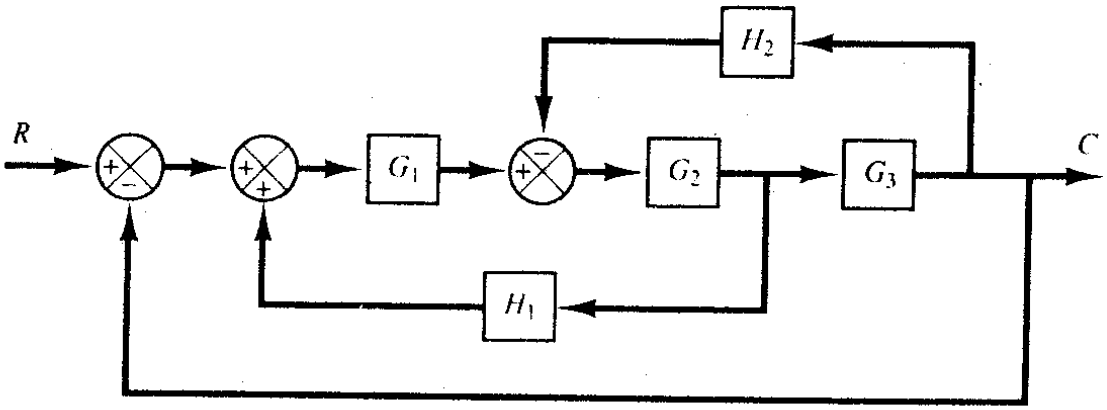
20	Determination of frequency domain specifications and transfer function from the bode diagram	L34 L35	T2, 492-497,497-515
21	Phase margin and gain margin	L36	T2, 539
22	Stability analysis from bode plots	L37	T2, 497-515
23	Polar plots	L38	T2,523-530
24	Nyquist plots	L39 L40	T2,540-549
UNIT – IV (No. of Lectures – 07)			
25	**CLASSICAL CONTROL DESIGN TECHNIQUES** : Introduction to Compensation techniques	L41	T2, 416
26	Lag compensators design using bode plots	L42 L43	T2,429-438
27	Lead compensators design using bode plots	L43 L44	T2, 421-428
28	Lead-Lag compensators design using bode plots	L45 L46	T1, 439-450
UNIT –V (No. of Lectures – 15)			
29	**UNIT-V:STATE SPACE ANALYSIS OF CONTINEOUS SYSTEM:** Concept of state	L47	T1,314
30	State variable and state model	L48	T1,314-315,316-328
31	Derivative of state models from block diagram	L49 L50	T1,328-340
32	Diagonalizations – Solving the time invariant state equation	L51 L52	T1,328-340
33	State transition matrix and its properties	L53 L54	T1,372-383
34	Concept of controllability	L55 L56	T1,384-394
35	Concept of controllability	L57 L58	T1,394-398

Review Questions
UNIT-I

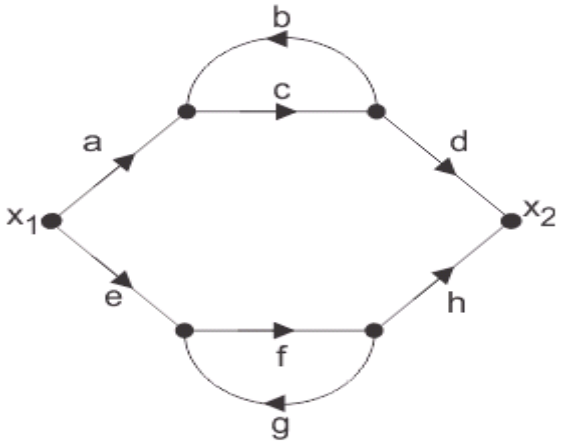
1.what are difference between open loop and close loop system
2 write the limitation of open loop and close loop system.
3 Write the differential equation for the figure given below and draw their F-v and F-I analogy.



4. Find the close loop transfer function T(s) using mesons gain formula.



5 **Use mason's gain formula to find the transfer function of the following signal flow graph.**



UNIT-II

1. Closed-loop transfer function of a unity-feedback system is given by Y(s) R (s) = 1 (τs +1). Find Steady-state error to unit-ramp input .
2. A unity feedback system with open-loop transfer function G(s) = 4 [s(s + p)] is critically damped. Find The value of the parameter p.
3. The open loop transfer function for unity feedback system is given by 5(1+0.1s) / (s(1+5s)(1+20s)) Find the steady state error for a ramp input of magnitude 10.
4. Explain P,PI, PID controller.
5. A unit step is applied at t=0 to a first order system without time delay. The response has the value of 1.264 units at t=10 mins, and 2 units at steady state. Find The transfer function of the system.
6. The transfer function of the system is G(s) =100/(s+1) (s+100). For a unit step input to the system the approximate settling time for 2% criterion is?
7. The overshoot in the response of the system having the transfer function $\frac{16}{(s^2+2s+16)}$ for a unit-step input is
8. The damping ratio of a system having the characteristic equation s2 +2S+8 is

UNIT-III

1. Determine the stability of the system whose characteristics equation is: a(s)=2s5+3s4+2s3+s2+2s+2. Using routh's stability criteria.
2. Considering the root locus diagram for a system with $G(s) = \frac{K(s+5)}{s(s+2)(s+4)(s^2+2s+2)}$, sketch the root locus and find their pole, zero, asymptotes angle of aperture and angle of departure .
3. Writes the limitation of routh,s stability criteria with suitable examples.
4. Writes the effect of adding of pole and zero in transfer function.
5. Explain gain margin and phase margin.
6. Explain polar plot in details.
7. State and explain the Nyquist stability criterion.
8. The open-loop transfer function of a control system is $G(s)H(s) = \frac{10}{s(1+0.5s)(1+0.1s)}$ Draw the Bode plot and determine the gain crossover frequency, and phase and gain margins.

UNIT-IV

1. Explain lead compensator.
2. Explain lag compensators.
3. Explain lead lag compensators.
4. The compensator G(s) = 5(1 + 0.3s)/(1 + 0.1s), would provide a maximum phase shift?
5. The transfer function of phase lead compensator is given by G(s) = (1 + TS)/(1 + αTS), where,
   T > 0, α < 0. Find the maximum phase shit provided by this compensator?
6. A controller transfer function is given by C(s) = (1+2s)/(1+0.2s). What is its nature and parameter?

7. The transfer function of a phase lead compensator is given by: G(s) = (1 + 3Ts)/(1 + Ts)where T>0. What is the maximum phase shift provided by such a compensator?

UNIT-V

1. Explain controllability and observability
2. What do you mean by state space model?
3. State and explain state transition matrix.
4. Consider a system with the mathematical model given by the differential equation, find the state variable representation matrix and calculate their state transition matrix.

$$5\frac{d^3y}{dt^3} + 10\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 2y = u(t).$$

5. Find state transition matrix.

$$\dot{\mathbf{x}} = \mathbf{A}\mathbf{x} + \mathbf{B}u,$$

where

$$\mathbf{A} = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix} \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.$$

6. A single input single output system has the state variable representation system given below, find the transfer function of the sytem.

$$\dot{\mathbf{x}} = \begin{bmatrix} 0 & 1 \\ -5 & -10 \end{bmatrix}\mathbf{x} + \begin{bmatrix} 1 \\ 0 \end{bmatrix}u$$
$$y = [\,0 \quad 10\,]\,\mathbf{x}$$

(EC111)ANALOG COMMUNICATIONS

Course Description:

This course provides a thorough introduction to the basic principles and techniques used in analog communications. The course will introduce analog modulation techniques, communication receiver and transmitter design, baseband and band-pass communication techniques, noise analysis and multiplexing techniques. The course also introduces analytical techniques to evaluate the performance of communication systems.

Prerequisites

Requires the knowledge of Basic mathematics and Signals & Systems.

COURSE OBJECTIVES:

Students will be able to

1. Explain the fundamental concepts of communication systems.
2. Analyze and compare different analog modulation schemes like AM, FM and PM.
3. Evaluate fundamental communication system parameters, such as bandwidth, power, Signal to noise ratio.
4. Discuss the AM and FM transmitter and receiver circuits using modulation and demodulation schemes.
5. Analyze the various pulse modulation schemes.

COURSE OUTCOMES:

At the end of the course, the student will develop ability to

1. Express the basic concepts of analog modulation schemes.
2. Evaluate the analog modulated wave in time / frequency domain and also find the modulation index.
3. Calculate the bandwidth and power requirements for analog systems.
4. Classify the AM and FM transmitters.
5. Analyze different characteristics of receiver.
6. Compute figure of merit of different analog modulation schemes.
7. Discuss the different pulse modulation schemes.
8. Discriminate the time and frequency division multiplexing techniques.

UNIT – I

Introduction to Communication System: Modulation, Frequency Translation, 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.

Double Side Band Suppressed Carrier Modulation: Time domain and frequency domain description, Generation of DSBSC Waves: Balanced Modulator, Ring Modulator, Detection of DSBSC Waves: Coherent detection of DSB-SC, COSTAS Loop.

UNIT – II SSB Modulation: Hilbert transform, Frequency-Domain description of SSB waves, generation of SSB-SC modulated wave: Frequency discrimination method, Time-Domain description, Phase discrimination method, Demodulation of SSB waves, Frequency division multiplexing. **Vestigial Side Band Modulation:** Frequency description, Generation of VSB Modulated wave, Time domain description, Detection of VSB: Coherent detection, Envelope detection method, Comparison of AM Techniques

UNIT – III Frequency Modulation: Basic concepts, FM: Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves: Direct FM, Indirect FM, Detection of FM Waves: Balanced Frequency discriminator, Foster Seeley Discriminator, Ratio detector, Phase locked loop, Comparison of FM and AM.

UNIT – IV Radio Transmitter: Classification of Transmitter, AM Transmitter, FM Transmitter, Radio Receiver: Receiver Types - Tuned radio frequency receiver, Super-heterodyne, choice of IF, receiver, FM Receiver.

UNIT – V Pulse Modulation: Time Division Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity), PWM: Generation and demodulation of PWM, PPM: Generation and demodulation of PPM. Noise: Introduction to noise (Qualitative analysis), Receiver model, Noise in DSB receiver, Noise in SSB receiver, Noise in AM receiver, Noise in FM receiver, Pre-emphasis and de-emphasis.

TEXT BOOKS:

1. H Taub, D. Schilling and Gautam Sahe, “Principles of Communication Systems”, TMH, 3rd Edition, 2007.
2. Simon Haykin, “Principles of Communication Systems”, John Wiley, 2nd Edition.

REFERENCE BOOKS:

1. George Kennedy and Bernard Davis, “Electronics and Communication System”, TMH 2004.
2. B.P. Lathi, “Communication Systems”, BS Publication, 2006.
3. Chakravarthy E and Dhanapath Raj, “Analog Communication Systems”, New Delhi, 2010.
4. Sanjay Sharma, “Analog Communications Systems”, Kataria, New Delhi, 2009.

WEBSITES

1. nptel.ac.in

2. freevideolectures.com/Subject/Electronics.
3. ocw.mit.edu
4. www.pearsoned.co.uk.
5. www.ece.uiuc.edu.
6. www.utexas.edu

CONTENT BEYOND SYLLABUS:

Introduction to Digital communication.

Needs of coding in Digital communication.

LECTURE PLAN

Sl. No.	Topics in syllabus	Modules and Sub modules	Lecture No.	Suggested books with Page Nos.
UNIT – I (No. of Lectures – 15)				
1	Introduction to Communication System	Review of Fourier transform Need for modulation	L1 L2	Simon Haykin 2nd edition-17 Simon Haykin -113
2	Introduction to Amplitude Modulation	Amplitude Modulation Definition, Time domain & frequency domain description. Single tone modulation & Multi tone Modulation	L3 L4	Simon Haykin -114 Simon Haykin -117
3	Power relations	Power relations in AM waves	L5	B.P.LATHI-176
4	Generation of AM waves	Square Law Modulation Switching Modulator	L6 L7	B.P.LATHI 171
5	Detection of AM waves	Square law detector Envelope detector	L8 L9	Simon Haykin-123 Simon Haykin -124
6	Double side band suppressed carrier modulators	Time domain & frequency domain description	L10	Simon Haykin -125
7	Generation of DSBSC Waves	Balanced Modulators Ring Modulator	L11 L12	Simon Haykin -124 Simon Haykin -128
8	Detection of DSB-SC Modulated waves	Coherent detection COSTAS loop	L13 L14	Simon Haykin -130 Simon Haykin -132
9	Problems	On Power relations and Modulation Index.	L15	Kennedy-39

UNIT – II (No. of Lectures – 11)				
10	Introduction to SSB Modulation	Frequency domain&Time domain descriptions	L16	Simon Haykin-137
11	Generation of SSBSC Waves	Frequency discrimination method Phase discrimination method	L17 L18	Simon Haykin -141 Simon Haykin -143
12	Detection of SSBSCwaves	Coherent detection Carrier re-insertion technique	L19 L20	Simon Haykin -146 Simon Haykin -160
13	Introduction to VSB Modulation	Frequency description&Time domain description	L21	Simon Haykin -149
14	Generation of VSB Waves	Generation of VSB modulated waves	L22 L23	Simon Haykin -154
15	Detection of a VSB Wave	Envelope detection of a VSB Wave pulse Carrier	L24	Simon Haykin -155
16	Comparisons	Comparisons of AM Techniques Application of different AM Systems	L25	B.P.LATHI-195
17	Problems	On power relations & Bandwidth	L26	
UNIT – III (No. of Lectures –15)				
18	Introduction to Angle Modulation	Basic concepts Frequency Modulation, single tone frequency modulation	L27 L28	Simon Haykin-180 Simon Haykin -183
19	Spectrum Analysis of sinusoidal FM wave	Narrow band FM Wide band FM	L29 L30 L31	Simon Haykin185 Simon Haykin187
20	Transmission BW	Transmission BW of FM wave	L32	Simon Haykin194
21	Generation of FM Waves	Direct FM Waves Indirect FM	L33 L34	Simon Haykin200 Simon Haykin201
22	Detection of FM	Balanced Frequency discriminator Foster Seely Discriminator Ratio Detector Phase locked loop Zero crossing detector	L35 L36 L37 L38 L39	Kennedy-163 Kennedy165 Kennedy169 Simon Haykin-207
23	Comparison	Comparison for FM & AM Problems	L40 L41	
UNIT – IV (No. of Lectures –15)				
24	Radio Transmitters	Classification of Transmitter	L42	
25	AM Transmitters	Low Level AM Transmitter High Level AM Transmitter Effect of feedback on performance of AM Transmitters	L43 L44 L45	Kennedy-45
26	FM Transmitters	Variable reactance type phase modulated FM Transmitter Frequency stability in FM Transmitters	L46 L47	Kennedy146
27	Receivers	Functions of receivers	L48	Kennedy-119

		Tuned Radio frequency Receiver Super heterodyne Receiver	L49 L50	Kennedy120
28	Receiver Characteristics	Selectivity, Sensitivity, Fidelity Image frequency rejection and Double spotting RF Section & Characteristics, Frequency Changing & Tracking IF, AGC	L51 L52 L53 L54	Kennedy125,123,126 ,128,`122Kennedy,13 4,136
29	Comparison	Comparison of FM receiver with AM receiver Amplitude Limiting & Problems	L55 L56	Kennedy158 Kennedy159
UNIT – V (No. of Lectures – 9)				
30	Noise in Analog Communication Systems	Noise in DSB & SSB System Noise in AM System large noise case& noise in AM System Small noise case	L57 L58	Simon Haykin-322,325,328
31	Noise in Angle Modulation System	Noise in FM System Pre-emphasis & De-emphasis, Threshold effect in angle Mod. Sys	L59 L60	Simon Haykin335,348,341
32	Pulse Modulation	Generation & Demodulation of PAM Generation & Demodulation of PWM Generation & Demodulation of PPM	L61 L62 L63	Simon Haykin385,389
33	Multiplexing Technique	Time Division Multiplexing	L64	Simon Haykin384
34	Problems	On Sampling Theorem	L65	

Review Questions

Introduction to Communication systems

1. Show, giving a mathematical proof, how a square-law device can be used toGenerate and an AM signal. Give complete diagram of the signal inputting andoutputting arrangements.
2. Explain how an AM signal can be generated using Non-Linear Modulationand derive the necessary equations.
3. Write about Diagonal clipping in a Diode Detector.
4. A Tone modulated AM signal with a modulation index of “m" and base band signal frequency of $\omega_m$is detected using Envelope Detector, whose time constant is RC. For effective demodulation, show that

$$\frac{1}{RC} \geq \frac{m\varpi_m}{\sqrt{1-m^2}}$$

5. Derive the expression for the Figure of Merit for an envelope detector used to detect an AM DSB-Full Carrier signal, under low noise case.

6. An arbitrary Baseband signal m(t) with zero mean modulates a carrier A_C Cosω_ct in its amplitude. Derive the expression for Modulation efficiency of the resultingAM signal.
7. A Carrier signal is sinusoidal modulated to a depth of m=0.8. What percentage of the total power of the modulated signal is in the two sidebands?
8. What is modulation index? What happens if it is greater than unity?
9. Define amplitude Modulation.
10. Sketch the spectrum of an AM signal assuming sinusoidal modulation with a modulation index of m (m< 1).
11. A carrier signal $A_C \cos\omega_c t$ is amplitude modulated by a message signal $A_m \cos\omega_m t$, where $A_m < A_C$
i) Write down the expression for the modulated signal.
ii) Write down the expression for the carrier component and the side-frequency components.
iii) Draw the phasor diagram of the modulated signal.
12. State one important advantage and one important disadvantage of AM. Where is AM used?

DSB Modulation

13.Draw the block diagram of AM transmitter and explain function of each block.
14. What is the necessity of synchronous Carrier in the coherent detection of aSuppressed carrier signal? Explain in detail, with the necessary mathematical treatment.
15. What are the carrier frequency requirements in a Radio Transmitter? Explain.
16. Justify that a Costa's loop can be used for carrier Acquisition and for demodulation of AM-DSB-SC signal.
17. Explain the classification of Radio Transmitters.
18. Explain about a High Level AM Transmitter, with a neat block diagram, andexplain the function of each block.
19. State how a DSB-SC signal is generated?
20. Assuming sinusoidal modulation, sketch the spectrum of a DSB-SC signal for some m (m<1).
21. Explain the operation of Ring Modulator.
22. Explain the operation of Balanced modulation.

SSB Modulation

23. Explain the synchronous demodulation of an AM-SSB-SC signal.

24. State and prove the properties of Hilbert Transform of a Signal x(t).

25. Find the Hilbert Transform of

i. x(t) = sin t/ t* cos 200πt
ii. x(t) = sin t/t*sin 200πt.
26. Explain the method of Demodulation of an AM-SSB-SC signal.
27. Discuss about the applications of various AM systems.
28. Explain the generation of vestigial side band modulated signal.
29. Discuss the advantages and disadvantages of SSB-SC transmission.
30. In the filter method of generation of an SSB-SC signal, why do we have to use initially a Low frequency carrier?
31.With reference to SSB-SC signal modulation, discuss the effective of an error in the locally

generated carrier signal's (i) frequency, and (ii) phase.
32. Draw the spectrum of an LSSB-SC signal. Write down an expression for this spectrum in terms of message signal.
33. Write down an expression for the time-domain representation of a VSB signal.
34.Sketch the spectrum of typical TV signal.

Angle Modulation Concepts

35. Derive an expression for a FM signal with carrier frequency fc and a modulationsignal $Am1\cos\omega m1t+Am2\cos\omega m2t$. Obtain an expression for the spectrum.
36. Derive an expression for the FM signal under Tone Modulation and derive the expression its bandwidth.
37. Explain how a PLL can be used as an FM demodulator.
38. Derive the frequency Domain representation of an FM signal under Multi Tone Modulation. Draw the corresponding Magnitude Spectrum.
39. By deriving the necessary expression, show that a narrowband angle modulated signal and a AM signal have similar forms (assuming single-tone modulation). Draw the phasor diagrams for both cases.
40. Define 'effective bandwidth' of an angle-modulated signal.
41. Explain how the transmission bandwidth changes with respect to changes in the modulating signal frequency in the case of PM and FM.
42. Derive the expression for FM wave in terms of its Bessel function and explain it.
43.State Carson's rule for determining the bandwidth for an angle modulated wave and explain clearly the effect of the modulation index on bandwidth.
44. Describe the usefulness of Carson's rule as applicable to FM Systems.

Angle modulation methods
45.Explain how a Varactor Diode is used to generate FM signal. Explain with the necessary mathematical equations.

46.What are the limitation of Direct Method of FM generation.

47.For an FM Reactance Modulator, derive the expression for the:

i. Inductive reactance offered
ii. Capacitive reactance offered

48.Explain the generation FM wave using varactor diode

49.Discuss the principle of phase locked loop.
50.Compare various FM detection techniques.

Noise
51.What is threshold effect with respect to angle modulation?

52.Derive an expression for (S/N) dB for an DSB system using coherent demodulation.

53.Derive the expression for the transfer function of a Pre-emphasis and De-emphasis circuit.

54. Compare the output S/N ratio for a PM system with that of AM-DSB-SC signals under low noise condition. Derive the expressions for both.

55.In a communication scenario, what is mean by noise?

Receivers

56.What is an Amplitude Limiter? Explain its operation with a neat circuit Diagram.

57.What is an AFC. Discuss with the help of Block Diagram.

58. Explain about the Image frequency and Image frequency rejection of a radio receiver.
59. Explain about Double Spotting.
60. Draw the block diagram of a Super Heterodyne receiver, and explain the operation of each stage of the receiver.
61. In a super heterodyne receiver used for the reception of signals in AM broad Cast band, among the Incoming signal frequency and Local Oscillator frequency, which is larger? Justify with the necessary computations.

Pulse Modulation

62. What is natural sampling? What do you mean by aperture effect?
63. Explain the generation and demodulation of a PPM signal.
64. A low pass signal x(t), has a spectrum X (f) given by

$$X(f) = \begin{cases} 1 - |f|/200, & |f| < 200 \\ 0, & otherwise \end{cases}$$

Assume that x(t) is ideally sampled at f_s= 400 Hz. Sketch the spectrum of Sampled signal for |f|<200.

65. Explain time division multiplexing.
66. Compare FDM and TDM.
67. Explain the generation and demodulation of a PAM signal.
68. Explain the generation and demodulation of a PWM signal.

(EC112) MICROPROCESSORS & MICROCONTROLLERS

Course Description:

Microprocessor technology is an exciting, challenging and growing field which will pervade industry for decades to come. Ever since the invent of first microprocessor to the latest, microprocessors have been used in different applications. To meet the challenges of this growing technology, one has also to be conversant with programming aspects of the microprocessor and microcontrollers. This course of microprocessor and interfacing presents an integrated approach to hardware and software in the context of 8086 microprocessor and 8051 microcontroller.

A handful of additional and less complex chips connected to the microprocessor enable a complete microcomputer to be built. This course provides a comprehensive coverage of the Intel 8086 microprocessor, it's major functional components, memory structure, register structure, instruction set, external interfaces, modes of operation, assembly language programming and introduces architectural concepts and programming of 8051 microcontroller

Prerequisites

Requires the knowledge of number theory, Boolean algebra, switching theory and logic design and fundamentals of computer architecture.

COURSE OBJECTIVES:

Students will be able to

1. Outline the history of computing devices (remember)
2. Describe the architecture of 8086 microprocessor (understand)
3. Develop assembly level programs for microprocessor and microcontroller (apply)
4. Compare between microprocessors and microcontrollers (analyze)
5. Design and implement microcontroller-based embedded system (create)

COURSE OUTCOMES:

At the end of the course, the student will develop ability to

1. Retrieve the history of microprocessors (remember).
2. Describe the architecture of 8085 and 8086 microprocessors (understand).
3. Apply the principles of top down design to microprocessor software development (apply).
4. Distinguish between the different modes of operations of microprocessor (analyze).
5. Execute assembly level programs for interfacing various devices to microprocessor and microcontroller (apply).
6. Compare between microprocessors and microcontrollers (analyze).
7. Evaluate the appropriateness of a memory expansion interface based on the address reference mix of a particular application (evaluate).
8. Design and implement microcontroller-based embedded system (create).

UNIT – I

Introduction: Evolution of Microprocessors, 8085 MPU architecture.

8086 Family Architecture: Organization of 8086 CPU, Concept of Memory Segmentation,

Physical and logical addressing, Addressing Modes, Instruction set: Data transfer, arithmetic, logical, string and control transfer instructions.

UNIT – II

Assembly Language Programming: Assemble directives, simple Programming of 8086 on data transfer, arithmetic, logical, string and branching. Procedures, macros, time delays, pin diagram, Min/Max modes of 8086, timing diagrams.

UNIT – III

Interfacing With 8086: 8255 PPI, interfacing, interfacing of switches, LEDs, ADC, DAC and Stepper motor. Interrupt structure of 8086, 8259 PIC, need for DMA, 8257 DMA Controller.

UNIT – IV

8051 Microcontroller: 8051 Architecture, pin diagram, addressing modes, instruction set: data transfer, arithmetic, logical, control transfer instructions. Assembly language Programming.

UNIT – V

8051 Microcontroller: Timers, I/O ports, Serial port, Interrupts. Interfacing: LEDs, switches, LCD, 7 Segment display, keyboard.

TEXT BOOKS:

1. D.V. Hall, "Microprocessors and Interfacing", TMGH, 2nd Edition, 2006,
2. Muhammed Ali Mazidi, "The 8051 Microcontrollers and Embedded Systems", Pearson, New Delhi.

REFERENCE BOOKS:

1. A.K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and Peripherals", TMH, 2nd Edition, 2006.
2. Kenneth J Ayala, "The 8051 Microcontroller", Cengage Learning, 3rd Edition.
3. Brey, "Advanced Microprocessors", Prentice Hall of India, New Delhi.
4. Raj Kamal, "Micro Controllers", Pearson, 2nd Edition, 2011.

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2. www.manchester.ac.uk/research/areas/
3. www.eecs.umich.edu/eecs/research/resprojects.html
4. www. kabuki.eecs.berkeley.edu/papers.html
5. www.intel.com
6. www.bbdbestoff.com/importers
7. www.ece.uiuc.edu
8. www.pearsoned.co.uk
9. www.atmel.com

CONTENT BEYOND SYLLABUS:

Introduction to ARM Controllers

LECTURE PLAN

Sl. No.	Topics in syllabus	Modules and Sub modules	Lecture No.	Suggested books with Page Nos.
UNIT – I (No. of Lectures – 10)				
1	An overview of 8085	Introduction of µp, Evolution of µp, Limitations of 8085.	L1 L2	Ramesh.S.Gaonkar Pg.No.4,75 TB1 Pg. No.26
2	Architecture of 8086 µp	Bus interface unit, Execution unit	L3 L4	TB1 Pg. No.27-30 RB1 Pg. No .3-5
3	Special functions of General purpose registers	Register organization of 8086, general registers, segment registers, pointers and index registers	L5 L6	TB1 Pg No.27-30 RB1 Pg. No .2,3
4	Flag registers	Functions of Flag, Register	L7 L8	TB1 Pg. No.29 RB1 Pg. No .7,8
5	Addressing modes of 8086.	Types of Addressing modes	L9	TB1 Pg. No.33 RB1 Pg. No.41-45
6	Instruction set of 8086	Instruction format, Types of instruction sets	L10	RB1 Pg. No.46-74,38-40
UNIT –II (No. of Lectures – 17)				
7	Assembler Directives	Types of Assembler, Directives	L11 L12	TB1 Pg No.158 RB1 Pg No.74-82
8	Simple programs	How to write a program, List of programs	L13 L14	TB1 Pg No.45 RB1 Pg No.85
9	Procedures	Passing parameters to the procedures, calls & returns, Procedure definition, Recursive procedures	L15 L16 L17	RB1 Pg No.140-150 TB1 Pg No.99
10	Macros	Defining macro, passing parameters to macro, local labels, nested macros	L18	TB1 Pg No.127 RB1 Pg No.150-152
11	Assembly language programs	Logical instructions, branch instructions, call instructions	L19 L20	RB1 Pg No.107-129
12	Sorting	Types of sorting	L21 L22	RB3 Pg No.173
13	String manipulation	Moving a string Length of string, Comparing a string, Reverse of a string, scanning a string	L23 L24 L25	TB1 Pg No.95 RB1 Pg No.66-69
14	Pin diagram	Operation of maximum and minimum mode	L24 L25	RB1 Pg No.8-14
15	Timing diagram	Timing diagram of max and min mode	L26 L27	RB1 Pg No.21-28 TB1 Pg No.164

UNIT –III (No. of Lectures – 14)				
16	8255 PPI	Architecture, pin diagram, I/O modes, Interfacing	L34 L35	RB1 Pg No.184-208
17	D/A and A/D converters	Interfacing of D/A and A/D converters	L36 L37	RB1 Pg No.212-215 RB1 Pg No.224-226
20	Stepper motor and actuators	Stepper motor and actuators	L38 L39	RB1 Pg No.228-231
21	Direct memory access	Need for DMA, Types of DMA	L40	RB1 Pg No.294
22	DMA data transfer method	DMA data transfer method	L41	RB1 Pg No.294-303 TB1 Pg No.348
23	Interfacing with 8257	Architecture, pin diagram, Interfacing	L42 L43	RB1 Pg No.294-303
25	Interrupt structure of 8086	S/w interrupts, H/w interrupts, Priority of interrupts	L44	TB1 Pg No.207
26	Interrupt vector table	Interrupt vector table, Interrupt service routine	L45	TB1 Pg No.208
28	8259 PIC	Architecture, Interfacing, Cascading, Importance	L46 L47	TB1 Pg No.232 RB1 Pg No.249-262
UNIT – IV (No. of Lectures – 08)				
29	8051 MC	Introduction, Architecture, Pin diagram	L48 L49	TB2PgNo.20-24,184-188
30	Register set of 8051	Flags, PSW, SFR	L50	TB2 Pg No.40-42,93
31	Addressing Modes	Addressing Modes	L51	TB2 Pg No.90-99
32	Instruction set of 8051	Data Transfer Arithmetic Logical	L52 L53	TB2 Pg No.116-140
33	Instruction set of 8051	Branch Instructions Call and RET Instructions	L54	TB2 Pg No.56-64
34	Assembly Language Programs	Programs involving Arithmetic, Logical operations	L55	TB2 Pg No.116-140

UNIT –V (No. of Lectures – 06)				
35	Modes of timer operations	Types	L56	TB2 Pg No.202-222
36	Serial port operation	Serial port operation	L57	TB2 Pg No.244-255
37	Interrupt structure of 8051	Interrupt structure of 8051	L58	TB2 Pg No.272-291
38	I/O Interfacing	Interfacing of LED Keyboard Interfacing	L59 L60	TB2 Pg No.300-315

TEXT BOOKS:

TB1=D.V.HALL Microprocessor

TB2=MUHAMMAD ALI MAZIDI ,8051 Microcontroller

REFERENCE BOOKS:

RB1:A.K.RAY BHURCHANDI

RB2:KENNETH AYALA

RB3:BREY

Review Question

UNIT – I

1. Draw the architectural diagram of 8085 and explain the function of each block in detail.
2. a. With a neat architectural diagram explain the functioning of 8086 microprocessor.
   b.. compare the flag resisters of 8086 & 8085. ?
3. Discusses the general functions of all general-purpose resisters of 8086? Explain the special function of each resister and instruction support for these functions.
4. Discuss the addressing modes provided by 8086 and explain with examples?
5. What is the length of the instruction queue in 8086? Discuss the use of the queue? Explain the reason for limiting the length of queue?
6. i. What are the advantages in using pipelining feature in introducing it to 8086 architecture?
   ii. What is the format of flag register. Explain their status change with an example.
7. i. What are the control flags in 8086? Explain each of the control flags in conjunction with the Instructions being used.
   ii What are the advantages of memory segmentation?

iii Explain the function of ALE pin in 8086

8. Explain physical address, effective address, offset used in 8086.

9. Explain the following 8086 instructions with examples.

   i) MUL ii) IMUL iii) DIV iv) IDIV

10. Discuss various branch instructions of 8086 microprocessor that are useful for relocation

11. Explain the operation performed by the following instruction of 8086

    i. AAM ii. CLD iii. IDIV iv. JCXZ

12. Explain the operation of JUMP, CALL and LOOP instruction with an example what are the flags affected in each of these instructions.

13. What are the loop instructions of 8086? Explain the use of DF flag in the execution of string instructions. With example describe the various branch (control) instructions in 8086 microprocessor

14. i. Write short notes on: i . MOVS ii. LODS

    ii. What condition or conditions will terminate the repeated string instructions REPNE SCASB?

15 . i. Describe the following addressing modes with examples.

    i. indexed addressing with displacement.

    ii. I/O port addressing

UNIT – II

1. Differentiate between procedures and macros using certain examples.
2. Discuss the importance of procedures in assembly language programming.
3. What is a recursive procedure? Write a recursive procedure to calculate the factorial of number N, where N is a two-digit Hex number?
4. write briefly about
    a. i. PUBLIC directive. ii. EXTERN directive.
5. Discuss the assembler directives with examples
6. What is procedure? How is a procedure identified as near or far?
7. What are the different ways of passing parameters to and from procedures? Explain the methods with examples in assembly language?
8. Develop an assembly language program to multiply two BCD numbers of 2-digit each
9. Draw and briefly explain the pin diagram of 8086?
10. Compute the average of N number of bytes in an array in memory. The length of the string is in
    a. First location of the array. The number starts from 2nd location of array.
11. Add two 5 byte numbers such the sum is stored in one of the source array locations.
12. Write an 8086 ALP to covert the Fahrenheit temperature to Celsius temperature.
13. Give a neat flow chart and the corresponding 8086 assembly language program for performing
    a. Bubble sort on N elements stored in an array A.
14. Develop an 8086 assembly language program that converts the given hexadecimal data into
        i. ASCII and vice-versa
15. Develop an 8086 assembly language program to find the LCM of two 16-bit unsigned integers.
16. Develop an 8086 assembly language program to find the GCD of two 16-bit unsigned integers

17. Develop and 8086 assembly language program for the following.
        i. to sum the numbers from 1 to 100
        ii. to count the total number of negative numbers in the given series

18. How is the LOCAL directive used within a macro sequence? Explain with an example
19. Draw and discuss the read and write cycle timings diagrams of 8086 in minimum mode.?
20. Draw and discuss the read and write cycle timings diagrams of 8086 in maximum mode.?
21. What is a far procedure? With an example clearly indicate the way of calling such procedures.
22. Write an 8086 Assembly Language Program to compute the average of 4-bytes stored in an array in memory
23. Write an Assembly program to convert a BCD number to Binary number
24. Distinguish between the inter segment and intra segment CALL instructions and explain how they will executed with examples.
25. What are the major ways of passing parameters to and from procedures? Explain the method with an example.
26. Write an ALP in 8086 to count number of positive and negative numbers from an array of 8-bit integers.
27. Describe the function of the following pins and their use in 8086 based system.
    a) DEN b). LOCK a) TEST b) READY
28. Develop an 8086 assembly language program to find the LCM of two 16-bit unsigned integers.
29. Write an 8086 assembly language program to check the password of length 4 bytes entered
    a. Through key board whether it is matching with the system password stored at FF00H location.
30. Develop an 8086 assembly language program to find the GCD of two 16-bit unsigned integers.
31. Develop an 8086 assembly language program that uses a 16-bit unsigned integer as the search key and performs binary search on the sorted 16-bit unsigned integers.

32. Develop an 8086 assembly language program to perform Ascending order of n numbers?
33. Develop an 8086 assembly language program to perform Descending order of n numbers?

UNIT – III

1. Explain the need of DMA. Discuss in detail about DMA data transfer method.

2. Explain with a neat diagram interfacing of 8257 with 8086?

3. Write the programming features of 8257 DMA controller?

4. Explain about interfacing of a DMA controller with 8086?

5. Draw and discuss the mode set register of 8257?

6. Discuss the priorities of DMA request inputs of 8257?

7. Explain the following data transfer schemes.

   i. Programmed I/O

   ii. Interrupted I/O

8. Describe memory-mapped I/O and direct I/O. Give the main advantages and disadvantages.

9. Explain the functions of and MN / pins of 8086 in detail.

10. Explain physical address, effective address, offset used in 8086.

11. What are the registers available in 8257? What are their functions?

12. Draw and discuss the status resisters of 8257?

13. Draw and discuss the mode set register of 8257?

14. Discuss the priorities of DMA request inputs of 8257?

15. Interface 8K x 8 EPROM to 8086 microprocessor in the address range FE000H to FFFFFH. by using 2732 EPROM chips.

16. Draw the internal block diagram of 8255 and explain its working.

17. Explain how a keyboard is interfaced to 8086 through 8255. Draw the necessary interface circuit?

18. Distinguish between Mode set control word and BSR control Word of 8255?

19. write an ALP in 8086 to generate a symmetrical square wave form with 1KHz frequency? Give the necessary circuit setup with a DAC?

20. Write the BSR control word to set bit 3 of port C and also write the BSR control word to reset bit

21. 3 of port C. introduce a 1m sec delay between set and reset of bit 3 of port C.

22. Briefly explain the application examples of mode 0, mode 1 and mode 2 of 8255.

23. Draw a typical keyboard interface with 8255 and write the program to detect the key closer.

24. Interface 8255 with 8086 so as to have port A address 00, port B address 02, port C address 02 and CWR address 03 with a suitable diagram.

25. Explain how eight ON/OFF switches can be interfaced with a micro processor using 8255 port .Give the hardware and software for it.

26. Explain with a block diagram how 4 digit seven segment LED'S can be interfaced to a microprocessor using multiplexing.

27. Suppose that the beginning address of an 8255 is 0500 and write a program sequence that will

28. Put both groups a and b in mode 0 with ports A and C being input ports and port B as an output

29. Explain interfacing I/O subsystem using an 8255 with one example.

30. Develop an 8086 assembly language program that reads a key from the keyboard and converts it to uppercase before displaying it. The program needs to terminate on typing the 'Crtl + C' key

31. What is BSR mode operation? How it is useful in controlling the interrupt initiated data transfer for mode 1 and 2?

32. Draw the block diagram of 8255 and explain each block?

33. Interface a stepper motor with 8-step input sequence to 8086 based system and write the instruction sequence to move the stepper motor 20 steps in clockwise and 12 steps in anti-clockwise direction.

34. A DAC is interfaced to 8255 with an address map of 0800H to 0803H. Give the hardware design?

35. It is necessary to design a counter type ADC with the same 8255 and DAC using a comparator.

36. Give the necessary hardware? Provide the necessary instruction sequence to store a sample in location sample one?

37. Using the above hardware write the instruction sequence for successive approximation ADC?

38. A DAC is interfaced to 8255 with an address map of 0B00H to 0B03H. It is necessary to design

39. An ADC with the same 8255 and DAC using a comparator. Give the necessary hardware?

40. Explain how to interface a stepper motor with 4-step input sequence to 8086 based system with the help of hard ware design? Write the instruction sequence to move the stepper motor 10 steps in clockwise and 12 steps in anti-clockwise direction.

41. Explain control word format of 8255 in I/O and BSR mode.

42. Interface 16 bit 8255 ports with 8086. The address of port A if F0H

43. Explain with a block diagram how a stepper motor can be interfaced to a microprocessor and explain it working

44. Explain the working principle of a digital-to-analog converter and how it can be interfaced. Give the hardware and software for it.

45. Suppose that the beginning address of an 8255 is 0500 and write a program sequence that will (i)

46. Explain interfacing I/O subsystem using an 8255 with one example.

47. Explain with a block diagram the working of successive approximation ADC and its interface

48. With neat layout, explain how a microprocessor can be used for Data Acquisition System using A/D converters and D/ A converters

49. Explain the application of Stepper Motor in microcomputers.

50. Explain with a block diagram the working of dual slope ADC and give its interface

51. Draw pin configuration of 8255 an explain function of each pin.

52. Give the relevant hardware and software for interfacing a Stepper Motor to 8086 based system.

53. Give hardware and software for 8-bit ADC by interfacing 8-bit DAC to 8086 based system.

54. What is a stepper motor? Give the schematic for interfacing of stepper motor to 8086 processor and an ALP to control the direction and speed of the stepper motor.

UNIT-IV

1. Explain the internal and external program memory as well as data memory of 8051 with the diagram showing their capacities.

2. a. Discuss about various addressing modes of 8051.

b. Explain the interrupt structure of 8051.

3. a. Discuss in detail about serial port operation in 8051 microcontroller.

b. Explain in detail about the interrupt structure of 8051.

b. Discuss the following signal descriptions?

i. ALE /PROG ii. EA/VPP iii. PSEN iv. RXD

4. a. How does 8051 differentiate between the external and internal program memory?

b. Explain with waveforms different modes of counter/timer in 8051?

5. i. Enlist salient features of 8051 family of microcontrollers?

ii. Explain with waveforms different modes of counter/timer in 8051?

6. Discuss the following signal descriptions?

i. ALE/PROG

ii. RXD

iii TXD

7. Draw and discuss the formats and bit definitions of the following SFR's in 8051 Microcontroller?

i. PSW

ii. IE

iii. SCON

iv. TMOD

8. Explain the support given in 8051 instruction set to handle bit addressable RAM?

9. Discuss the following signal descriptions?

i. INT0/INT1

ii. TXD

iii. T0 AND T1

iv. RD

10. i. What is meant by interrupt? What are the different interrupt of 8051?

ii. Explain the interrupt operation of 8051 in detail

11. Explain the internal architecture of 8051 with the help of a neat block diagram.

12. i. Distinguish between a microprocessor and a micro controller

ii. Describe the hardware features of 8051

13. Write a program of 8051 to copy the value of 55H into RAM memory location 40H to 45H using:

i. Direct addressing mode

ii. Resister indirect mode without a loop

iii. with a loop

14. Show different methods by which a byte in TCON is copied to register R2.

15. Write 8051 instructions to set timer T0 to an initial setting of 1234 H.
16. Explain the stack operation in 8051 microcontroller.
17. Determine whether the 8051 can be made to execute a single program instruction Using external circuitry only without the help of software.
18. Outline a scheme for single stepping the 8051 using a combination of hardware and Software.
19. Explain 8051 communication modes with the help of suitable examples.
22. Give the 8051-instruction format.
23. Explain different addressing modes of 8051 with suitable examples.
24. Describe the hardware features of 8051

UNIT – V

1. Explain the internal and external program memory as well as data memory of 8051 with the diagram showing their capacities.
2. Draw and discuss the formats and bit definitions of the following SFRs in 8051 Microcontroller?
   i. SCON
   ii. TCON
3. Draw and discuss the formats and bit definitions of the following SFR's in 8051 Microcontroller?
   i) IP ii) TMOD iii) TCON iv) SCON

4. a. Discuss the following signal descriptions
   i. INT0/ INT1 ii. TXD iii. T0 and T1 iv. RD
   b. Draw and discuss the formats and bit definitions of the following SFRs 8051microcontroller.

5. a. How does 8051 differentiate between the external and internal program memory?
b. Explain with waveforms different modes of counter/timer in 8051?
6. i. How does 8051 differentiate between the external and internal program memory?
ii. Explain with waveforms different modes of counter/timer in 8051?
7. i. Explain the alternate functions of Port 0, Port 2 and Port 3?
ii. Discuss the interrupt structure of 8051? Mention the priority? Explain how least priority is made as highest priority?

8. List out the steps involved in programming the 8051 to transfer data serially.

9. Explain the terms:

i. Baud rate in the 8051

ii. SCON register

ii. List out the steps involved in programming the 8051 to transfer data serially.

10. Explain 8051 communication modes with the help of suitable examples.

.11. How many ports are available in 8051? Out of them, which port pins, are individually programmable?

12 . Explain the port pin circuits for all the ports with neat diagrams.

13. Create a square wave of 50% duty cycle on the P1.5 bit of 8051. Timer 0 is used to generate the time delay.Analyze the program.

14. Explain the normal mode functions and alternate mode functions of different ports of 8051?.Explain each pin?

(EC113) ANTENNAS & WAVE PROPAGATION

Course Description:

Antennas have become increasingly important to our society and at present, they are indispensable. They are everywhere: at our homes and work places, on our cars and aircraft, and our ships, satellites and spacecrafts bristle with them. even as pedestrians, we carry them unknowingly. Although antennas seem to have a bewildering, almost infinite variety, all operate on the same basic principles of electromagnetic.

There are no hard and fast rules for selecting an antenna for a particular frequency range or application. While choosing an antenna, many electrical, mechanical and structural aspects are to be taken into account. These aspects include radiation pattern, gain, efficiency, impedance, frequency characteristics, shape, size, weight, look of antennas, and above all their economic viability.

Antennas are an integral part of all wireless communication systems. In view of the vast development in the field of communications, the development of antennas has also attained its zenith. Depending upon their applications and frequency of operation, the size of antennas may vary from very small to very large. Their shapes may have 1D, 2D or 3D configurations. Depending on the frequency, waves are propagation over ground, through troposphere and ionosphere; diversity principles, propagation effects in microwave systems, satellite, space, and radar links.

This course deals Review of electromagnetic radiation. Radiation from current elements, loops, short wires. Antenna parameters. Reciprocity, equivalence and induction theorems. Linear antennas. Radiation pattern and impedance. Antenna arrays and the general antenna formulas. Receiving antenna theory. Elements of ground wave, tropospheric and ionospheric propagation.

It gives about the basic concepts of the antenna parameters and also about the various antenna theorems in detail.

Antennas are the basic components of any electric systems and are connecting links between the transmeter and free space and the receiver. Antenna place a vital role in finding the characteristics of the system in which antennas are employed. It gives in detail about the various types of microwave, VHF, and UHF antennas, their characteristics and the various applications. It also gives about the wave propagation in the various layers.

Prerequisites

Requires the knowledge of Physics, Electromagnetic Theory and Transmission lines

COURSE OBJECTIVES:

Students will be able to

1. Discuss the parameters and fundamental concepts of antennas.
2. Demonstrate electric and magnetic fields and radiation patterns for different types of antennas.
3. Construct different arrays of antennas in order to improve their gain and directivity.
4. Classify the various types of antennas depending upon frequency and working.
5. Explain the basic propagation of wave in troposphere, ionosphere regions.

COURSE OUTCOMES:

At the end of the course, the student will develop ability to

1. Explain antenna radiation patterns and other essential parameters of the antenna.
2. Solve engineering problems related to the radiation characteristics of different types of antennas.
3. Describe directivity of loop antennas.
4. Design the array of antennas in different ways to increase gain.
5. Explain various feeding mechanisms for antennas.
6. Compare horn antenna and reflector antennas.
7. Explain different types of wave propagation in atmosphere above earth surface.
8. Solve problems on critical frequency, maximum usable frequency and skip distance.

UNIT – I

Antenna Basics: Introduction, basic antenna parameters – patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity- Gain- Resolution, Antenna Apertures, Effective height Illustrative problems. Fields from oscillating dipole, field zones, shape-impedance considerations, antenna temperature, front-to-back ratio, antenna theorems, Helmholtz theorem related problems.

UNIT – II

Thin Linear Wire Antennas: Retarded potentials Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam width, Directivity, Effective Area and Effective Height. Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths Illustrative problems.

Loop Antennas: Introduction Small Loops Comparison of far fields of small loop and short dipole, radiation resistances and directivities of small and large loops (Qualitative treatment)

UNIT – III

Antenna Arrays: 2-element arrays – different cases, N-elements Linear Arrays – Broadside, Endfire arrays Derivation of their characteristics and comparison, Principal of Multiplication of patterns, Binomial Arrays.

Non-Resonant Radiators: Introduction, Travelling wave radiators – basic concepts, Vantennas, Rhombic antennas.

UNIT – IV

VHF, UHF and Microwave Antennas: Arrays with parasitic elements, folded dipoles, Yagi-Uda antenna, Plane sheet and corner reflectors, Paraboloidal Reflectors – Characteristics, types of feeds, spill over, aperture blocking, offset feed, Cassegrain Feeds.

Horn Antennas – Types, characteristics, optimum horns. Lens Antennas – features, applications.

UNIT – V

Wave Propagation: Concepts – factors involved, Ground Wave Propagation – Characteristics, wave tilt, flat and spherical earth considerations. Ionosphere – formation of layers and mechanism of propagation, reflection and refraction mechanisms, Critical Frequency, MUF, Optimum frequency, skip distance, Virtual Height; Considerations in space wave propagation M-Curves and Duct Propagation, Tropospheric Scattering.

TEXT BOOKS:

1. John D. Kraus and Ronald J. Mathefka, "Antennas", TMH.
2. E.C. Jordan and K.G. Balman, "Electromagnetic Waves and Radiating Systems", Prentice Hall India Learning Private Limited, 2nd Edition, 1964.

REFERENCE BOOKS:

1. K.D. Prasad, "Antennas and Wave Propagation", Sataya Prakashan Publication.
2. F.E. Terman, "Electronic and Radio Engineering", McGraw Hill Publication.
3. Balanis, Constantine-A, "Antenna Theory", John Wiley, New Delhi, 2nd Edition, 2008.
4. Raju GSN, "Antenna and Wave Propagation", Pearson, New Delhi, 2006.

WEBSITES

1. www.awpl@ece.uic.edu
2. www.eecs.tufts.edu
3. www.ryerson.ca/ualca/programs/compeng.html
4. www.peeas.ecs.umass.edu/degee/ece_degeee.html
5. www.georgefox.edu/catlog/undergrad/enge.html

CONTENT BEYOND SYLLABUS:

Introduction to Smart antennas and Micro waves.

LECTURE PLAN

Sl. No.	Topics in syllabus Modules and Sub modules	Lecture No.	Suggested books with Page Nos.
UNIT – I (No. of Lectures – 11)			
1	**UNIT-I:** Introduction to Antenna	L1	T1, 1-2
2	Antenna parameters: radiation pattern, radiation intensity, gain	L2	T1, 11-14
3	directive gain, directivity, half power beam width	L3	T1, 18-20
4	beam area, beam efficiency, Antenna aperture.	L4	T1, 15-18, 23-25
5	Effective height, problems	L5	T1, 25
6	fields form oscillating dipole, field zones.	L6	T1, 31-35
7	shape-impedance considerations, antenna temperature.	L7	R1, 579
8	front to back ratio, antenna theorems	L8	R1, 572
9	radiation-basic maxwell's equations	L9	R1, 355-357
10	related potentials-helmholtz theorem	L10 L11	R1, 415
UNIT –II (No. of Lectures – 12)			
11	**Thin Linear Wire Antennas** : radiation from small electric dipole	L12	T1, 157
12	Quarter wave, monopole	L13	R1, 698
13	Half wave dipole- current distributions	L14	T1, 157
14	field components, radiated power, radiation resistance.	L15 L16	T1, 157-166
15	beam width, directivity, effective area. Effective height	L17	R1, 691, 693
16	Natural current distributions, far field and patterns of thin linear antenna	L18	R1, 692
17	problems	L19	T1, 169
18	**Loop antennas:** introduction to loop antenna.	L20	T1, 238
19	small loops comparison of far field of small loop	L21	T1, 242
20	short dipole, radiation resistance	L22	T1, 200-201
21	directivities of small and large loops	L23	T1, 254
UNIT –III (No. of Lectures – 11)			
22	**Antenna Arrays:** 2-Element arrays-different cases	L24	R1, 606
23	N-elements Linear arrays Broadside array Derivation of their characteristics	L25 L26	R1, 617
24	N-elements Linear array send fire array Derivation of their characteristics	L27 L28	R1, 620
25	comparison	L29	R1, 617-620
26	Principle of Multiplication of patterns	L30	R1, 635-636
27	Bionomial arrays.	L31	R1, 635-637
28	Non- Resonant Radiators: Introduction.	L32	R1, 700
29	Travelling wave radiators concepts	L33	R1, 716
30	V- antennas, Rhombic antennas	L34	T1, 227-230

UNIT – IV (No. of Lectures – 12)			
31	**VHF,UHF and Microwave Antennas** : Arrays with parasitic elements	L35	T1, 232
32	folded dipole	L36	T1,232-235
33	yagi-uda antenna	L37	T1, 214-216
34	plane sheet reflector, corner reflectors.	L38	T1, 369, 374-381
35	paraboliddal reflectors- characteristics	L39	T1, 385-389, 396
36	types of speeds, spill over, aperture blocking, offset feed.	L40	T1, 396, 305
37	cassegrain feeds	L41	T1, 613
38	horn antennas- types, characteristics, optimum horns	L42 L43	T1, 283-284
39	optimum horns	L44	T1, 285-286
40	Lens antenna- features, dielectric lenses	L45	T1, 406
41	Lens antenna- metal plate lenses, applications	L46	T1, 409
UNIT –V (No. of Lectures – 15)			
42	**UNIT-V : Wave Propagation** introduction to wave propagation	L47	R1, 1102, 1106
43	Ground wave propagation- characteristics wave tilt, flat, spherical earth considerations	L48	R1, 1106
44	ionosphere formation of layers	L49	R1, 1117-1118
45	mechanism of propagation	L50	R1, 1113
46	reflection and refraction mechanism	L51	R1, 1110
47	critical frequency	L52	R1, 1122
48	MUF(maximum Usable Frequency)	L53	R1, 1139
49	optimum frequency	L54	R1, 1145
50	skip distance	L55	R1, 1144
51	virtual height	L56	R1, 1136
52	space wave propagation	L57	R1, 1152
53	M- curves	L58	R1, 1152
54	Duct propagation	L59	R1, 1160
55	tropospheric scattering	L60	R1, 1113
56	problems	L61	R1, 1198, 1201-1202

Review Questions
UNIT-I

1. Explain in detail about the below Antenna parameters.
i) Radiation lobes
ii) FNBW
iii) Radiation intensity
2. Explain in detail about Antenna field zones and Antenna temperature.
3. Find the relation between Maximum effective aperture & Effective length.
4. Explain briefly about Shape impedance considerations and Field zones.

5. Explain in detail about the oscillating dipole.

6. Drive the Expressions for Helm Holtz theorem.

7. Define following terms
    a. Directivity
    b. Radiation intensity
    c. Solid angle
    d. Front to back ratio
8. An antenna has a loss resistance 10 ohms, power gain of 20 and directivity 22. calculate its radiation resistance
9. A. The radiation resistance of an antenna is 72 ohm and loss resistance is 8 ohm. What is its the directivity, if the power gain is 16.
    B. Find the relation between Maximum effective aperture & Directivity

UNIT-II

9. Derive an expression for the Radiation resistance of a loop antenna
    B. Calculate the maximum effective Aperture of a half-wave dipole antenna
10. Calculate the Effective aperture of a half wave dipole
11. A thin dipole antenna is $\lambda/15$ long. If its loss resistance is 1.5 ohm, find radiation resistance and its efficiency.
12. Find the Radiation Resistance of a small dipole.
13. Establish the field expression for a small loop with neat sketch.
14. Derive the electric and magnetic field intensity of a small circular loop antenna.
15. Explain in detail about working of a small rectangular loop antenna in detail.
16. Prove that the phase angle of a rectangular loop antenna is $\beta d \sin\theta$.
17. Derive the field intensity expressions from the radiation of a small current element(short dipole)

UNIT-III

1. Drive the Electric field due to two isotropic point sources with equal magnitude and phase and draw the radiation pattern.
2. Explain in detail about endfire array
3. Write the operation of Rhombic antenna
4. Drive the Electric field due to two isotropic point sources with equal magnitude and out of phase and draw the radiation pattern.
5. Compare broadside array and endfire array
6. Explain briefly about multiplication pattern. With an example.
7. Explain principle of Binomial Array
8. explain briefly about travelling wave radiator
9. What is meant by uniform linear array
10. Write the difference between resonant and non resonant antennas
11. Explain about parasitic elements

UNIT-IV

1. Explain various features of horn antenna along with its diagram
2. Explain why folded dipole bandwidth is more than the single dipole. And derive the expression for it.
3. Explain square corner reflector with image elements .
4. Briefly explain the principle of lens antenna.
5. Explain about cassegrain feed and mention the disadvantages and advantages.
6. A Paraboloid reflector of 1.8m diameter is used at 6GHz. Calculate the beam width between the nulls and gain in dBs.
7. Define following terms
   a. Spill over
   b. Aperture blocking
   c. Offset feed
8. What is Yagi-Uda antenna? Explain the construction and operation of yagi-uda antenna.
9. Write short notes on paraboloidal reflector

UNIT-V

1. Explain a. Ground wave propagation
   b. Sky wave propagation
   c. Space wave propagation

2. Explain duct propagation.
3. Write about M curves.
4. Derive the expression for MUF and critical frequency.
5. Derive the relationship between Critical frequency and MUF.
6. Define skip distance, virtual height, optimum working frequency
7. Explain Super refraction
8. Explain briefly about ionosphere formation of layers.
9. Define i) MUF ii) Skip distance

(EC120) ANALOG COMMUNICATION LAB

COURSE OBJECTIVES:

The students will be able to

1. Analyze amplitude modulation and demodulation. .
2. Examine the frequency modulation and demodulation.
3. Design and analyze pre-emphasis and de emphasis circuits.
4. Examine the operation of TDM and FDM.
5. Analyze different pulse modulation techniques.

COURSE OUTCOMES:

At the end of the course the students will develop ability to

1. Measure modulation index of AM and simulate using MATLAB. .
2. Construct the modulating signal from AM wave using diode detector and simulate using MATLAB.
3. Generate the modulated and demodulated waves of SSB-SC and DSB-SC and simulate using MATLAB.
4. Perform the FM demodulation using PLL.
5. Analyze the operations of pre-emphasis and de-emphasis circuits and simulate using MATLAB. .
6. Analyze the operation of TDM and FDM and simulate using MATLAB.
7. Analyze the operation of sampling theorem and simulate using MATLAB.
8. Analyze various pulse modulation schemes and simulate using MATLAB.

LIST OF EXPERIMENTS: (Note: minimum 10 experiments should be conducted) All these experiments are to be simulated first either using Commsim, MATLAB, SCILAB, OCTAVE or any other simulation package and then to be realized in hardware.

1. Amplitude modulation and demodulation.
2. DSB-SC modulator and detector.
3. SSB-SC modulator and detector (phase shift method).
4. Frequency modulation and demodulation.
5. Study of spectrum analyzer and analysis of AM and FM signals.
6. Pre- emphasis and de-emphasis.
7. Time division multiplexing and de multiplexing.
8. Frequency division multiplexing and de multiplexing.
9. Verification of sampling theorem.
10. Pulse amplitude modulation and de modulation.
11. Pulse width modulation and de modulation.
12. Pulse position modulation and de modulation.
13. Frequency synthesizer.
14. AGC characteristics.
15. PLL as FM demodulator.

(EC121) MICROPROCESSORS AND MICROCONTROLLERS LAB

COURSE OBJECTIVES:

Students will be able to

1. List the features of 8086 microprocessor and 8051 microcontroller.
2. Describe accessing of data using different addressing modes.
3. Develop assembly language programs for 8086 microprocessor and 8051 microcontroller.
4. Analyze interfacing of peripheral devices with 8086 (analyze).
5. Test operation of timers/counters, serial / parallel ports, interrupts using 8051.

COURSE OUTCOMES:

At the end of the course, the student will develop ability to

1. Write assembly level programs on arithmetic operations using various addressing modes.
2. Familiarize with the assembly level programming on strings.
3. Apply the concepts of assembly level programming on sorting and code conversions.
4. Design interfacing of various I/O devices to microprocessor.
5. Write assembly language programs on 8051 microcontroller.
6. Apply the concept of serial communication for transmission of serial data.
7. Verify the ports, timers, and interrupts operation in 8051 microcontroller.
8. Design and implement microcontroller-based embedded system.

LIST OF EXPERIMENTS:

I. Microprocessor 8086

1. Introduction to Assembler.
2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. DOS/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.

II. Interfacing

1. ADC/DAC 2. Stepper Motor 3. Traffic Light 4. Keyboard

III. Microcontroller 8051

1. Programming on arithmetic operations
2. Reading and writing on a parallel port.
3. Timer in different modes
4. Serial communication implementation.
5. Interfacing: switches, LEDs, LCD.