INSTITUTE VISION

"To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society"

INSTITUTE MISSION

"To continuously strive for the overall development of students, educating them in a state of the art infrastructure, by retaining the best practices, people and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals"

DEPARTMENTAL VISION

"To be the centre of excellence in providing education in the field of Electronics and Communication Engineering to produce technically competent and socially responsible engineering graduates."

DEPARTMENTAL MISSION

"Educating students to prepare them for professional competencies in the broader areas of the Electronics and Communication Engineering field by inculcating analytical skills, research abilities and encouraging culture of continuous learning for solving real time problems using modern tool".

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1:

Acquire core competence in Applied Science, Mathematics, and Electronics and Communication Engineering fundamentals to excel in professional carrier and higher study.

PEO2:

Design, Demonstrate and Analyze the Electronic Systems which are useful to society.

PEO3:

Maintain Professional and Ethical values, Employability skills, Multidisciplinary approach and an Ability to realize Engineering issues to broader social contest by engaging in lifelong learning.

PROGRAM OUTCOMES(POs):

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

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

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

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

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

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

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

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

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

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

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and mangement 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. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

STUDENT HELP DESK

Sr.No.	Name of the Faculty	Activities
1	Prof. S. B. Akkole	GATE / Preplacement Coaching
		ED Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Participation in Funded Projects
2	Dr. R. R. Maggavi	GATE / Preplacement Coaching
		CN Lab Incharge
		Students Mentor
		Module Coordinator
		Research Center Coordinator
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
		Innovations Club Coordinator
3	Prof. S. S. Malaj	GATE / Preplacement Coaching
		Adv.Comm. Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
		NIRF Coordinator
		Conference Coordinator
04	Prof. S. S. Kamate	GATE / Preplacement Coaching
		VLSI Lab Incharge
		Students Mentor
		Module Coordinator
		IEEE Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Project Coordinator
05	Porf. D. M. Kumbhar	GATE / Preplacement Coaching
		AC Lab Incharge
		Students Mentor
		Dept. Association Coordinator
		Class Teacher
		IIIC Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Dept. ED Cell Coordinator

Sr.No.	Name of the Faculty	Activities
06	Prof. S. S. Patil	GATE / Preplacement Coaching
		ARM & ES Lab Incharge
		Students Mentor
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Admission Coordinator
		Module Coordinator
07	Prof. D. B. Madihalli	GATE / Preplacement Coaching
		DSD Lab Incharge
		Students Mentor
		NBA Coordinator
		News & Publicity Coordinator
		NBA Criteria Coordinator
		Website Coordinator
		VTU LIC Coordinator
08	Prof. P. V. Patil	GATE / Preplacement Coaching
		HDL Lab Incharge
		Students Mentor
		NBA Criteria Coordinator
		T&P Cell Coordinator
		Alumni Coordinator
09	Prof. S. S. Ittannavar	GATE / Preplacement Coaching
		DSP Lab Incharge
		Students Mentor
		EMS/ IA Coordinator
		News Letter / Technical Magazine
		ISTE Coordinator
		AICTE Coordinator
10	Prof. B. P. Khot	GATE / Preplacement Coaching
		MC Lab Incharge
		Students Mentor
		Dept. Time Table Coordinator & Meeting Coordinator
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator

CONTENTS

FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty.	10	15.76Y
2	Technical supporting staff.	03	21.02Y
3	Helper staff	02	20.50Y

MAJOR LABORATORIES

S.N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs	S.N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs
1	Digital Electronics Lab	71	1.54	5	VLSI Lab	71	35.51
2	Analog Electronics (ED &I) Lab	92	8.24	6	Project Lab	95	--
3	Advanced Commn & Commn + LIC Lab	92	20.50	7	Research/E-Yantra/DSP & C.N.Lab	71	16.49
4	HDL/MC / EMD Lab	71	19.57	8	Power Electronics Lab	--	4.86
Total Investment In The Department					**Rs. 95.31 Lacs**		

FACULTY DETAILS

TEACHING FACULTY

S.N.	Name and Designation	Qualification	Specialization	Professional Membership	Teaching Exp.	Contact No.
1	Dr. R. R. Maggavi	Ph.D	E&C	LMISTE	17Y.05M	9480275583
2	Sri S B Akkole	M.Tech.	Communication	LMISTE	27Y.03M	9480422508
3	Smt.S.S.Kamate	M.Tech	Digital Electronics	LMISTE	19Y.00M	9008696825
4	Smt. S. S. Malaj	M.E.	E & TC	LMISTE	24Y.07M	9731795803
5	Sri. D.M. Kumbhar	M.Tech	Electronics	LMISTE	17Y.10M	09373609880
6	Sri. Sachin .S. Patil	M.Tech	VLSI & Embedded	LMISTE	17Y.08M	9448102010
7	Sri .D.B. Madihalli	M.Tech	Industrial Electronics	LMISTE	14Y.07M	9902854324
8	Sri.P.V.Patil	M.Tech	VLSI & Embedded	LMISTE	9Y.04M	9731104059
9	Sri.S.S.Ittannavar	M.Tech	DSP	LMISTE	8Y.11M	9964299498
10	Smt. B. P. Khot	M.Tech	Microelectronics & Control Systems	LMISTE	5Y.11M	9964019501

TECHNICAL SUPPORTING STAFF

S.N.	Name	Qualification	Experience (in years)
1.	Sri. P. S. Desai	DEC	21Y-.07M
2.	Sri. V. V. Guruwodeyar	DEC	30Y-02 M
3.	Sri.M.A.Attar	DEC	11Y-09M

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education(OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

V SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week L	Teaching Hours /Week T	Teaching Hours /Week P	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1	HSMC	18ES51	Technological Innovation Management And Entrepreneurship		3	0	--	03	40	60	100	3
2	PCC	18EC52	Digital Signal Processing		3	2	--	03	40	60	100	4
3	PCC	18EC53	Principles of Communication Systems		3	2	--	03	40	60	100	4
4	PCC	18EC54	Information Theory & Coding		3	--	--	03	40	60	100	3
5	PCC	18EC55	Electromagnetic Waves		3	--	--	03	40	60	100	3
6	PCC	18EC56	Verilog HDL		3	--	--	03	40	60	100	3
7	PCC	18ECL57	Digital Signal Processing Laboratory		--	2	2	03	40	60	100	2
8	PCC	18ECL58	HDL Laboratory		--	2	2	03	40	60	100	2
9	HSMC	18CIV59	Environmental Studies	Civil/ Environmental [Paper setting: Civil Engineering Board]	1	--	--	02	40	60	100	1
			TOTAL		19	08	4	26	360	540	900	25

Note: PCC:Professional Core, HSMC: Humanity and Social Science.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

ACADEMIC CALENDER 2020-21

			IQAC
	S J P N Trust's		**File I-11**
	Hirasugar Institute of Technology, Nidasoshi.		**2021-22 (Odd)**
	Inculcating Values, Promoting Prosperity		
	Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi.		**Rev: 00**
	Recognized Under Section 2(f) of UGC Act, 1956.		
	Accredited at ' A' Grade by NAAC, Programmes Accredited by NBA: CSE, ECE, EEE& ME.		

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2021-22 (ODD)

Date	Events
01-10-2021	Commencement of V/VII Semester Classes
02-10-2021	Gandhi Jayanthi & Swachh Bharat Abhiyan
18-10-2021	Commencement of III Semester Classes
01-11-2021	Kannad Rajyotsava
20-11-2021	Awareness Program on NEP
25-11-2021 to 27-11-2021	First Internal Assessment for III/V/VII Semester
29-11-2021	Feedback-I on Teaching-Learning
01-12-2021	Display of 1st Internal Assessment Marks and submission of Feedback-I to office
02-12-2021 to 04-12-2021	EDP Activities/ Green Club Activities
11-12-2021	Awareness Program on NEP
27-12-2021 to 29-12-2021	Second Internal Assessment for III/V/VII Semester
30-12-2021	Feedback-II on Teaching-Learning
03-01-2022	Display of 2nd Internal Assessment Marks and submission of Feedback-II to office
10-01-2022	Sports Day
11-01-2022	HSIT-Quest 2022
12-01-2022	HSIT-Fest 2022
13-01-2022	Blood Donation Camp
24-01-2022 to 25-01-2022	Lab Internal Assessment for V/VII Semester
27-01-2022 to 29-01-2022	Third Internal Assessment for V/VII Semester
31-01-2022	Display of Final Marks of V/VII Semester
31-01-2022	Last working day of V/VII Semester
10-02-2022 to 12-02-2022	Third Internal Assessment for III Semester
14-02-2022 to 15-02-2022	Lab Internal Assessment for III Semester
17-02-2022	Display of Final Marks of III Semester
19-02-2022	Last working day of III Semester
01-02-2022 to 10-02-2022	Practical Examinations for V/VII Semester
11-02-2022 to 25-03-2022	Theory Examinations for V/ VII Semester
21-02-2022 to 04-03-2022	Practical Examinations for III Semester
07-03-2022 to 25-03-2022	Theory Examinations for III Semester

October-2021

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

2-Gandhi Jayanthi, 6-Mahalaya Amavasya
14-Mahanavami, Ayudhapooja
15-Vijayadashami
20-Valmiki Jayanthi, Eid-Milad

November-2021

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

1-Kannada Rajyotsava, 3-Naraka Chaturdashi
5-Balipadyami Deepavalli
22-kanakadasa Jayanti

December-2021

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

25-Christmas

January-2022

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

14-Makar Sankranti, 26-Republic Day

February-2022

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

01/10/2021

Dr. B. V. Madiggond
IQAC Coordinator

01/10/21

Dr. S. C. Kamate
Principal

Subject Title	Technological Innovation Management and Entrepreneurship		
Subject Code	18ES51	CIE Marks	40
Number of Lecture Hrs / Week	03 L	SEE Marks	60
Total Number of Lecture Hrs	40 (08 Hrs/Module)	Exam Hours	03

FACULTY DETAILS:

Name: Prof. Sunita.S.Malaj	Designation: Assistant Professor	Experience: 24 Years
No. of times course taught: 04	Specialization: E & TC	

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
1	-----		

2.0   Course Objectives

This course will enable students to:
- Understand basic skills of Management.
- Understand the need for Entrepreneurs and their skills.
- Understand project identification and selection.
- Identify the Management functions and social responsibilities.
- Distinguish between management and administration.

3.0   Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	RBT Level	POs
C301.1	Understand basic skills of Management.	L1, L2	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.2	Understand the Concept of organizing, Staffing Directing & Controlling in Management Field.	L1, L2	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.3	Identify Social Responsibilities & Understand the need for Entrepreneurs and their skills	L1, L2	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.4	Understand the Ideation process, Creation of Business Model	L1, L2	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.5	Understand Feasibiltiy Study & sources of funding	L1, L2, L3	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
Total Hours of instruction		**40**	

4.0 Course Content

Module 1

Management: Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession (Selected topics of Chapter 1, Text 1).

Planning: Planning-Nature, Importance, Types, Steps and Limitations of Planning; Decision Making – Meaning, Types and Steps in Decision Making(Selected topics from Chapters 4 & 5, Text 1). L1,L2

Module 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing**-Need and Importance, Recruitment and Selection Process (Selected topics from Chapters 7, 8 & 11,Text 1).

Directing and Controlling: Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioral Approach of Leadership; Coordination-Meaning, Types, Techniques of Coordination; Controlling – Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process (Selected topics from Chapters 15 to 18 and 9, Text 1).L1,L2

Module 3

Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance (Selected topics from Chapter 3, Text 1). L1, L2.

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship (Selected topics from Chapter 2, Text 2). L1,L2.

Module 4

Family Business: Role and Importance of Family Business, Contributions of Family Business in India, Stages of Development of a Family Business, Characteristics of a Family-owned Business in India, Various types of family businesses (Selected topics from Chapter 4,(Page 71-75) Text 2).

Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.(Selected topics from Chapter 6(Page No. 111-117) & Chapter 7(Page No. 140-142), Text 2)

Module 5

Business model – Meaning, designing, analyzing and improvising; Business Plan – Meaning, Scope and Need; Financial, Marketing, Human Resource and Production/Service Plan; Business plan Formats; Project report preparation and presentation; Why some Business Plan fails?

(Selected topics from Chapter 8 (Page No 159-164, Text 2)

Financing and How to start a Business? Financial opportunity identification; Banking sources; Nonbanking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise**(Selected topics from Chapter 7(Page No 147-149), Chapter 5(Page No 93-99) &**

Chapter 8(Page No. 166-172) Text 2)

Project Design and Network Analysis: Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences**.(Selected topics from Chapters 20, Text 3).**

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Project identification, Project documentation, Project Report

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Apply management skills to various industrial aspects.
02	Develop Entrepreneurship skills.
03	Start a small scale industry.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Staffing, directing, project preparation
02	NPTEL	http://nptel.ac.in/courses

8.0 Books Used and Recommended to Students

Text Books

1. Principles of Management – P.C Tripathi, P N Reddy, McGraw Hill Education, 6th Edition,2017, ISBN-13:978-93-5260-535-4.

2. Entrepreneurship, Development Small Business Enterprises-Poornima M Charantimath, Pearson Education 2008, ISBN 978-81-7758-260-4.

3. Dynamics of Entrepreneurial Development & Management by Vasant Desai.HPH 2007, ISBN: 978-81-8488-801-2.

Reference Books

1. Essentials of Management: an International, Innovation and Leadership perspective by Harold Koontz, Heinz Weihrich McGraw Hill Education,10 th Edition 2016,ISBN- 978-93-392-2286-4.

Additional Study material & e-Books

1. NPTEL notes and Videos

2. VTU notes from website.

9.0	**Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended**

Website and Internet Contents References

01) https://www.managementconcepts.com/Training

02) https://www.entrepreneur.com/article/239274

03) http://www.assocmc.com/

10.0   Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	International Journal of Management Concepts and Philosophy	http://www.inderscience.com/jhome.php?jcode=ijmcp
2	International Journal of Management and Decision Making	http://www.inderscience.com/jhome.php?jcode=ijmdm
3	International Journal of Management in education	http://www.inderscience.com/jhome.php?jcode=IJMIE

11.0   Examination Note

Scheme of Evaluation for CIE (40 Marks)

Internal Assessment test will be done in the same pattern as that of the main examination.
Internal Assessment: 30 Marks
Assignment: 10 Marks

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.

The question paper will have ten questions.

- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	**Management:** Nature and functions of Management-Importance, Definition, Management Functions	20
	2	Levels of Management, Roles of Manager, Managerial skills	
	3	Management and Administration	
	4	Management as a science	
	5	Management as a Art & Profession	
	6	**Planning:** Nature & Importance, Types.	
	7	Steps and Limitation of Planning	
	8	Steps and Limitations of Planning.	
	9	Decision Making-Meaning, Types	
	10	Decision Making, Steps in Decision making.	
2	11	**Organizing and Staffing:** Meaning, Characteristics, Process of Organizing.	40
	12	Principles of organizing, Span of Management.	
	13	Departmentalization, Committees-Meaning, Types of Committees	
	14	Centralization Vs Decentralization of Authority and Responsibility.	
	15	Staffing-Need and Importance, Recruitment and selection process.	
	16	**Directing and Controlling:** Meaning and Requirements of Effective Direction, Giving Orders. Motivation-Nature of Motivation, Motivation Theories.	
	17	Communication-Meaning, Importance and purposes of communication	
	18	Leadership-Meaning, Characteristics ,Behavioral Approach of Leadership, Coordination-Meaning	
	19	Types, Techniques of coordination, Controlling-Meaning, Need for control system.	
	20	Benefits of Effective Control System, Steps in control process.	
3	21.	**Social Responsibilities of Business**: Meaning of Social Responsibility.	60
	22	Social Responsibilities of Business towards Different Groups.	
	23	Social Audit	
	24	Business Ethics and Corporate Governance.	
	25	Business Ethics and Corporate Governance.	
	26	**Entrepreneurship:** Definition of Entrepreneur, Importance of Entrepreneurship.	
	27	Concepts of Entrepreneurship, Characteristics of Successful Entrepreneur.	
	28	Classification of Entrepreneurs, Myths of Entrepreneurship	
	29	Entrepreneurial Development Models, Entrepreneurial development cycle.	
	30	Problems faced by Entrepreneurs and capacity building for Entrepreneurship.	

	31	**Family Business**: Role and Importance of Family Business.	
4	32	Contributions of Family Business in India, Stages of Development of a Family Business.	80
	33	Characteristics of a Family-owned Business in India.	
	34	Various types of family businesses.	
	35	**Idea Generation and Feasibility Analysis**- Idea Generation.	
	36	Creativity and Innovation; Identification of Business Opportunities.	
	37	Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities.	
	38	Market Entry Strategies; Marketing Feasibility; Financial Feasibilities.	
	39	Technical Feasibilities; Managerial Feasibility.	
	40	Location and Other Utilities Feasibilities.	
5	41	**Business model** – Meaning, designing, analyzing and improvising.	100
	42	Business Plan – Meaning, Scope and Need.	
	43	Financial, Marketing, Human Resource and Production/Service Plan.	
	44	Business plan Formats; Project report preparation and presentation	
	45	Why some Business Plan fails?	
	46	**Financing and How to start a Business?** Financial opportunity identification; Banking sources. Nonbanking Institutions and Agencies ; Venture Capital – Meaning and Role in Entrepreneurship.	
	47	Government Schemes for funding business; Pre launch, Launch and Post launch requirements	
	48	Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise	
	49	**Project Design nd Network Analysis** : Introduction, Importance of Network, Origin of PERT and CPM, Network, Network Techniques.	
	50	Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Management, Administration, Planning.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Organizing and Staffing & Directing and Controlling.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Entrepreneurship and SSI	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	5	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

| 4 | Assignment 2: University Questions on Project Management and Network Techniques. | Students study the Topics and write the Answers. Get practice to solve university questions. | Module 4 of the syllabus | 6 | Individual Activity. Printed solution expected. | Book 1, 2 of the reference list. Website of the Reference list |
| 5 | Assignment 5: University Questions on Project review and Financial Management. | Students study the Topics and write the Answers. Get practice to solve university questions. | Module 5 of the syllabus | 6 | Individual Activity. Printed solution expected. | Book 1, 2 of the reference list. Website of the Reference list |

14.0   QUESTION BANK

MODULE -1

Management

1. Define the term management and write down the characteristic
2. What is meant by the scope of management and how it can be understood, explain in detail
3. What are the different functional areas of management and at least explain 5 of them.
4. What is the basic aim of management and write down its functions.
5. Explain the term Management as a Science and its properties.
6. Explain the properties of management.
7. Explain the term Management as a Art and its properties
8. Explain the term Management as a Profession and its properties.
9. Distinguish between administration and management.
10. What are the roles of management?

Planning

1. Define the term planning and explain its different characteristics.
2. Explain the importance and purpose of planning process.
3. What are the different steps in planning processes explain each step in detail.
4. What are the objectives of planning process?
5. How organizational plans can be broadly classified.
6. What is decision making and write down the characteristics of it.
7. Write notes on a) strategic planning b) tactical planning c) operational planning.
8. Draw a block diagram showing hierarchy of plans.

MODULE -2

Organization and Staffing

1. Explain the term organization and write down its characteristics.
2. Write down the different principles of organization and explain each.
3. What is meant by formal and informal organization?
4. With neat block diagram explain line, military or scalar organization.
5. Draw a neat block diagram showing the functional organizational chart and explain it.
6. Write down the different application of functional organization.
7. List the applications line and staff organization.
8. Write a note on matrix or grid organization.

9. Write down the advantages and disadvantages of Departmentation.

10. What are the different types of committees?

11. Write a note on centralization and decentralization.

12. Briefly explain the difference between authority and responsibility.

Directing and Controlling

1. Explain the meaning of directing. What are the different features of directing?

2. What is leadership? and what are the different leader ship styles.

3. What is motivation? Write down its characteristics.

4. Write a note on Maslow's hierarchy of needs theory with a block diagram.

5. Write a note on the two-factor theory.

6. Compare the Maslow's theory and Herzberg theory.

7. Distinguish between theory X and theory Y.

8. Explain McClelland's three need model, VROOM'S VALANCE EXPECTANCY Theory.

9. What is communication and write down the importance of communication

10. Explain the term coordination and write down its importance.

11. What is controlling and what are the different steps involved in controlling.

MODULE -3

Social Responsibilities of Business:

1. What is Meaning of Social Responsibility

2. Explain Social Responsibilities of Business towards Different Groups.

3. What is Social Audit?

4. Explain Internal and External Audit.

Entrepreneurship

1. What is entrepreneurship explain the concept.

2. Differentiate between Manager and Entrepreneur

3. What are the functions of entrepreneur?

4. Write a note on types of entrepreneurs.

5. Differentiate between entrepreneur and entrepreneur.

6. What is the role of entrepreneurs in economy development?

7. Write a note on barriers to entrepreneurship.

8. Write a note on entrepreneurship in India.

MODULE -4

Family Business & Idea Generation & Feasibility

1. What is the role & Importance of family business? Explain.

2. What are the Contributions of Family Business in India ? Explain.

3. Explain the stages of Development of a Family Business ?

4. What are the Characteristics of a Family –owned Business in India? Explain.

5. Explain the Various types of family businesses.

6. Explain the concept of Idea Generation.

7. What is Creativity & Innovation .Explain.

8. Explain the identification of Business Opportunities Concept.

9. Explain the concept of Market Entry Strategies.

10. Explain Marketing Feasibility.

11. Write short notes on the following:

i) Financial Feasibilities ii) Political Feasibilities iii) Economic Feasibility iv) Social and Legal Feasibilites.

MODULE -5

Business Model

1. Explain the meaning, designing, analyzing and improvising Business model.

2. What is the meaning,scope and need of business plan.

3. Explain the concept of Financial Marketing.

4. Explain the concept of Human Resource and Production/Service plan.

5. Explain Business Plan formats.

6. Write the concept of Project report preparation aand presentation.

7. Why some Business Plan fails ?Explain.

Financing and How to start a Business

1. Explain the concept of Financial opportunity identification.

2. Explain the concept of Nonbanking Institutions & Agencies.

3. Explain Pre launch,Launch and Post launch requirements.

4. Write the procedure for getting License and Registration.

5. What are the Challenges and Difficulties in starting an Enterprise.

Project Design and Network Analysis

1 Give the Introduction to Project Design and Network Analysis.

2. Explain the concept of Origin of PERT and CPM.

3. Explain the need for Network Techniques.

4. What are the steps in PERT.

5. Give the Limitations and differences of PERT & CPM.

15.0   University Result

Examination	FCD	FC	SC	% Passing
Jan-2021	18	13	04	100
Jan-2020	00	11	19	100

Prepared By	Checked By		
Prof. S. S. Malaj	Prof. S. S. Patil	HOD	Principal

Subject Title	Digital Signal Processing		
Subject Code	18EC52	IA Marks	40
Number of Lecture Hrs / Week	03+02	Exam Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03

FACULTY DETAILS:

Name: Prof. S. S. Ittannavar	**Designation:** Assistant Professor	**Experience:**8.6 yrs
No. of times course taught:07	**Specialization:** DIGITAL SIGNAL PROCESSING	

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	IV	Signals and Systems
02	ECE	IV	Linear Integrated Circuits

2.0   Course Objectives

This course will enable students to
- Understand the frequency domain sampling and reconstruction of discrete time signals.
- Study the properties and the development of efficient algorithms for the computation of DFT.
- Realization of FIR and IIR filters in different structural forms.
- Learn the procedures to design of IIR filters from the analog filters using impulse invariance and bilinear transformation.
- Study the different windows used in the design of FIR filters and design appropriate filters based on the specifications

3.0   Course Outcomes

Having successfully completed this course, the student will be able to

	Course Outcome	RBT Level	POs
C302.1	Determine response of LTI systems using time domain and DFT techniques.	L1, L2, L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C302.2	Compute DFT of real and complex discrete time signals.	L1, L2, L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C302.3	Computation of DFT using FFT algorithms and linear filtering approach.	L1, L2, L3	PO1, PO2, PO3, PO4, PO6, PO8, PO11, PO12
C302.4	Design and realize FIR and IIR digital filters.	L1, L2, L3	PO1, PO2, PO3, PO4, PO6, PO8, PO11, PO12
C302.5	Understand the DSP processor architecture.	L1, L2, L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
Total Hours of instruction			**50**

4.0	Course Content

Course Content:

MODULE -1	RBT Level
Discrete Fourier Transforms (DFT): Frequency domain sampling and Reconstruction of Discrete Time Signals, The Discrete Fourier Transform, DFT as a linear transformation, Properties of the DFT: Periodicity, Linearity and Symmetry properties, Multiplication of two DFTs and Circular Convolution, Additional DFT properties. **[Text 1]** (10 Hours)	L1, L2,L3
MODULE -2	
Linear filtering methods based on the DFT: Use of DFT in Linear Filtering, Filtering of Long data Sequences. **Fast-Fourier-Transform (FFT) algorithms:** Efficient Computation of the DFT: Radix-2 FFT algorithms for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. **[Text 1]** (10 Hours)	L1, L2, L3
MODULE -3	
Design of FIR Filters: Characteristics of practical frequency –selective filters, Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR filters using windows - Rectangular, Hamming, Hanning, Bartlett windows. Design of FIR filters using frequency sampling method. Structure for FIR Systems: Direct form, Cascade form and Lattice structures.**[Text1]** (10 Hours)	L1, L2, L3
MODULE -4	
IIR Filter Design: Infinite Impulse response Filter Format, Bilinear Transformation Design Method, Analog Filters using Lowpass prototype transformation, Normalized Butterworth Functions, Bilinear Transformation and Frequency Warping, Bilinear Transformation Design Procedure, Digital Butterworth Filter Design using BLT. Realization of IIR Filters in Direct form I and II. **[Text 2]** (10 Hours)	L1, L2, L3
MODULE -5	
Digital Signal Processors: DSP Architecture, DSP Hardware Units, Fixed point format, Floating point Format, IEEE Floating point formats, Fixed point digital signal processors, Floating point processors, FIR and IIR filter implementations in Fixed point systems.**[Text 2]** (10 Hours)	L1, L2, L3

5.0	Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	DSP, image processing and communication
02	VI/VIII	Digital communication, Multimedia Communication	Projects and Research

6.0	Relevance to Real World

Sl. No	Real World Mapping
01	Analyze different types of signals.
02	Design of different types of filers for better the communication

7.0	Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	https://dspguru.com/dsp/tutorials/
02	NPTEL	http://nptel.ac.in/courses/108105055/

8.0	Books Used and Recommended to Students

Text Books
1. **Digital signal processing** – **Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.
Reference Books
1. Discrete Time Signal Processing, Oppenheim & Schaffer, PHI, 2003.
2. Digital Signal Processing, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. Digital Signal Processing, Lee Tan: Elsevier publications, 2007.
Additional Study material & e-Books
1. NPTEL notes and Videos
2. VTU online notes.
3. MAT LAB

9.0	Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
01) http://nptel.ac.in/courses/108105055/
02) https://dspguru.com/dsp/tutorials/
03) http://nptel.ac.in/courses/117102060/

10.0	Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com/digital-signal-processing
2	IEEE Journals	https://signalprocessingsociety.org/
3	Journal on digital signal processing	http://www.imanagerpublications.com/JournalIntroduction.aspx?journal=JournalonDigitalSignalProcessing

11.0	Examination Note

Internal Assessment: 40 Marks
Three IA will be conducted and average of three will be accounted for 30 Marks.
Assignment is10 Marks.
Total is 40 Marks

Scheme of Evaluation for Internal Assessment (50 Marks)
Four full questions will be given which consists of a, b as sub sections.
Students have to answer either Q: 1 or 2 and Q 3 or 4 completely.
Question 1 or 2   for 25 or 25Marks
Question 3 or 4   for 25 or 25Marks
Each IA will be conducted for 50 Marks.
Three IA will be conducted and average of three will be accounted for 30 Marks.
Assignment is 10 Marks
Total = 40Marks
Scheme of External Exam (60 Marks)
Ten questions to be set from the syllabus covered.
Each Module consists of two questions. Each question consists of a, b, c and d sub questions.
Student has to answer one full question from Each Module.
Each Module Consists of 20 Marks. Total 5 Modules=5*20=100 Marks
This 100 Marks results will be converted for 60 Marks.

12.0   Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	**Discrete Fourier Transforms (DFT):** Frequency domain sampling and Problems	20
	2	Reconstruction of Discrete Time Signals and Problems	
	3	The Discrete Fourier Transform Problems	
	4	DFT as a linear transformation and Problems	
	5	Properties of the DFT: Periodicity, Linearity with Problems	
	6	Symmetry properties with Problems	
	7	Symmetry properties with Problems	
	8	Multiplication of two DFTs with Problems	
	9	Circular Convolution with Problems	
	10	Additional DFT properties.	
2	11	**Linear filtering methods based on the DFT**: Use of DFT in Linear Filtering with Problems	20
	12	Filtering of Long data Sequences with Problems	
	13	Overlap Add method with Problems	
	14	Overlap save method with Problems	
	15	Problems on Overlap add and Overlap Save Methods	
	16	**Fast-Fourier-Transform (FFT) algorithms:** Efficient Computation of the DFT	
	17	Radix-2 DIT FFT algorithm	
	18	Radix-2 DIF FFT algorithm	
	19	Inverse Radix-2 DIT FFT algorithm	
	20	Inverse Radix-2 DIF FFT algorithm	
3	21	**Design of FIR Filters:** Characteristics of practical frequency –selective filters	20
	22	Symmetric and Antisymmetric FIR filters	
	23	Design of Linear-phase FIR filters using window - Rectangular, , Hanning, Bartlett windows.	
	24	Design of Linear-phase FIR filters using window Hanning	
	25	Design of Linear-phase FIR filters using window Bartlett.	
	26	Design of FIR filters using frequency sampling method.	
	27	Structure for FIR Systems: Direct form	
	28	Problems on Direct Form Structures	
	29	Cascade form with Problems	
	30	Lattice structures with Problems	

	31	**IIR Filter Design:** Infinite Impulse response Filter Format	
	32	Bilinear Transformation Design Method	
	33	Analog Filters using Lowpass prototype transformation	
	34	Normalized Butterworth Functions	
4	35	Bilinear Transformation and Frequency Warping	20
	36	Bilinear Transformation Design Procedure	
	37	Design Problems using Bilinear Transformation	
	38	Digital Butterworth Filter Design using BLT.	
	39	Realization of IIR Filters in Direct form I and II.	
	40	Problems on IIR Filters in Direct form I and II.	
	41	**Digital Signal Processors:** DSP Architecture	
	42	DSP Hardware Units	
	43	Fixed point format, Floating point Format	
	44	IEEE Floating point formats.	
5	45	Problems on Fixed Point format	20
	46	Problems on floating Point format	
	47	Fixed point digital signal processors	
	48	Continuation of Fixed point digital signal processors	
	49	Floating point processors	
	50	FIR and IIR filter implementations in Fixed point systems	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on DFT and properties of DFT.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions on linear filtering and FFT.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Design of FIR Filters with structures	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	5	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
4	Assignment 2: University Questions on design of IIR filters with structures	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 1, of the reference list. Website of the Reference list
5	Assignment 5: University Questions on DSP Processor.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 2, of the reference list. Website of the Reference list

14.0   **QUESTION BANK**

MODULE -1

1. Define discrete time signals and classify them.

2. Explain Fourier transform for discrete time signals and state its important properties.

3. Define DFT and IDFT.

4. What is the relationship between DFT and DFS?

5. Determine 8-point DFT of the signal $x(n) =\{ 1,1,1,1,1,1,0,0\}$.

6. For given impulse response $h(n) = \{1,2,3\}$, $x(n) =\{1,2\}$ verify using linear convolution.

7. Explain circular convolution. What is the difference between circular convolution and linear convolution?

8. Compute the circular convolution of the following sequences using DFT and IDFT.

$$X1(n) =\{1,2,3,1\} \quad x2(n) =\{4,3,2,2\}$$

9. Using circular convolution obtain linear convolution between the sequences

$X(n) =(1/2)^n$, $0<= n <= 3$ $h(n) = (1/4)^n$, $0<=n<=3$

10. Compute the DFT of the following finite length sequence of length N $x(n) = u(n) – u(n - N)$

MODULE -2

1) With appropriate diagrams describe overlap-save method and overlap-add method.

2) Compare various FFT algorithms

3) Write short notes on

     a.   Butterfly computation b. In place computation c. Bit reversal

4) Determine number of bits required to compute an FFT of 1024 points with signal to noise ratio of 30 dB.

5) Explain different sectional convolution methods.

6) State and prove Parsevals theorem.

7) Compute complex additions, complex multiplications for N=128, 256.

8) Given $x(n)=\{1,0,-1,1,2,3,1,0,-2,2,1,3,0,1,-1\}$ and $h(n)=\{1,2\}$ find the linear convolution of the above sequence using Overlap save method.

9) Compute the linear convolution of above sequence using Overlap add method.

10) Use the 8 point radix -2 DIT-FFT algorithm to find the DFT of the sequence

$$x(n) = \{0.707,1,0.707,0,-0.707,-1, -0.707,0\}$$

11) First 5 points of the 8-point DFT of a real valued sequence is given by $X(0)=0$, $X(1)=2+j2$, $X(2) = -4$

12) $X (3) = 2-j2$, $X(4) = 0$ determine the remaining points. Hence find the original sequence $x(n)$ using Decimation in frequency FFT algorithm

13) Calculate the IDFT of $X(k) = \{0,28284-j28284,0,0,0,0, 28284+j28284\}$ using Inverse Radix – 2 DIT FFT algorithm

14) Draw the flow graph for the implementation of 8 point DIT FFT of the following sequence

$$x(n) =\{0.5,0.5,0.5,0.5,0,0,0,0\}$$

MODULE -3

1) What are the properties of FIR filters? State their importance
2) Explain the designing of FIR filters using windows
3) Compare various windows for design of FIR filters
4) Write short note on
    i. Frequency sampling technique
    ii. FIR differentiator
    iii. Hilbert transformers
5) Design the symmetric FIR lowpass filter whose desired frequency is given as

$$H(w) = e^{-jwt} \quad \text{for } |w| <= wc$$
$$\text{a.} \quad = 0 \quad \text{otherwise}$$

6) The length of the filter should be 7 and wc=1 rad/sec. use rectangular window
7) Design the FIR filter above example 5 using hanning window
8) Explain Kaiser Window.
9) Design an FIR linear phase filter using Kaiser window to meet the following specifications

i. $0.99 <= |H(e^{jw})| <= 1.01 \qquad 0 <= |w| <= 0.19\backslash$
1. $|H(e^{jw})| <= 0.01 \qquad 0.21\prod <= |w| <= \prod$

MODULE -4

1. What are time domain and frequency domain approximations?
2. Explain in detail Butterworth filter approximation
3. Design an analog Butterworth filter for the following specifications
   $0.8 <= |H(e^{j\Omega}| <= 1$ for $0 <= \Omega <= 0.2\prod$
   $|H(e^{j\Omega})| <= 0.2 \qquad$ for $0.6\prod <= \Omega <= \prod$
4. Obtain the system functions of normalized Butterworth filters for order N =1,2 and 3
5. Given that $|H(j\Omega)|^2 = 1/1 + 64\Omega^6$ determine the analog filter system function H(s)

MODULE -5

1. Draw the block diagram of DSP architecture.
2. Explain Fixed point format, Floating point Format.
3. Explain FIR filter implementations in Fixed point systems
4. Explain FIR filter implementations in Fixed point systems
5. Explain IEEE Floating point formats.

16.0   University Result

Examination	FCD	FC	SC	% Passing
Jan 2021	10	18	10	84.85
Jan 2020	16	09	10	97.14
Jan 2019	14	07	22	95.56
Jan- 2018	22	15	18	100

Prepared by	Checked by		
Prof. S. S. Ittannavar	Prof. S. B. Akkole	HOD	Principal

Subject Title	**PRINCIPLES OF COMMUNICATION SYSTEMS**		
Subject Code	18EC53	**IA Marks**	40
Number of Lecture Hrs / Week	03+2 Tutorials	**Exam Marks**	60
Total Number of Lecture Hrs	50	**Exam Hours**	03
	CREDITS – 04		

FACULTY DETAILS:

Name: Prof. S B Akkole	Designation: Asst.Professor	Experience: 27 Years, 06 Months
No. of times course taught: 3		Specialization: Communication System

1.0	**Prerequisite Subjects:**

Sl. No	Branch	Semester	Subject
01	Electronics and Communication Engineering	I	Basic Electronics
02	Electronics and Communication Engineering	III	Electromagnetic Engineering

2.0	**Course Objectives**

.Understand and analyse concepts of Analog Modulation schemes viz; AM, FM., Low pass sampling and Quantization as a random process.
• Understand and analyse concepts digitization of signals viz; sampling, quantizing and encoding.
• Evolve the concept of SNR in the presence of channel induced noise and study Demodulation of analog modulated signals.
• Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver.

3.0	**Course Outcomes**

Having successfully completed this course, the student will be able to draw and use modeling to generate

COs	Course Outcome	RBT Level	POs
CO313.1	Analyze and Compute performance of amplitude modulation schemes in time and frequency domains.	L1, L2, L3	PO1-PO5, PO8, PO11, PO12
CO313.2	Analyze and Compute performance angle modulation schemes in time and frequency domains	L1, L2, L3	PO1-PO5, PO8, PO11, PO12
CO313.3	Analyze and Compute the performance of AM and FM system in the presence of noise	L1, L2, L3	PO1-PO4, PO8, PO11, PO12
CO313.4	Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems.	L1, L2, L3	PO1-PO4, PO8, PO11, PO12
CO313.5	Analyze and Compute the performance digital formatting process and demonstare its use in multiplexers and vocoders	L1, L2, L3	PO1-PO4, PO8, PO11, PO12
Total Hours of instruction		**50**	

4.0   Course Content

Module 1	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1: **AMPLITUDE MODULATION:** Introduction, Amplitude Modulation: Time & Frequency Domain description, Switching modulator, Envelop detector. **(3.1 – 3.2 in Text)** **DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION:** Time and Frequency Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadraturre Carrier Multiplexing. **(3.3 – 3.4 in Text)** **SINGLE SIDE–BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION:** SSB Modulation, VSB Modulation, Frequency Translation, Frequency-Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television. **(3.5 – 3.8 in Text)**	10	L1, L2, L3
Module 2: **ANGLE MODULATION**: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver **(4.1 – 4.6 of Text)**	10	L1, L2, L3
Module 3: *[Review of Mean, Correlation and Covariance functions of Random Processes.* *(No questions to be set on these topics)]* **NOISE** - Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth **(5.10 in Text)NOISE IN ANALOG MODULATION:** Introduction, Receiver Model, Noise in DSB-SC receivers. Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM **(6.1 – 6.6 in Text)**	10	L1, L2, L3
Module 4: SAMPLING AND QUANTIZATION: Introduction, Why Digitize Analog Sources?, The Low pass Sampling process Pulse Amplitude Modulation. Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves.**(7.1 – 7.7 in Text)**	10	L1, L2, L3
Module 5: : SAMPLING AND QUANTIZATION (Contd): The Quantization Random Process, Quantization Noise ,Pulse–Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing; Delta Modulation **(7.8 – 7.10 in Text)**, Application examples - (a) Video + MPEG **(7.11 in Text)** and (b) vocoders **(refer Section 6.8 of Reference Book 1)**.	10	L1, L2, L3

5.0   Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Modulation Purposes
02	IV	Wireless Communication	Various Modulation Schemes used in Communication

6.0   Relevance to Real World

SL.No	Real World Mapping
01	Noise calculation in communications
02	Various types of modulation schemes used in communication
03	Various types of demodulation schemes used in communication

7.0   Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Noise Calculation
02	NPTEL	Various Modulation Schemes

8.0   Books Used and Recommended to Students

Text Books
1. **Communication Systems**, Simon Haykins & Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010 ISBN 978-81-265-2151-7
Reference Books
1/Modern Digital and Analog Communication Systems, B. P. Lathi, Oxford University Press., 4th edition.
2. An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.
3. Principles of Communication Systems, H.Taub&D.L.Schilling, TMH,2011.
4. Communication Systems, Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.

9.0   Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
www.nptel.com

10.0   Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Antennas and Propagation	www.ieeexplorere.org
2	Microwave and Optical Technology Letters	onlinelibrary.wiley.com
3	IEEE Communication Magazine	www.comsoc.org

11.0   Examination Note

Internal Assessment: 40 Marks
Three internal assessment tests will be conducted. Among three, average of best two IAs will be taken. And, 5 marks are evaluated based on assignments and/or quiz.
Scheme of Evaluation for Internal Assessment (30 Marks)
(a) Class work, assignment, quiz: 10 Marks.
(b) Internal Assessment test in the same pattern as that of the main examination (avg.): 30marks.

SCHEME OF EXAMINATION:
5 models and each module has 1 question of 20 marks each
Total marks=5 x 20 = 100.
Total = 100 Marks
INSTRUCTIONS FOR PRINCIPLE OF COMMUNICATION SYSTEM (18EC53) EXAMINATION
1. Five full questions will be given which consist of a, b, c, and/or d sub sections.
2. Students have to answer either **Q. 1 or Q. 2 AND Q 3 or Q. 4**   ……completely.

12.0	Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1:		**AMPLITUDE MODULATION:** Introduction, AM: Time-Domain description, Frequency – Domain description	20
	1	Generation of AM wave: Switching modulator	
	2	Detection of AM waves: envelop detector	
	3	Double side band suppressed carrier Modulation (DSBSC): Time and frequency domain Description,	
	4	Generation of DSBSC waves: balanced modulator, ring modulator	
	5	Coherent detection of DSBSC modulated waves & Costas Receiver, Quadrature Carrier Multiplexing.	
	6	**Single side-band modulation(SSB):** Single side-band modulation, Frequency and Time Domain description of SSB wave	
	7	Demodulation of SSB waves,	
	8	VSB Modulation,	
	9	Frequency Translation, Frequency- Division Multiplexing, Theme example	
	10	VSB Transmission of Analog and Digital Television.	
Module 2:	11	**ANGLE MODULATION:** Basic definitions	20
	12	FM, narrow band FM, wide band FM	
	13	transmission bandwidth of FM waves	
	14	**Problems**	
	15	Generation of FM waves: indirect FM and direct FM	
	16	FM Stereo Multiplexing,	
	17	Demodulation of FM waves, Phase-locked loop	
	18	model of the phase – locked loop.	
	19	Nonlinear model of the phase – locked loop, Linear	
Module 3:	20	The Super heterodyne Receiver	20
	21	**NOISE :**Shot Noise, Thermal noise, ,	
	22	White Noise	
	23	Noise Equivalent Bandwidth	
	24	**NOISE IN ANALOG MODULATION:** Introduction, Receiver Model,	
	25	Noise in DSB-SC receivers	
	26	Noise in AM receivers	
	27	Noise in FM receivers, Capture effect, FM	
	28	threshold effect and FM threshold reduction	
	29	Pre-emphasis and De-emphasis in FM	
Module 4:	30	Problems	20
	31	**SAMPLING AND QUANTIZATION** Introduction, Why Digitize Analog Sources?,	
	32	The Low pass Sampling process	
	33	Pulse Amplitude Modulation	
	34	Time Division Multiplexing	
	35	, Pulse-Position Modulation	
	36	Generation of PPM Waves,	
	37	Detection of PPM Waves	
	38	**Problem**	
	39	**Problem**	
	40	**Problems**	
Module 5:	41	**SAMPLING AND QUANTIZATION**	20
	42	The Quantization Random Process	
	43	Quantization Noise,	
	44	Pulse–Code Modulation	
	45	Sampling, Quantization	
	46	Encoding, Regeneration Decoding	
	47	Delta Modulation	
	48	Application examples MPEG + videos	
	49	Filtering, Multiplexing;	
	50	Vocoders	

13.0 Assignments, Quiz, Mini Project and Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on random process and Amplitude modulation	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on module Angle Modulation and Noise in communication system	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on digital modulation schemes	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: University Questions on noise in continuous wave modulation schemes	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment 5: University Questions on pulse modulation schemes	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

14.0 University Result

Examination	FCD	FC	SC	% Passing
May/June-2018	00	06	30	87.80
May/June-2020	–	–	–	**97.14**

Prepared by	Checked by		
Prof. S.B Akkole	Prof. S. S.Malaj	HOD	Principal

Subject Title	INFORMATION THEORY AND CODING		
Subject Code	18EC54	**IA Marks**	40
Number of Lecture Hrs / Week	03	**Exam Marks**	60
Total Number of Lecture Hrs	40 (08 Hours Module)	**Exam Hours**	03

FACULTY DETAILS:

Name: Prof. D.B.Madihalli.	**Designation:** Assistant Professor	**Experience:**14 Years
No. of times course taught:02	**Specialization:** Industrial Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Digital Electronics
02	ECE	IV	Analog Communication
03	ECE	V	Digital Communication

2.0 Course Objectives

1. To enhance knowledge of probabilities, entropy, measures of information.
2. To analyze the information-carrying capacity of the communication channel.
3. To design source compression codes to improve the efficiency of information transmission.
4. To adapt and tailor known error control codes for use in particular applications.
5. To understand the basic theory and design of error detection and correction codes.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

COs	Description	RBT Level	PO's
CO304. 1:	Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source.	L1,L2,L3	1,2,3,4,5,6,12
CO304. 2:	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms.	L1,L2,L3	1,2,3,4,5,6,12
CO304. 3:	Model the continuous and discrete communication channels using input, output and joint probabilities.	L1,L2,L3	1,2,3,4,5,6,12
CO304. 4:	Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes	L1,L2,L3	1,2,3,4,5,6,12
CO304. 5:	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.	L1,L2,L3	1,2,3,4,5,6,12

4.0   Course Content

MODULE - 1

Information Theory: Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model for Information Sources, Entropy and Information rate of Markoff Sources. **(Section 4.1, 4.2 of Text 1)**

08 Hrs

MODULE – 2

Source Coding: Encoding of the Source Output, Shannon's Encoding Algorithm**(Sections 4.3, 4.3.1 of Text 1),** Shannon Fano Encoding Algorithm **(Section 2.15 of Reference Book 4** Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI, Huffman codes **(Section 2.2 of Text 2)**

08 Hrs

MODULE – 3

Information Channels: Communication Channels, Discrete Communication channels Channel Matrix, Joint probabilty Matrix, Binary Symmetric Channel, System Entropies. **(Section 4.4, 4.5, 4.51,4.5.2 of Text 1)**

Mutual Information, Channel Capacity, Channel Capacity of Binary Symmetric Channel, **(Section 2.5, 2.6 of Text 2)** Binary Erasure Channel, Muroga,s Theorem **(Section 2.27, 2.28 of Reference Book 4)**

08 Hrs

MODULE – 4

Error Control Coding:
Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error detection & Correction capabilities of Linear Block Codes, Single error correction Hamming code, Table lookup Decoding using Standard Array.
Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction **(Sections 9.1, 9.2,9.3,9.3.1,9.3.2,9.3.3 of Text 1)**

08 Hrs

MODULE – 5

Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm) **(Section 8.5 – Articles 1,2 and 3, 8.6- Article 1 of Text 2)**

08Hrs

5.0   **Relevance to future subjects**

Sl No	Semester	Subject	Topics
01	VIII	Project work	Digital transmission of voice, video and data
02	VI	CCN	Data Encryption, CRC

6.0	Relevance to Real World

SL.No	Real World Mapping
01	Design of error detection and correction codes for digital communication systems.
02	Source coding and channel coding applications.
03	Design of encoders and decoders with minimum or no errors.

7.0	Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Convolution Codes, Examples
02	NPTEL	Video Lectures

8.0	Books Used and Recommended to Students

Text Books
1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

Reference Books
1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Principles of digital communication, J. Das, S. K. Mullick, P. K. Chatterjee, Wiley, 1986 - Technology & Engineering
3. Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016, ISBN: 9780134724058.
4. Information Theory and Coding, HariBhat, Ganesh Rao, Cengage, 2017.
   Error Correction Coding by Todd K Moon, Wiley Std. Edition, 2006

Additional Study Material & e-Books
4. NPTEL notes and Videos
5. VTU online notes

9.0	Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1) https://nptel.co.in

10.0	Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	IEEE Xplorer	http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=18
2	International Journal of Information and Coding Theory	http://www.inderscience.com/jhome.php?jcode=ijicot

11.0	Examination Note

Internal Assessment: 40 Marks
Three IA will be conducted and average of best of two will be accounted.
Scheme of Evaluation for Internal Assessment (40 Marks)
30 marks for IA Test and 10 marks for assignment
SCHEME OF EXAMINATION:
Four questions to be set from the syllabus covered.
Question 1 or 2 and question 3 or 4. Answer any two main questions

Question 1 or Question 2   =   15Marks
Question 3 or Question 4   =   15Marks
Total   =   30Marks

12.0   Course Delivery Plan

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Introduction to set theory, probability theory, and axioms of probability	20
	2	Properties of probability and examples	
	3	Total probability, Bayes' theorem, examples	
	4	Random variables, probability distributions	
	5	Uniform and binomial distributions	
	6	Exponential, Poisson, and Gaussian distributions	
	7	Information, entropy or avg. uncertainty and its expression, ZMS	
	8	Properties of entropy with examples	
	9	Source efficiency and extension of ZMS	
	10	Entropy of source with memory: Markov model	
2	11	Introduction to source coding and its significance	20
	12	Types of codes and prefix codes	
	13	Source coding theorem	
	14	Shanon's first encoding algorithm	
	15	Shanon's Fano encoding algorithm with examples	
	16	Huffman codes with examples	
	17	Extended Huffman coding and arithmetic coding	
	18	Lampel Ziv algorithm and run-length coding	
	19	Examples on source coding techniques	
	20	Examples on source coding techniques (Q-paper problems)	
3	21	Introduction to information channels and discrete commn. channels	20
	22	Channel models and channel matrix representation	
	23	Joint probability, entropy functions, priori, posteriori entropies.	
	24	Mutual information (M.I.) and properties of M.I.	
	25	Channel capacity theorem, channel efficiency, and redundancy	
	26	Symmetric/uniform channels, binary symmetric channels (BSCs)	
	27	Examples on SCs and BSCs	
	28	Binary erasure channels with examples	
	29	Noiseless, deterministic, and cascaded channels	
	30	Muroga's theorem and continuous channels	
4	31	Error control coding, need and types with examples	20
	32	Linear block codes, Matrix description, parity check matrix (PCM)	
	33	Encoding circuit for linear block codes	
	34	Syndrome and error detection with examples	
	35	Hamming weight, distance, and minimum dist. LBC with examples	
	36	Error detection and correction capabilities of linear block codes	
	37	Single error correcting hamming codes	
	38	Syndrome decoding using standard array coding	
	39	Solved examples	
	40	Examples (Q-paper problems)	
5	41	Introduction to binary cyclic codes, algebraic description, algebraic structure of cyclic codes.	20
	42	Properties of cyclic codes, Systematic and non systematic codes	
	43	Generator and PCM of (7,4) code: example	
	44	Encoding using an (n-k) bit shift register	
	45	Syndrome calculation and error detection	
	46	Decoding of cyclic codes	
	47	Convoln. encoder, T-domain approach, Encoding using genr. matrix	
	48	Transform domain approach, representation of convolution codes.	
	49	Tree diagram and trellis diagram	
	50	Decoding of convolution codes using Veterbi coding.	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Information theory, entropy, and probability.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity. Printed solution expected.	Text Book and Ref. 1 & 2 of the reference list.
2	Assignment 2: University Questions on Source coding techniques	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity. Printed solution expected.	Text Book and Ref. 2 & 3 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Information Channels	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: University Questions on error control coding & convolution codes	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 & 5 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
5	Mini Project Rivets based for the students groups	Students study the Rivets applications from Real World Example view.	Syllabus with Real World Mapping	12	Group Activity. Student Group need to perform Project and do a brief Report	All Books / paper Resources / Study Material. All Internet /

14.0 QUESTION BANK (Typical)

MODULE- 1: INTRODUCTION TO PROBABILITY THEORY & INFORMATION THEORY

1. What is the mutual information? Find in general equation for mutual information.
2. What is joint entropy? Find in general equation for it.
3. State properties of mutual information.
4. Why logarithmic expression is chosen for measuring information?
5. If I_1 is the information carried out by message M_1 & I_2 is the information carried out by message M_2, then prove that the amount of information carried compositely due to M_1 & M_2 is $I_{12}=I_1+I_2$.
6. Find expression for average information content & information rate of symbols in long independent sequences.
7. State & explain various properties of entropy.
8. Prove that upper bond of an entropy is given as "$H_{max} \leq \log_2 q$" where q = number of messages emitted by the source.
9. Show that "by partitioning of symbols into sub-symbols cannot decrease the entropy" OR explain additive property of entropy.
10. Show that $H(S^2) = 2H(S)$.
11. Show that $H(S^n) = nH(S)$.

MODULE-2: SOURCE CODING
1. With the help of an example explain Shannon's encoding algorithm.
2. State & explain source coding algorithm. What is coding effects?
3. With the help of an example explain Shannon's – Fano algorithm.
4. Explain Huffman coding with the help of an example.
5. State properties of codes.
6. What is prefix of code? What is the prefix property of instantaneous code?
7. State Kraft inequality.

8. Consider binary code with 2^n codeword of same length n, show that the Kraft inequality is satisfied by the code.
9. State Shannon's first theorem OR Noiseless theorem.
10. What are the steps for Shannon's – Fano ternary code?
11. What are the steps for Huffman minimum redundancy code?

MODULE-3 INFORMATION CHANNELS

1. What is joint probability matrix? State various properties of JPM.
2. Define – priori entropy, posteriori entropy, equivocation with their equations.
3. What is the mutual information? Find in general equation for mutual information.
4. What is joint entropy? Find in general equation for it.
5. State properties of mutual information.
6. What is symmetric channel? Find its channel capacity.
7. What is binary symmetric channel? Find its channel capacity.
8. Define noiseless channel. Also state properties of noiseless channel matrix.
9. Define deterministic channel. Also state properties of deterministic channel matrix

MODULE- 4 ERROR CONTROL CODING

1. What is error control coding? Explain the functional block that accomplish error control coding and indicate their functions.
2. If C is valid code vector then prove that $CH^T = 0$, where H^T is transpose of parity check matrix H.
3. What is the effect of error detection & correction on the performance of the communication system?
4. If Ci & Cj are two code vectors in a (n, k) linear block code, show that their sum is also a code vector.
5. Prove that minimum distance of linear block code is the smallest weight of the non-zero code vector in the code.
6. Define terms – Hamming weight, Hamming distance, minimum distance (d_{min}).
7. List parameters of single error correcting Hamming codes.
8. What is Hamming bond of a linear block code? Explain with example.
9. List properties of standard array for an (n, k) linear block code.

MODULE- 5 BINARY CYCLIC CODES & CONVOLUTION CODES

1. What is a binary cyclic code? Describe the features of encoder & decoder used for cyclic codes using an (n-k) bit shift register.
2. List out properties of cyclic codes.
3. Write short note on – BCH code.
4. What is RS code?
5. Explain Golay code with example.
6. Explain shortened cyclic code.
7. Explain burst error correcting code.
8. Explain burst & random error correcting code with example.
9. What is the difference between block code & convolution code?
10. With example explain an encoder for (n, k, m) convolution code.
11. For (n, k, m) convolution encoder explain: a) state table b) state transmission table c) state diagram d) code tree
12. Briefly explain maximum likely hood decoding of convolution code.
13. Explain the Viterbi algorithm.

15.0   University Result

Examination	S+	S	A	B	C	D	E	F	% of passing
Dec-2019/Jan-2020	00	00	07	11	11	02	00	03	91.11
Dec-2020/Jan-2021	01	02	14	13	05	00	00	00	100

Prepared by	Checked by		
Prof.D.B.Madihalli	Prof.S.S.Ittannavar	HOD	Principal

Subject Title	Electromagnetic waves		
Subject Code	18EC55	**CIE Marks**	40
Number of Lecture Hrs /	03	**SEE Marks**	60
Total Number of Lecture Hrs	40	**Exam Hours**	03
	CREDITS – 03		

FACULTY DETAILS:

Name: Prof S. S. Kamate	Designation: Asst. Professor	Experience: 19
No. of times course taught: 13		Specialization: Digital Electronics

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	I/II	Physics

2.0   Course Objectives

The objectives of this course is to introduce students to the mostly used analytical and numerical methods in the different engineering fields by making them to Electric and Magnetic fields, Maxwell's equations and wave propagation concepts

1. Define and Describe Coulomb's law and electric field intensity.
2. Define and Explain electric flux density, Gauss's law and divergence.
3. Describe energy and potential along with concepts of current and conductors.
4. Describe Poisson's and Laplace's Equations, and Uniqueness Theorem.
5. Define and Describe basic concepts of Magnetostatics by studying the various laws,
6. Stoke's Theorem and scalar and vector magnetic flux density.
7. Explain Magnetic Forces, Materials and Inductance.
8. Describe the concepts of time varying fields and Develop Maxwell's equations in
9. Point and Integral Forms.
10. Describe and Compare different Types of Wave Propagation.

3.0   Course Outcomes

	Course Outcome	RBT Levels	POs
C305.1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.	L1, L2 & L3	1,2,10,12
C305.2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge.	L1, L2 & L3	1,2,10,12
C305.3	Determine potential and energy with respect to point charge and capacitance using Laplace equation.	L1, L2 & L3	1,2,10,12
C305.4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.	L1, L2 & L3	1,2,10,12
C305.5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem.	L1, L2 & L3	1,2,10,12
Total Hours of instruction			**40**

4.0   Course Content

MODULES	RBT Levels	No. Of Hours
Module 1: **Coulomb's Law, Electric Field Intensity and Flux density** Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Electric flux density Numerical Problems.	L1, L2 & L3	8
Module 2: **Gauss's law and Divergence** Gauss 'law, Application of Gauss' law to point charge, line charge, Surface charge and volume charge, Point (differential) form of Gauss law, Divergence. Maxwell's First equation (Electrostatics), Vector Operator ▼ and divergence theorem, Numerical Problems (**Text: Chapter 3.2 to 3.7**). **Energy, Potential and Conductors**: Energy expended or work done in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of point charge, Potential gradient, Numerical Problems (**Text: Chapter 4.1 to 4.4 and 4.6**).Current and Current density, Continuity of current. (**Text: Chapter 5.1, 5.2**)	L1, L2 & L3	8
Module 3 **Poisson's and Laplace's Equations**: Derivation of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation, Numerical problems on Laplace equation. (**Text: Chapter 7.1 to 7.3**) **Steady Magnetic Field**: Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Basic concepts Scalar and Vector Magnetic Potentials, Numerical.problems. (**Text: Chapter 8.1 to 8.6**)	L1, L2 & L3	8
Module 4 **Magnetic Forces**: Force on a moving charge, differential current elements, Force between differential current elements, Numerical problems (**Text: Chapter 9.1 to 9.3**). **Magnetic Materials**: Magnetization and permeability, Magnetic boundary conditions, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance and mutual reactance, Numerical problems (**Text: Chapter 9.6 to 9.7**). Faraday' law of Electromagnetic Induction –Integral form and Point form, Numerical problems (**Text: Chapter 10.1**)	L1, L2 & L3	8
Module 5 **Maxwell's equations** Continuity equation, Inconsistency of Ampere's law with continuity equation, displacement current, Conduction current, Derivation of Maxwell's equations in point form, and integral form, Maxwell's equations for different media, Numerical problems (**Text: Chapter 10.2 to 10.4**) **Uniform Plane Wave**: Plane wave, Uniform plane wave, Derivation of plane wave equations from **L1, L2,L3** Maxwell's equations, Solution of wave equation for perfect dielectric, Relation between E and H, Wave propagation in free space, Solution of wave equation for sinusoidal excitation, wave propagation in any conducting media (γ, α, β, η) and good conductors, Skin effect or Depth of penetration, Poynting's theorem and wave power, Numerical problems. (**Text: Chapter 12.1 to 12.4**)	L1, L2 & L3	8

5.0	Relevance to future subjects

Sl. No.	Semester	Subject	Topics
1.	VI	Microwave and Antennas	Antenna impedance
2.	VI/VII	Project work	Antennas and communication

6.0	Relevance to Real World

SL. No.	Real World Mapping
01	Learnt methods are used to solve some field related engineering problems.
02	Losses in propagation due to different media, impedance of an Antenna

7.0	Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Videos	Behavior of Electric and Magnetic Fields
02	NPTEL	Study Wave propagation

8.0	Books Used and Recommended to Students

Text Books

1) W.H. Hayt and J.A. Buck, "Engineering Electromagnetics", 8th Edition, Tata McGraw-Hill, 2009, ISBN-978-0-07-061223-5.

Reference Books

1. Elements of Electromagnetics – Matthew N.O., Sadiku, Oxford university press, 4thEdn.
2. Electromagnetic Waves and Radiating systems – E. C. Jordan and K.G. Balman, PHI, 2ndEdn.
3. Electromagnetics- Joseph Edminister, Schaum Outline Series, McGraw Hill.
N. NarayanaRao, ―Fundamentals of Electromagnetics for Engineering‖, Pearson

Additional Study material & e-Books

6. Schaum's outline series "Electromagnetics" by Joseph A. Edminister**.**
7. VTU on line notes.

9.0	Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

04) https://nptel.co.in
05) http://m.noteboy.in/vtuflies/machine%20drawing.pdf
06) https://www.edx.org/school/iitbombayx?utm_source=bing&utm_medium=cpc&utm_term=iit-bombay&utm_campaign=partner-iit-bombay

10.0	Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	IJCOT - International Journal of Computer & Organization Trends	www.ijcotjournal.org/
2	Journals - The Science and Information (SAI) Organization	thesai.org/Publications
3	Computer Hardware Organizations Innovate with IEEE Information	https://www.ieee.org/documents/ieee_focus_on_computer_hardware.pdf

11.0   Examination Note

Internal Assessment: 40 Marks
Theoretical aspects as well as relevant sketches should be drawn neatly.
Scheme of Evaluation for Internal Assessment (40 Marks)
(c) Internal Assessment test in the same pattern as that of the main examination
   (All the three Internal Tests marks considered): **30**Marks.
(d) Assignments: **10** Marks

SCHEME OF EXAMINATION:
Question paper pattern:
 Note: - The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.
  i)   The question paper will have **ten** full questions carrying equal marks.
  ii) Each full question consisting of **20** marks.
  iii) There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
  iv) Each full question will have sub question covering all the topics under a module.
  v)   The students will have to answer **five** full questions, selecting **one** full question from each module.

12.0   Course Delivery Plan

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Basics- vector analysis	20
	2	Coordinate systems: Cartesian	
	3	Cylindrical	
	4	Spherical	
	5	Examples	
	6	Relation between coordinate systems	
	7	Experimental law of Coulomb.	
	8	Electric field intensity.	
	9	Field of a line charge.	
	10	Field due to continuous surface charge distribution	
	11	Field due to continuous volume charge distribution	
2	12	Electric flux density	40
	13	Gauss' law, Divergence.	
	14	Maxwell's First equation	
	15	Vector operator **del** and divergence theorem.	
	16	Energy expended in moving a point charge in an electric field	
	17	Definition of potential difference and Potential,	

	18	The potential field of a point charge and system of charges Potential	
	19	Current and current density.	
	20	Continuity of current	
	21	Examples	
3	22	Laplace's and Poisson's equations.	60
	23	Laplace's Equations	
	24	Uniqueness theorem	
	25	Examples of the solutions of Laplace's equations.	
	26	Biot-Savart law. Examples	
	27	Ampere's circuital law. Examples	
	28	Curl, Stokes' theorem. Examples	
	29	Magnetic flux and flux density. Examples	
	30	Scalar magnetic potentials. Examples	
4	31	Force on a moving charge and differential current element	80
	32	Force between differential current elements	
	33	Magnetization and permeability	
	34	Magnetic boundary conditions	
	35	Magnetic circuit and Examples	
	36	Potential energy and forces on magnetic materials	
	37	Examples	
	38	Examples	
5	39	Faraday's law & Examples	100
	40	Displacement current & Examples	
	41	Maxwell's equation in point form.	
	42	Maxwell's equation in Integral form.	
	43	Wave propagation in free space and dielectrics	
	44	Wave propagation in perfect dielectric	
	45	Wave propagation in free space and dielectrics	
	46	Propagation in good conductors. Examples	
	47	Poynting's theorem derivation	
	48	Wave power.	
	49	& Examples	
	50	Examples from question papers	

14.0   QUESTION BANK

MODULE -1

.
1. State coulomb's law of force between any two point charges & state the units of force.
2. Define electric field intensity. Obtain an expression for the electric field intensity at a point which is at a distance of 'R' from a point Q.
3. State the units of electric field intensity E & explain the method of obtaining E at a point in Cartesian system, due to a point charge Q.
4. Obtain an expression for total electric field intensity at a point due to infinite number of point charges.

5. An empty metal paint can is placed on a marble table, the lid is removed, and both parts are discharged (honorably) by touching them to ground. An insulating nylon thread is glued to the center of the lid, and a penny, a nickel, and a dime are glued to the thread so that they are not touching each other. The penny is given a charge of +5 nC, and the nickel and dime are discharged. The assembly is lowered into the can so that the coins hang clear of all walls, and the lid is secured. The outside of the can is again touched momentarily to ground. The device is carefully disassembled with insulating gloves and tools. (a) What charges are found on each of the five

metallic pieces? (b) If the penny had been given a charge of +5 nC, the dime a charge of -2 nC, and the nickel a charge of -1 nC, what would the final charge arrangement have been?

6. 2 A point charge of 12 nC is located at the origin. Four uniform line charges are located in the x = 0 plane as follows: 80 nC/m at y = -1 and -5 m, -50 nC/m at y ~ -2 and -4m. (a) Find D at P(O, -3,2). (b) How much electric flux crosses the plane y = -3, and in what direction? (c) How much electric flux leaves the surface of a sphere, 4m in radius, centered at qo, -3, O)?

7. The value of E at pep = 2, 4J = 40°, z = 3) is given as E = 100ap - 200a", + 300az. Vim. Determine the incremental work required to move a 20-J..lC charge a distance of 6 J..lm in the direction of: (a) ap; (b) a",; (c) az; (d) E; (e) G = 2ax - 3ay + 4az.

8. Let E = 400ax - 300ay + 500az V 1m in the neighborhood of point P(6, 2, -3). Find the incremental work done in moving a 4-C charge a distance of I mm in the direction specified by: (a) ax + ay + az; (b) -2ax + 3ay - az.

9. If E = 120ap V 1m, find the incremental amount of work done in moving a 50-J..lC charge a distance of 2 mm from: (a) P(l, 2, 3) toward Q(2, 1,4); (b) Q(2, 1,4) toward P(I, 2, 3).

10. Find the amount of energy required to move a 6-C charge from the origin to P(3, 1, -1) in the field E = 2xax - 3y2ay + 4az Vim along the straight-line path x = -3z, y = x + 2z.

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MODULE -2

1. State and prove divergence theorem
2. Let D = 4xyax + 2(x2 + z2)ay + 4yzaz C/m2 and evaluate surface integrals to find the total charge enclosed in the rectangular parallelepiped 0 < x < 2, 0 < y < 3, 0 < z < 5m.
3. Two uniform line charges, each 20 nC/m, are located at y = I, z = ::!: I m. Find the total electric flux leaving the surface of a sphere having a radius of 2 m, if it is centered at: (a) A(3, 1,0); (b) B(3, 2, 0).
4. Given the electric flux der.sity, D = 2xyax + x2ay + 6z3az Cjm2: (a) use Gauss's law to evaluate the total charge enclosed in t.he volume 0 < x, y, z < a.
5. Determine work done in carrying a charge of 2C from B(1, 0,1) to A(08, 0.6, 0) in an electric field of E = yax + x ay V/m.along the short arc of the circle x²+ y²=1, z =1; along a straight line path.
6. A 15nC point charge is at origin in free space. Calculate V1 if point P is located at P(-2, 3, -1) and I) V =0V at (6, 5, 4) ii) V =0V at infinity.
7. Discuss current, current density and hence derive an expression for continuity equation.
8. The z =0, defines the the boundary between free space and dieelectric with dielectric contant 20. The E in free space is E = 10ax +20 ay + 40az V/m.
9. Derive an expression for electric potential due to a point charge.

10. Derive an expression for electric potential due to a infinite line charge.

MODULE -3
1. Explain Poisson's & Laplace's equations.
2. State & explain uniqueness theorem.
3. Given the potential field V = 4yz/ (x²+ 1) ; Find V and ρat (1, 2, 3)
4. Use laplace equation to find the capacitance per unit length of co-axial cable of inner radius a m and outer b m. Assume V = Vo at r=a and V=0 at r=b.
5. Determine whether or not the following vectors represent a possible electric field
    i)   E = 5Cosz az V/m
    ii)   E = (12yx²-6z²x) ax + (4x³+18zy²) ay + (6y³ ⁻6zx²) az
6. Explain properties of magnetic field.
7. Derive an expression for H due to infinite long straight conductor.
8. Derive an expression for H due to finite long straight conductor.

MODULE -4
1. An infinite filament on the z axis carries 20n mA in the az direction. Three uniform cylindrical current sheets are also present: 400 mAim at P = 1 cm, -250mA/m at P = 2cm, and -300mA/m at P = 3 em. Calculate Hq, at p = 0.5, 1.5,2.5, and 3.5 cm.
2. State and explain Magnetic flux & Magnetic density.
3. Derive an expression for force on a moving charge.
4. Derive an expression for force & torque on a closed circuit.
5. Explain the nature of magnetic materials.
6. What is Magnetization & Permeability?

7. Derive an expression for magnetic boundary conditions.

MODEL-5

1. Wet marshy soil is characterized by σ = 10 $^{-2}$ s/m. εr = 15 and ur = 1. At frequencies 60Hz and 10GHz. Indicate whether soil be considered as a conductor or dielectric.
2. What is displacement current and equation of continuity? Derive Maxwell's equation for Ampere's circuital law.
3. Obtain the solution of wave equation for a uniform (UPW) in free space.
4. Discuss uniform plane wave propagation in a good conducting media.
5. State and prove poynting theorem.
6. Derive an expression for depth of penetration
7. Find the depth of penetration at a frequency of 1.6MHz in aluminum, where σ = 38.2Ms/m and ur = 1. also find γ , λ and Vp.
8. A 800MHz plane wave travelling has an average poynting vector of 8mW/m2. I the medium is lossless with
   ur = 1.5 and εr = 6. Find
      i) Velocity of the wave
      ii) wavelength
      iii) Impedance of the medium
      iv) r.m.s. Electric field E
      v) r.m.s magnetic field H.
9. For an electromagnetic wave propagating in free space prove that {IEI/IHI} = η

15.0　　　University Result

Examination	S+	S	A	B	C	D	E	% Passing
	--	--	--	--	--	--	--	

Prepared by	Checked by		
Prof. S. S. Kamate	Prof. S.S.Kamate	HOD	Principal

Subject Title	VerilogHDL		
Subject Code	18EC56	IA Marks	40
Number of Lecture Hrs / Week	03L	Exam Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
			CREDITS – 04

FACULTY DETAILS:

Name: Prof. Sachin S Patil	**Designation:** Asst. Professor	**Experience:** T-16.7Yrs, I-02.3Yrs
No. of times course taught: 11	**Specialization:** VLSI & Embedded System Design	

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	I/II	Basic Electronics
02	Electronics & Communication Engineering	III	Digital Electronics

2.0   Course Objectives

1. Familiarize basics of Chips design in Top Down design methodology.
2. Program Verilog code for different digital circuits.

3.0   Course Outcomes

At the end of the course students will be able to:

	Course Outcome	RBT Level	POs
CO306.1	Write Verilog programs in gate, dataflow (RTL), behavioral and switch modeling levels of Abstraction.	L3	PO1 to PO12
CO306.2	Design and verify the functionality of digital circuit/system using test benches.	L3	PO1 to PO12
CO306.3	Identify the suitable Abstraction level for a particular digital design.	L3	PO1 to PO12
CO306.4	Write the programs more effectively using Verilog tasks, functions and directives.	L3	PO1 to PO12
CO306.5	Perform timing and delay Simulation and Interpret the various constructs in logic synthesis.	L3	PO1 to PO12
Total Hours of instruction		**50**	

4.0   Course Content

Module-1   8 Hours

Overview of Digital Design with Verilog HDL

Evolution of CAD, emergence of HDLs, typical HDL-flow, why Verilog HDL?, trends in HDLs. (Text1)

Hierarchical Modelling Concepts

Top-down and bottom-up design methodology, differences between modules and module instances, parts of a

simulation, design block, stimulus block. (Text1)

Module-2   8 Hours

Basic Concepts

Lexical conventions, data types, system tasks, compiler directives. (Text1)

Modules and Ports

Module definition, port declaration, connecting ports, hierarchical name referencing. (Text1)

Module-3   **8 Hours**

Gate-Level Modelling

Modelling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. (Text1)

Dataflow Modelling

Continuous assignments, delay specification, expressions, operators, operands, operator types. (Text1)

Module-4   **8 Hours**

BehaviouralModelling

Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, multiway branching, loops, sequential and parallel blocks.

Tasks and Functions: Differences between tasks and functions, declaration, invocation, automatic tasks and functions.(Text1)

Module-5   **8 Hours**

Useful Modeling Techniques: Procedural continuous assignments, overriding parameters, conditional compilation and execution, useful system tasks.

Logic Synthesis with Verilog: Logic Synthesis, Impact of logic synthesis, Verilog HDL Synthesis, Synthesis design flow, Verification of Gate-Level Netlist. (Chapter 14 till 14.5 of text).

5.0   Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	HDL based projects
02	Higher	CMOS VLSI	Design and Programming

6.0   Relevance to Real World

SL.No	Real World Mapping
01	Integrated Circuits (Chip)
02	Model creation for analysis
03	Development of a software applications

7.0	Gap Analysis and Mitigation

SL. No	Delivery Type	Details
01	Tutorial	Topic: Lettering, Line, Methods of dimensioning
02	NPTEL	Assembly Application

8.0	Books Used and Recommended to Students

Text Books
1. Samir Palnitkar, "**Verilog HDL: A Guide to Digital Design and Synthesis**", Pearson Education, Second Edition.
2. Kevin Skahill, "**VHDL for Programmable Logic**", PHI/Pearson education, 2006.
Reference Books
1. Donald E. Thomas, Philip R. Moorby, "**The Verilog Hardware Description Language**", Springer Science+Business Media, LLC, Fifth edition.
2. Michael D. Ciletti, "**Advanced Digital Design with the Verilog HDL**" Pearson (Prentice Hall), Second edition.
3. Padmanabhan, Tripura Sundari, "**Design through Verilog HDL**", Wiley, 2016 or earlier.
Additional Study material & e-Books
8.

9.0	Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
2)   https://vtu.ac.in
3)   http://www.bookspar.com/engineering-vtu
3)   http://www.rejinpaul.com/2014/10/vtu-ece-notes-vtu-ece-1st-2nd-3rd-4th-5th-6th-7th-8th-semester-lecture-notes-download-link.htmlhttp://www.vlab.co.in/
4)   https://www.youtube.com

10.0	Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org/Xplore/home.jsp
2	PC World	http://www.pcworld.com/article/146957/components/article.html

11.0	Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)

(e) Class work, Assignment, Technical quiz: 10Marks.

(f) Internal Assessment test Average of three Tests out of three tests: 30marks.

SCHEME OF EXAMINATION:

Two questions to be set from each Module (Module1 to Module5).

Student has to answer one full question each from five modules 20 marks each of Total 100 marks.

12.0	Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1:	1	**Overview of Digital Design with Verilog HDL** Evolution of CAD	20
	2	Emergence of HDLs	
	3	Typical HDL-flow	
	4	Why Verilog HDL?,	
	5	Trends in HDLs	
	6	**Hierarchical Modelling Concepts** Top-down and bottom-up design methodology	
	7	differences between modules and module instances	
	8	Parts of a simulation	
	9	Design block	
	10	Stimulus block	
Module 2:	11	**Basic Concepts** Lexical conventions	40
	12	Data types	
	13	System tasks	
	14	Compiler directives	
	15	**Modules and Ports** Module definition	
	16	Port declaration	
	17	Connecting ports	
	18	Connecting ports	
	19	Hierarchical name referencing	
	20	Hierarchical name referencing	
Module 3:	21	**Gate-Level Modelling** Modelling using basic Verilog gate primitives	60
	22	Description of and/or and buf/not type gates	
	23	Rise, fall and turn-off delays	
	24	Min, max, and typical delays	
	25	**Dataflow Modelling** Continuous assignments	
	26	Delay specification	
	27	Expressions	
	28	Operators,	
	29	Operands	
	30	Operator types	

Module 4:	31	**BehaviouralModelling** Structured procedures,	80
	32	Initial and always	
	33	Blocking and non-blocking statements	
	34	Delay control, Generate statement,	
	35	Event control, Conditional statements,	
	36	Multiway branching	
	37	Loops,Sequential and parallel blocks	
	38	**Tasks and Functions:** Differences between tasks and functions,	
	39	declaration, invocation	
	40	Automatic tasks and functions	
Module 5:	41	**Useful Modeling Techniques**: Procedural continuous assignments, conditional	100
	42	overriding parameters	
	43	compilation	
	44	execution	
	45	useful system tasks.	
	46	**Logic Synthesis with Verilog:** Logic Synthesis,	
	47	Impact of logic synthesis	
	48	Verilog HDLSynthesis	
	49	Synthesis design flow	
	50	Verification of Gate-Level Netlist	

13.0   Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Section of solids and Orthographic views	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1,2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on Thread forms and fasteners	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3,4 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 3: University Questions on Keys, Joints and Riveted joints	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3,4 of the syllabus	12	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

4	Mini Project Rivets based for the students groups	Students study the Rivets applications from Real World Example view. Gain Knowledge of Rivets Applications.	Syllabus with Real World Mapping	12	Group Activity. Student Group need to perform Project and do a brief Report	All Books / paper Resources / Study Material. All Internet / Web resources.

14.0 QUESTION BANK

Module I

1. What is HDL? Explain the emergence of HDL.
2. Describe the typical design flow.
3. List the importance of HDLs.
4. Explain the Design methodologies.

   Explain 1.Module 2.Instances 3.Simulation

Module II

5. What are Laxical conventions of Verilog?
6. Describe the Data types of Verilog.
7. Explain the System tasks and Compiler directives.
8. What is module?
9. Explain the Ports of Verilog.

Module III

10. Describe Gate types?
11. Write a Verilog code for 4-bit Ripple carry full adder.
12. Explain the Gate delays.
13. Explain in details Continuous Assignments.
14. Describe different Delays of Verilog.
15. Explain the Expressions, Operators and Operands?
16. Write a Verilog program for 4:1 Multiplexer.
17. Write a program for Carry Lookahead Adder.
18. Write a Verilog program for Ripple Counter

Module IV

19. What is Behavioral Description? Explain the structure of Verilog Behavioral model.
20. Explain procedural assignment statements.
21. What is timing control? Explain different timing controls.
22. Explain briefly following multiway branching statements 1.CASE 2.CASEX, CASEZ
23. Explain following LOOP statements 1.WHILE 2.FOR 3.REPEAT 4.FOREVER

24. Describe sequential and parallel blocks with examples.

25. With example explain working of GENERATE statements.

26. Design the 4-to-1 multiplexer by using IF & ELSE statements. The port interface must remain same.

27. Design the traffic signal controller by using if and else statements.

Module V

28. What is Procedural continuous assignments

29. What is synthesis? Explain the synthesis with design flow diagram.

30. Explain Synthesis design flow

31. Differentiate VHDL & Verilog.

32. Explain in details the FUNCTION and TASK.

16.0 University Result

Examination	FCD	FC	SC	% Passing
2020-21	32	1	00	100
2019-20	16	17	18	100
2017-18	23	19	13	100

Prepared by	Checked by		
Prof. S. S. Patil	Prof. P. V. Patil	HOD	Principal

Subject Title	DSP LAB		
Subject Code	18ECL57	IA Marks	40
Number of Lecture Hrs / Week	2 Hr Tutorial + 2 Hrs Lab	Exam Marks	60
Total Number of Lecture Hrs	39	Exam Hours	03
		CREDITS – 02	

FACULTY DETAILS:		
Name: 1) Prof. Shreevijay Ittannavar, 2) Prof. B. P. Khot	Designation: Assistant Professor	Experience: i) 8.6Years ii) 5.9 Years
No. of times course taught: 1) 06 2) 03	Specialization: 1) Digital Signal Processing 2) Microelectronics and Control Systems	

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	I/II	Basic Electronics
02	Electronics & Communication Engineering	III	Digital Electronics

2.0   Course Objectives

This course will enable students to:
- Simulate discrete time signals and verification of sampling theorem.
- Compute the DFT for a discrete signal and verification of its properties using MATLAB.
- Find solution to the difference equations and computation of convolution and correlation along with the verification of properties.
- Compute and display the filtering operations and compare with the theoretical values.
- Implement the DSP computations on DSP hardware and verify the result.

3.0   Course Outcomes

At the end of the course students will be able to:

	Course Outcome	RBT Level	POs
C307.1	Develop the MATLAB and C programming skills.	L1,L2,L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C307.2	Program in MATLAB to perform different type of signal processing.	L1,L2,L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C307.3	Program in C using DSP hardware kit to perform different type of signal processing.	L1,L2,L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C307.4	Design and analyze the performance of IIR filters using MATLAB.	L1,L2,L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
C307.5	Design and analyze the performance of FIR filters using MATLAB.	L1,L2,L3	PO1, PO2, PO3, PO6, PO8, PO11, PO12
Total Hours of instruction		**39**	

4.0	Course Content

Laboratory Experiments:

Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:

1. Verification of sampling theorem.
2. Linear and circular convolution of two given sequences, Commutative, distributive and associative property of convolution.
3. Auto and cross correlation of two sequences and verification of their properties
4. Solving a given difference equation.
5. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum (using DFT equation and verify it by built-in routine).
6. (i) Verification of DFT properties (like Linearity and Parsevals theorem, etc.) (ii) DFT computation of square pulse and Sinc function etc.
7. Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques) and test the filter with an audio file. Plot the spectrum of audio signal before and after filtering.
8. Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications and test with an audio file. Plot the spectrum of audio signal before and after filtering.

Following Experiments to be done using DSP kit:

9. Obtain the Linear convolution of two sequences.
10. Compute Circular convolution of two sequences.
11. Compute the N-point DFT of a given sequence.
12. Determine the Impulse response of first order and second order system.
13. Generation of Sine wave and standard test signals

5.0	**Relevance to future subjects**

Sl No	Semester	Subject	Topics
01	VIII	Project work	Microprocessor based projects
02	V	DSP	Convolution, filtering techniques.

6.0	**Relevance to Real World**

SL. No	Real World Mapping
01	DSP Model system
02	Model creation for analysis
03	Development of a software applications

7.0	**Gap Analysis and Mitigation**

SL. No	Delivery Type	Details
01	Tutorial, Manual	Topic: CCS, Filtering design
02	NPTEL	http://nptel.ac.in/courses/108105055/

8.0	**Books Used and Recommended to Students**

Text Books
1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

9.0	Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1. https://vtumaterials.wordpress.com/2010/11/16/dsp-lab-manual-5th-sem-ec-vtu/
2. https://vtumaterials.files.wordpress.com/2011/11/dsp-lab-manual-19-nov-20111.pdf
3. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.394.4996&rep=rep1&type=pdf
4. http://eceweb1.rutgers.edu/~orfanidi/ece348/labs-2011.pdf

10.0	Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Elsevier	https://www.journals.elsevier.com/digital-signal-processing
2	IEEE Journals	https://signalprocessingsociety.org/
3	Journal on digital signal processing	http://www.imanagerpublications.com/JournalIntroduction.aspx?journal=JournalonDigitalSignalProcessing

11.0	Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)
(a) Lab work, Assignment, Technical quiz: 10 Marks.
(b) Lab Internal Assessment test: 30marks.
SCHEME OF EXAMINATION:
Two questions to be set from each part.
Student has to answer both full questions. 100 Marks divided in three parts write up 15marks, Conduction 70marks & Viva 15marks.

12.0	Course Delivery Plan

| Expt.	Content	% of Portion
	Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:	
1	Verification of sampling theorem (use interpolation function).	7.69
2	Linear and circular convolution of two given sequences, Commutative, distributive and associative property of convolution.	7.69
3	Auto and cross correlation of two sequences and verification of their properties	7.69
4	Solving a given difference equation.	7.69
5	Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum (using DFT equation and verify it by built-in routine).	7.69
6	(i) Verification of DFT properties (like Linearity and Parsevals theorem, etc.) (ii) DFT computation of square pulse and sinc function etc.	7.69
7	Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques) and test the filter with an audio file. Plot the spectrum of audio signal before and after filtering.	7.69
8	Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications and test with an audio file. Plot the spectrum of audio signal before and after filtering.	7.69
	Following Experiments to be done using DSP kit	
9	Obtain the Linear convolution of two sequences.	7.69
10	Compute Circular convolution of two sequences.	7.69
11	Compute the N-point DFT of a given sequence.	7.69
12	Determine the Impulse response of first order and second order system.	7.69
13	Generation of Sine wave and standard test signals.	7.69

13.0 VIVA BANK

1. What is DSP?

2. What are advantages of DSP?

3. What are applications of DSP?

4. Why DFT? What is need of Sampling DTFT?

5. What is the necessity of processing of signal

6. What do you mean by discrete signal?

7. When a discrete time signal is called periodic?

8. What is anti aliasing filter? Can it be Digital filter? Justify.

9. What is impulse response and what is its significance?

10. What do you mean by real time signal? Give example.

11. What are linear and non-linear systems?

12. Why linear convolution is important in DSP?

13. What do you mean by aliasing in circular convolution?

14. Why circular convolution is important in DSP?

15. How to perform linear convolution using circular convolution?

16. What are the applications of Correlation?

17. What is auto-correlation and cross correlation?

18. What is Finite Impulse Response?

19. What is infinite Impulse Response?

20. What is the need of FFT?

21. DFT gives discrete spectrum or continuous spectrum? Justify?

22. How efficient is the FFT?

23. FFT is faster than DFT. Justify.

24. What do you mean by Decimation?

25. Why Radix-2 algorithms are fast compared to radix-3 algorithms. ?

26. What is the drawback in Fourier Transform and how it is overcome?

27. Why sectioned convolution is performed?

28. What is Zero padding? Why it is needed?

29. What are the two methods of sectioned convolution?

30. In what way zero padding is implemented in overlap save method?

31. Compare the overlap add and overlap save method of sectioned convolution.

32. What is periodicity and aperiodicity

33. What is the Nyquist rate

34. What is stable and unstable
35. What do you mean by casual and non casual
36. Distinguish linear and non linear
37. Give the memory signal and memory less signal
38. What is FIR and IIR
39. Give the 1st order,2nd order system
40. State sampling theorem? What is the necessary condition?
41. On what signal Fourier transform and Fourier series applied
42. State convolution theorem

43. Necessity of convolution theorem
44. Define Impulse signal and its timing properties
45. Differentiate between linear convolution and circular convolution
46. What do you mean by filter
47. Define auto correlation and cross correlation
48. Give the phase and magnitude equation of calculation
49. What do you mean by macros
50. What is necessity of function in C programming
51. Give the different data types in C
52. What is file extension of C programs
53. What is the file extension for C++ programs
54. Give the mathematical header available in C.
55. What are conditional statements in C programming
56.

14.0   University Result

Examination	FCD	FC	SC	% Passing
Jan 2021	32	01	01	100
Jan 2020	31	05	00	100
Jan 2019	32	05	08	100
Jan- 2018	39	03	13	100

Prepared by	Checked by		
1)Prof. S. S. Ittannavar 2) Prof. B. P. Khot	Prof. S. B. Akkole	HOD	Principal

Subject Title	**HDL LABORATORY**		
Subject Code	18ECL58	**IA Marks**	40
Number of Lecture Hrs / Week	2Hrs Tutorial + 2Hrs Laboratory	**Exam Marks**	60
Total Number of Lecture Hrs	36	**Exam Hours**	03
		CREDITS – 02	

FACULTY DETAILS:

Name:1. Prof. Sachin S Patil	Designation:1. Asst. Professor	Experience: T-16.7Yrs, I-02.3Yrs
No. of times course taught: 1.09		**Specialization:** VLSI & Embedded System Design

1.0   Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	I/II	Basic Electronics
02	Electronics & Communication Engineering	III	Digital Electronics

2.0   Course Objectives

This course will enable students to:
- Familiarize with the CAD tool to write HDL programs.
- Understand simulation and synthesis of digital design.
- Program FPGAs/CPLDs to synthesise the digital designs.
- Interface hardware to programmable ICs through I/O ports.
- Choose either Verilog or VHDL for a given Abstraction level.

3.0   Course Outcomes

At the end of the course students will be able to:

Co's	Course Outcome	RBT Level	POs
CO308.1	Write the Verilog/VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.	L1,L2, L3	PO1-6, PO9-12
CO308.2	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.	L1,L2, L3	PO1-6, PO9-12
CO308.3	Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.	L1,L2, L3	PO1-6, PO9-12
CO308.4	Interface the hardware to the programmable chips and obtain the required output.	L1,L2, L3	PO1-6, PO9-12
Total Hours of instruction		**36**	

4.0   Course Content

Laboratory Experiments:
PART-A
PROGRAMMING (Verilog)

1. Write Verilog program for the following combinational design along with test bench to verify the design:
    a. 2 to 4 decoder realization using NAND gates only (structural model)
    b. 8 to 3 encoder with priority and without priority (behavioural model)
    c. 8 to 1 multiplexer using case statement and if statements
    d. 4-bit binary to gray converter using 1-bit gray to binary converter 1-bit adder and subtractor

2. Model in Verilog for a full adder and addfunctionality to perform logical operations of XOR, XNOR,AND and OR gates. Write test bench with appropriate input patterns to verify the modelled behaviour.3. Write a Verilog/VHDL code to describe the functions of a Full Adder Using three modeling styles.

3. Verilog 32-bit ALU shown in figure below and verify the functionality of ALU by selecting appropriatetest patterns. The functionality of the ALU is presented in Table 1.
    a. Write test bench to verify the functionality of the ALU considering all possible input patterns
    b. The enable signal will set the output to required functions if enabled, if disabled all the outputsare set to tri-state
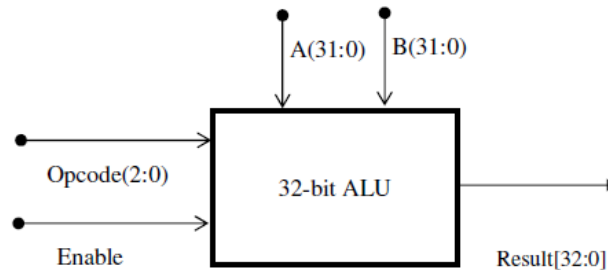   c. The acknowledge signal is set high after every operation is completed

Figure 1 ALU top level block diagram

Opcode(2:0)	ALU Operation	Remarks	
000	A + B	Addition of two numbers	Both A and B are in two's complement format
001	A – B	Subtraction of two numbers	
010	A + 1	Increment Accumulator by 1	A is in two's complement format
011	A - 1	Decrement accumulator by 1	
100	A	True	Inputs can be in any format
101	A Complement	Complement	
110	A OR B	Logical OR	
111	A AND B	Logical AND	

Table 1 ALU Functions

4. Write Verilog code for SR, D and JK and verify the flip flop.
5. Write Verilog code for 4-bit BCD synchronous counter.
6. Write Verilog code for counter with given input clock and check whether it works as clock divider performing division of clock by 2, 4, 8 and 16. Verify the functionality of the code.

PART-B

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write a Verilog code to design a clock divider circuit that generates 1/2, 1/3rd and 1/4thclock from agiven input clock. Port the design to FPGA and validate the functionality through oscilloscope.
2. Interface a DC motor to FPGA and write Verilog code to change its speed and direction.
3. Interface a Stepper motor to FPGA and write Verilog code to control the Stepper motor rotation whichin turn may control a Robotic Arm. External switches to be used for different controls like rotate theStepper motor (i) +N steps if Switch no.1 of a Dip switch is closed (ii) +N/2 steps if Switch no. 2 of aDip switch is closed (iii) –N steps if Switch no. 3 of a Dip switch is closed etc.
4. Interface a DAC to FPGA and write Verilog code to generate Sine wave of frequency F KHz (eg.200 KHz) frequency.

Modify the code to down sample the frequency to F/2 KHz. Display the Original and Down sampled signals by connecting them to an oscilloscope.

5. Write Verilog code using FSM to simulate elevator operation.

6. Write Verilog code to convert an analog input of a sensor to digital form and to display the same on a suitable display like set of simple LEDs, 7-segment display digits or LCD display.

5.0   Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	HDL based projects
02	Higher	CMOS VLSI	Design & Programming

6.0   Relevance to Real World

SL.No	Real World Mapping
01	Integrated Circuits (Chip)
02	Model creation for analysis
03	Development of a software applications

7.0   Gap Analysis and Mitigation

SL. No	Delivery Type	Details
01	Tutorial	Topic: Lettering, Line, Methods of dimensioning
02	NPTEL	Assembly Application

8.0   Books Used and Recommended to Students

Text Books
1. **Verilog HDL** –Samir Palnitkar-Pearson Education

9.0   Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
4)   https://vtu.ac.in
5)   http://www.bookspar.com/engineering-vtu
3)   http://www.slideshare.net/farohalolya/HDL lab-manual
4)   https://www.youtube.com

10.0   Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE	http://ieeexplore.ieee.org/Xplore/home.jsp
2	PC World	http://www.pcworld.com/article/146957/components/article.html

11.0   Examination Note

Scheme of Evaluation for Internal Assessment (40 Marks)

(c) Lab work: 24Marks.

(d) Internal Assessment test:16Marks.

SCHEME OF EXAMINATION:

Two questions to be set each from Module.

Student has to answer both full questions. 60marks Marks divided in three parts Write-upConduction & Viva.

12.0 Course Delivery Plan

Experiment	Content	% of Portion
1	Write HDL code to realize all the logic gates	14
2	Write a HDL program for the following combinational designs a. 2 to 4 decoder b. 8 to 3 (encoder without priority & with priority) c. 8 to 1 multiplexer d. 4 bit binary to gray converter e. Multiplexer, de-multiplexer, comparator.	28
3	Write a HDL code to describe the functions of a Full Adder Using three modeling styles	42
4	Write a model for 32 bit ALU	56
5	Develop the HDL code for the following flip-flops, SR, D, JK, T. Opcode (3:0) Enable	70
6	Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters	84

7	**Interfacing Experiments:** **1.** Write a Verilog code to design a clock divider circuit that generates 1/2, 1/3rd and 1/4thclock from agiven input clock.Port the design to FPGA and validate the functionality through oscilloscope. **2.** Interface a DC motor to FPGA and write Verilog code to change its speed and direction. **3.** Interface a Stepper motor to FPGA and write Verilog code to control the Stepper motor rotation whichin turn maycontrol a Robotic Arm. External switches to be used for different controls like rotate theStepper motor (i) +N steps if Switch no.1 of a Dip switch is closed (ii) +N/2 steps if Switch no. 2 of aDip switch is closed (iii) – N steps if Switch no. 3 of a Dip switch is closed etc. **4.** Interface a DAC to FPGA and write Verilog code to generate Sine wave of frequency F KHz (eg. 200 KHz) frequency. Modify the code to down sample the frequency to F/2 KHz. Display the Original and Down sampled signals by connecting them to an oscilloscope. **5.** Write Verilog code using FSM to simulate elevator operation. **6.** Write Verilog code to convert an analog input of a sensor to digital form and to display the same on a suitable display like set of simple LEDs, 7-segment display digits or LCD display.	100

13.0 VIVA BANK

1. HDL stands for_____.
2. VHDL stands for_____.
3. Explain the structure of Verilog module.
4. Explain Verilog Ports.
5. List the logical operators. Explain any one with example.
6. List the Relational operators. Explain any one with example.
7. List the Arithmetic operators. Explain any one with example.
8. Explain Shift and Rotate operators.
9. What is Data type?

10. Explain the Verilog Data types.

11. Compare VHDL and Verilog.

12. If A and B are two unsigned variables, with A=1100 and B=1001, find the value of

The following expressions:

      a.   (A AND B)   b. (A ^ B)   c. (A & B)   d. (A NOR B)   e. (A && B)   f. !(B) g. ~|(A) h. A >>1 i. B ror 2

13. What do you mean concurrent statements?

14. Draw the simulation wave form for 2x1 MUX.

15. What is logic synthesis?

16. Explain Signal declaration and assignment statements.

17. What is sensitivity list?

18. Explain the structure of PROCEDURE in Verilog.

19. Explain the structure of TASKS in Verilog.

20. Explain the structure of FUNCTIONS in Verilog.

21. Which IDE is used for Verilog code development?

22. How many windows get open when you open the Xilinx Project Navigator?

23. FPGA stands for_____.

24. JTAG stands for_____.

25. Which simulator is used in Lab.

14.0   University Result

Examination	FCD	FC	SC	% Passing
Feb- 2020	-	-	-	100
Jan- 2019	-	-	-	100
Jan- 2018	-	-	-	100

Prepared By	Checked By		
Prof. S. S. Patil	Prof. S B Akkole	HOD	Principal

Subject Title	ENVIRONMENTAL STUDIES		
Subject Code	18CIV59	IA Marks	40
Number of Lecture Hrs /	01	Exam Marks	60
Total Number of Lecture Hrs	25	Exam Hours	02
	CREDITS – 01		

FACULTY DETAILS:		
Name: Dr. M. S. Hanagadakar Prof. S. J. Walaki	Designation: i) Assoc. Professor ii) Asst. Professor	Experience:i) 17.0 ii) 6.0
No. of times course taught:i) 08 ii) 03	Specialization:i) Physical Chemistry ii) Organic Chemistry	

1.0   Prerequisite Subjects:

Fundamentals of Chemistry, Physics, Mathematics, Biology, Engineering, Anthropology, Sociology, (Social problems), Economics (production, consumption, and transfer of wealth), management, Ecology Knowledge are required.

2.0   Course Learning Objectives

1. Recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
2. Develop analytical skills, critical thinking, and demonstrate problem-solving skills using scientific techniques.
3. Demonstrate the knowledge and training for entering graduate or professional schools, or the job market.

3.0   Course Outcomes

Having successfully completed this course, the student will be able to

Course Code	Course Outcome	RBT level	POs
C309.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.	L1,L2	1,2,3,6,7,9,10,12
C309.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.	L1, L2	1,2,3,6,7,9,10,12
C309.3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.	L1, L2	1,2,3,6,7,9,10,12
C309.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.	L1, L2	1,2,3,6,7,9,10,12
C309.5	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.	L1,L2	1,2,3,6,7,9,10,12
Total Hours of instruction		**25**	

4.0   Course Content

Module-1
Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.
Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.
Module -2
Advances in Energy Systems (Merits, Demerits, Global Status and Applications)**:** Hydrogen, Solar, OTEC, Tidal and Wind.

Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.

Module -3

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies)**:** Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.
Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

Module -4

Global Environmental Concerns:(Concept, policies and case-studies):Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

Module -5

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs.

Field work: Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Waste water treatment Plant; ought to be followed by understanding of process and its brief documentation.

5.0	Relevance to future subjects

Sl. No.	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Sustainable development, waste management, Pollution control, Energy systems, Environmental issues.

6.0	Relevance to Real World

Sl.No	Real World Mapping
01	All engineering applications / projects leading to the sustainable development, waste management, pollution control, to resolve global related issues.

7.0	Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	NPTEL	http://nptel.ac.in/courses

8.0	Books Used and Recommended to Students

Text Books
1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and JagadishKrishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.
Reference Books
1. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage

learning Singapore, 2005

2. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006

3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007

4. ErachBharucha, "Text Book of Environmental Studies", for UGC, University press, 2005

5. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004

6. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006

7. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.PiyushMalaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

| 9.0 | Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended |

Website and Internet Contents References

Web links and Video Lectures:
https://nptel.ac.in/courses/120/108/120108005/
https://nptel.ac.in/courses/120/108/120108002/
https://nptel.ac.in/courses/120/108/120108004/
https://nptel.ac.in/courses/105/102/105102089/
https://www.my-mooc.com/en/categorie/environmental-science
https://academicearth.org/environmental-studies/

| 10.0 | Magazines/Journals Used and Recommended to Students |

Sl.No	Magazines/Journals	website
1	Environmental-science	http://nlspub.ac.in/category/journals/journal-of-environmental-law-policy-and-development/
2	Environmental-research	https://www.journals.elsevier.com/environmental-research

| 11.0 | Examination Note |

Question paper pattern:
- The Question paper will have 100 objective questions.
- Each question will be for 01 marks
- Student will have to answer all the questions in an OMR Sheet.
- The Duration of Exam will be 2 hours.

Scheme of Evaluation for CIE (40 Marks)
Internal Assessment test will be done in the same pattern as that of the main examination.
Internal Assessment: 30 Marks
Assignment: 10 Marks

12.0   Course Delivery Plan

Module No.	Lecture No.	Content of Lecturer	% of Portion
1	1	**Ecosystems** (Structure and Function):, Wetlands, Riverine	20
	2	Forest and Desert	
	3	Oceanic and Lake	
	4	**Biodiversity:** Types, Value; Hot-spots; Threats and Conservation of biodiversity.	
	5	Forest Wealth, and Deforestation	
2	6	**Advances in Energy Systems** (Merits, Demerits, Global Status and Applications)**:** Hydrogen,	20
	7	Solar and OTEC	
	8	Tidal and Wind.	
	9	**Natural Resource Management** (Concept and case-studies): Disaster Management.	
	10	Sustainable Mining, Cloud Seeding, and Carbon Trading.	
3	11	**Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies)**:** Surface and Ground	20
	12	Water Pollution and Noise pollution	
	13	Soil Pollution and Air Pollution.	
	14	**Waste Management & Public Health Aspects:** Bio-medical Wastes; Solid waste	
	15	Hazardous wastes; E-wastes; Industrial and Municipal Sludge	
4	16	**Global Environmental Concerns:**(Concept, policies and case-studies):Groundwater depletion/recharging.	20
	17	Climate Change; Acid Rain and Ozone Depletion	
	18	Radon and Fluoride problem in drinking water	
	19	Resettlement and rehabilitation of people	
	20	Environmental Toxicology.	
5	21	**Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):** G.I.S. & Remote Sensing.	20
	22	Environment Impact Assessment,	
	23	Environmental Management Systems, ISO14001, Environmental Stewardship-NGOs.	
	24	**Field work:** Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Waste water treatment Plant.	
	25	Ought to be followed by understanding of process and its brief documentation.	

13.0   Assignments

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity.	Book 1, of the reference list. Website of the Reference list
2	Assignment 2: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list

3	Assignment 3: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment 5: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list

14.0   QUESTION BANK

Module-1

1. The term 'Environment' has been derived from the French word which means to encircle or surround
a) Environ   b) Oikos   c) geo   d) Aqua
2. The objective of environmental education is
a) Raise consciousness about environmental conditions   b) To teach environmentally appropriate
behavior   c) Create an environmental ethic   d) All of the above
3. Which of the following conceptual spheres of the environment is having the least storage capacity for matter?
a) Atmosphere   b) Lithosphere   c) Hydrosphere   d) Biosphere
4. Which of the following components of the environment are effective transporters of matter?
a) Atmosphere and Hydrosphere   b) Atmosphere and Lithosphere
c) Hydrosphere and Lithosphere   d) Biosphere and Lithosphere
5. Biosphere is
a) The solid shell of inorganic materials on the surface of the earth
b) The thin shell of organic matter on the surface of earth comprising of all the living things
c) The sphere which occupies the maximum volume of all of the spheres   d) all of these.
6. Atmosphere consists of 79 per cent Nitrogen and 21 per cent Oxygen by
a) Volume   b) weight   c) Density   d) All the three
7. Which of the following is a biotic component of an ecosystem?
a) Fungi   b) solar light   c) temperature   d) humidity
8. In an ecosystem, the flow of energy is
a) Bi-directional   b) Cyclic   c) Unidirectional   d) Multidirectional
9. Which Pyramid is always upright?
a) Energy   b) biomass   c) numbers   d) food chain
10. In complex ecosystems the degree of species diversity is
a) Poor   b) high   c) medium   d) none
Module-2
1. Which of the following is considered as an alternate fuel?
a) CNG   b) Kerosene   c) Coal   d) Petrol
2. Solar radiation consists of
a) UV   b) Visible light   c) Infrared   d) All of these
3. Reduction in usage of fuels cannot be brought about by
a) Using alternate fuels   b) Changing lifestyles   c) Reducing car taxes   d) Both a) & b)
4. Which of the following is a hazard of a nuclear power plant?
a) Accident risk when tankers containing fuel cause spill
b) Radioactive waste of the power plant remains highly toxic for centuries
c) Release of toxic gases during processing   d) All of these
5. The most important fuel used by nuclear power plant is
a) U – 235   b) U- 238   c) U – 245   d) U – 248
6. Biogas is produced by
a) Microbial activity   b) Harvesting crop   c) Both a) & b)   d) None of these

7. Oil and Gas are preferred because of
a) Easy transportation   b) Cheap   c) Strong smell   d) All of these

8. Biomass power generation uses
a) Crops   b) Animal dung   c) Wood   d) All of these

9. Chernobyl nuclear disaster occurred in the year
a) 1984   b) 1952   c) 1986   d) 1987

10. Which of the following is not a renewable source of energy?
a) Fossil fuels   b) Solar energy   c) Tidal wave energy   d) Wind energy

Module-3

1. Environmental pollution is due to
a) Rapid Urbanization   b) deforestation   c) Afforestation   d) a & b

2. Which of the following are natural sources of air pollution?
a) Volcanic eruption   b) solar flair   c) earth quake   d) all

3. Which of the following are biodegradable pollutants?
a) Plastics   b) Domestic sewage   c) detergent   d) all

4. The liquid waste from baths and kitchens is called
a) Sullage   b) Domestic sewage   c) Storm waste   d) Run off

5. Noise pollution can be minimized by
a) Urbanization   b) Maintaining silence   c) Reducing noise at source   d) none

6. BOD Means
a) Biochemical oxygen demand   b) chemical oxygen demand   c) biophysical oxygen demand   d) all

7. Which of the following industry generates colored waste?
a) Software industry   b) Textile industry   c) Biomedical industry   d) none

8. Physical pollution of water is due to
a) Dissolved oxygen   b) Turbidity   c) pH   d) none of these

9. Which of the following source is surface water?
a) Springs   b) streams   c) deep wells   d) all

10. Deforestation can
a) Increase the rain fall   b) Increase soil fertility   c) Introduce silt in the rivers   d) None of these

11. Which of the following is non point source of water pollution?
a) Factories   b) Sewage treatment plant   c) Urban and Sub-urban land   d) all of the above
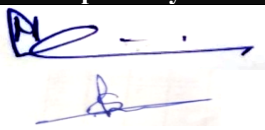
Module-4
1. Acid rain can be controlled by
a) Reducing SO_2 and NO_2 emissions.   b) Reducing oxygen emission.
c) Increasing number of lakes.   c) Increasing the forest cover.

2. Atmospheric oxidation of SO_2 to SO_3 is influenced by
a) Sunlight.   b) Humidity   c) presence of hydrocarbons   d) all of these

3. Reduction in brightness of the famous TajMahal is due to
a) Global warming.   b) Air pollution   c) Ozone depletion   d) Afforestation.

27. The Effect of Acid rain
a) Reduces soil fertility.   b) increases atmospheric temperature.
c) Causing respiratory problems   d) skin cancer

4. The process of movement of nutrients from the soil by the Acid rain iscalled
a) Transpiration.   b) Evapo transpiration   c) Leaching   d) Infiltration.

5. Ozone layer is present in
a) Troposphere   b) Stratosphere   c) Mesosphere   d) Thermosphere

6. Which of the following statements about ozone is true?
a) Ozone is a major constituent of photochemical smog
b) Ozone protects us from the harmful uv radiation of sun
c) Ozone is highly reactive   d) All of the above

7. Major compound responsible for the destruction of stratospheric ozone layer is
a) Oxygen   b) CFC   c) Carbon dioxide   d) Methane

8. Ozone layer thickness is measured in
a) PPM   b) PPB   c) Decibels   d) Dobson units

9. Normal average thickness of stratospheric ozone layer across the globe is around
a) 200 DU   b) 300 DU   c) 400 DU   d) 500 DU

10. ChloroFluro Carbon's (CFC) are
a) Non toxic   b) Non flammable   c) Non carcinogenic   d) All these

11. Ozone layers absorbs
a) UV rays   b) infra red rays   c) Cosmic rays   d) CO

12. Which of the following is not an ill effect of acid rain?
a) Results in killing fish   b) causes stone leprosy. c) Leaches nutrients from the soil. d) Causes cataract.

13. Formation of ozone layer is explained by
a) Rosenmund reaction   b) Henderson's reaction   c) Chapman's reaction.   d) Perkin's reaction
14. Each Chlorine free Radical can destroy the following number of ozone molecules.
a) 1000   b) 10,000   c) 1, 00, 000   d) 100
15. Which of the following statements about ozone is true?
a) Ozone is a major constituent of photochemical smog   b) Ozone is highly reactive
c) Ozone protects us from the harmful UV radiation of sun.   d) All of these

Module-5
1. Sustainable development means
a) Meeting present needs without compromising on the future needs   b) Progress in human well beings
c) Balance between human needs and the ability of Earth to provide the resources   d) All the above
2. The most important remedy to avoid negative impact due to industrialization is
a) Industry should be closed   b) Don't allow new industrial units
c) Industry should treat all the wastes generated by it before disposal
d) Industries should be shifted far away from human habit tats.
3. Mining means
a) To conserve & preserve minerals   b) To check pollution due to mineral resources
c) To extract minerals and ores   d) None
4. E.I.A. can be expanded as
a) Environment & Industrial Act   b) Environment & Impact Activities
c) Environmental Impact Assessment   d) Environmentally Important Activity
5. E.I.A. is related to
a) Resource conservation   b) Efficient equipment/process
c) Waste minimization   d) All of the above
6. In order to protect the health of people living along the adjoining areas of roads, one should.
a) Plant trees alongside of the roads   b) Not allow diesel driven vehicles
c) Shift them (people) to other places   d) None of the above
7. The pollution caused by transportation/vehicular activities depends on
a) Type of the vehicle's engine   b) Age of the vehicle
c) Traffic congestion   d) All of the above
8. Sustainable development will not aim at
a) Social economic development which optimizes the economic and societal benefits available in the
present, without spoiling the likely potential for similar benefits in the future
b) Reasonable and equitably distributed level of economic well being that can be perpetuated continually
c) Development that meets the needs of the present without compromising the ability of future generations
d) Maximizing the present day benefits through increased resource meet their own needs consumption
10. Which of the following is a key element of EIA?
a) Scoping   b) Screening   c) Identifying and evaluating alternatives   d) all of these

Prepared by	Checked by		
Dr. M. S. Hanagadakar Prof. S. J. Walaki	Dr. M. S. Hanagadakar	HOD	Principal