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 SPECIFIC OUTCOMES(PSOS)

The graduates will be able to:

PSO1:

An ability to understand the concepts of Basic Electronics and Communication Engineering and to apply them to various areas like Signal Processing, VLSI, Embedded Systems, Communication Systems and Digital & Analog Devices

PSO2:

An ability to solve complex Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive at cost effective and appropriate solutions

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 sustainable 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

Sl. No	Name of the faculty	Activities
1	Dr.M.C.Sarasamba	GATE / Pre placement Coaching
		Students Mentor
		Module Coordinator
		Research Center Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
2	Prof. S. S. Malaj	GATE / Replacement Coaching
		Adv.Comm. Lab In charge
		Students Mentor
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		NIRF Coordinator
3	Prof. S. S. Kamate	GATE / Pre placement Coaching
		VLSI Lab In charge
		Class Teacher VI Sem
		Students Mentor
		Module Coordinator
		IEEE Coordinator/ IA Coordinator
		Dept. NAAC Criteria Sub Coordinator
		Project Coordinator
		NBA Criteria Coordinator
4	Prof. D. M. Kumbhar	GATE / Pre placement Coaching
		AC Lab In charge
		Students Mentor
		Dept. Association Coordinator
		Class Teacher
		IIIC Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Dept. ED Cell Coordinator
5	Prof. S. S. Patil	GATE / Pre placement Coaching
		ARM & ES Lab In charge
		Students Mentor
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Admission Coordinator
		Module Coordinator

SL. No	Name of the faculty	Activities
6	Prof. D. B. Madihalli	GATE / Pre placement Coaching
		DSD Lab In charge
		Students Mentor
		NBA Coordinator
		News & Publicity Coordinator
		NBA Criteria Coordinator
		Website Coordinator
		VTU LIC Coordinator
7	Prof. P. V. Patil	GATE / Pre placement Coaching
		HDL Lab In charge
		Students Mentor
		NBA Criteria Coordinator
		T&P Cell Coordinator
		Alumni Coordinator
8	Dr. S. S. Ittannavar	GATE / Pre placement Coaching
		BSP /DSP Lab In charge
		Students Mentor
		Module Coordinator
		News Letter / Technical Magazine
		AICTE Coordinator
9	Prof. B. P. Khot	GATE / Pre placement Coaching
		CN/MC Lab In charge
		Students Mentor
		Dept. Time Table Coordinator & Meeting Coordinator
		Class Teacher
		NBA Criteria Coordinator
		Dept T&P Cell Coordinator
		AICTE Activity Coordinator
10	Prof. S.R.Mallurmath	EMS Coordinator
		GATE / Pre placement Coaching
		Students Mentor
		AICTE Activity Coordinator
		NBA Criteria Coordinator
11	Prof. K.S.Patil	GATE / Pre placement Coaching
		Students Mentor
		AICTE Activity Coordinator
		NBA Criteria Coordinator

CONTENTS

FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty.	10	16.36Y
2	Technical supporting staff.	03	23.06Y
3	Helper staff	02	23.00Y

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	39.03
2	Analog Electronics Lab	92	8.24	6	Project Lab	95	--
3	Advanced Commn & Commn + LIC Lab	92	20.01	7	Research/E-Yantra/DSP & C.N.Lab	71	12.15
4	HDL/MC / EMD Lab	71	22.61	8	Power Electronics Lab	--	4.86
Total Investment In The Department					**Rs. 109.09 Lacs**		

FACULTY DETAILS

TEACHING FACULTY

Sl. No.	Name	Designation	Qualification	Specialization	Professional Membership	Teaching Exp.	Contact No.
1	Prof. M.C.Sarasamba	Prof. & HOD	Ph.D	E&C	LMISTE	20Y.03M	9480714746
2	Prof.S .S .Ittannavar	Assoc. Prof	Ph.D	DSP	LMISTE	11Y.05M	9964299498
3	Prof. S. S. Malaj	Asst. Prof	M.E.	E & TC	LMISTE	27Y.02M	9731795803
4	Prof.S.S.Kamate	Asst. Prof	M.Tech	Digital Electronics	LMISTE	21Y.07M	9008696825
5	Prof. D.M. Kumbhar	Asst. Prof	M.Tech	Electronics	LMISTE	20Y.05M	09373609880
6	Prof .Sachin .S. Patil	Asst. Prof	M.Tech	VLSI & Embedded	LMISTE	20Y.03M	9448102010
7	Prof .D.B. Madihalli	Asst. Prof	M.Tech	Industrial Electronics	LMISTE	**17Y.02M**	9902854324
8	Prof.P.V.Patil	Asst. Prof	M.Tech	VLSI & Embedded	LMISTE	12Y.00M	9731104059
9	Prof. B. P. Khot	Asst. Prof	M.Tech	Microelectronics & Control Systems	LMISTE	8Y.06M	9964019501
10	Prof. S.R.Mallurmath	Asst. Prof	M.Tech	Industrial Electronics	LMISTE	11Y.05M	7259865769
11	Prof. K.S.Patil	Asst. Prof	M.Tech	VLSI	LMISTE	30Y.00M	9902682781

TECHNICAL SUPPORTING STAFF

S.N.	Name	Qualification	Experience (in years)
1.	Sri. P. S. Desai	DEC	24Y-.01M
2.	Sri. V. V. Guruwodeyar	DEC	32Y-08 M
3.	Sri.M.A.Attar	DEC	14Y-03M

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in Electronics and Communication Engineering (ECE)
Scheme of Teaching and Examinations 2021
Outcome-Based Education(OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021 - 22)

VI SEMESTER

Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theor	Tutorial	Practical	Self -Study	Duration	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	HSMC 21EC61	Technological Innovation Management and Entrepreneurship	Any Department	3	0	0	0	03	50	50	100	3
2	IPCC 21EC62	C **Microwave Theory & M Antennas**	TD: ECE PSB: ECE	3	0	2		03	50	50	100	4
3	PCC 21EC63	VLSI Design & Testing	TD: ECE PSB: ECE	3	0	0		03	50	50	100	3
4	PEC 21EC64x	Professional Elective Course-I	TD: ECE PSB: ECE					03	50	50	100	3
5	OEC 21EC65x	Open Elective Course-I	Concerned Department					03	50	50	100	3
6	PCC 21ECL66	VLSI Laboratory		0	0	2		03	50	50	100	1
7	MP 21ECMP67	Mini Project		Two contact hours /week for interaction between the faculty and students.				--	100	--	100	2
8	INT 21INT68	Innovation/Entrepreneurship /Societal Internship	Completed during the intervening period of IV and V semesters.					--	100	--	100	3
							Total		**500**	**300**	**800**	**22**

Professional Elective – I

21EC641	Artificial Neural Networks (L:T:P :: 2:2:0)	21EC643	Python Programming (L:T:P :: 2:0:2)
21EC642	Cryptography (L:T:P :: 2:2:0)	21EC644	Micro Electro Mechanical Systems (L:T:P :: 3:0:0)

Open Electives – I offered by the Department to other Department students

21EC651	Communication Engineering (L:T:P :: 3:0:0)	21EC653	Basic VLSI Design (L:T:P :: 3:0:0)
21EC652	Microcontrollers (L:T:P :: 3:0:0)	21EC654	Electronic Circuits with Verilog (L:T:P :: 2:0:2)
21EC655	Sensors & Actuators (L:T:P :: 3:0:0)		

Note: HSMC: Humanity and Social Science & Management Courses, **IPCC:** Integrated Professional Core Course, **PCC:** Professional Core Course, **PEC:**
Professional Elective Courses, O**EC**–Open Elective Course, **MP** –Mini Project, INT –Internship.
L –Lecture, **T** – Tutorial, **P** - Practical / Drawing, **S** – Self Study Component, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Examination.

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with Practical of the same course. Credit for IPCC can be 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE. For more details, the regulation governing the Degree of
Bachelor of Engineering /Technology (BE/B.Tech) 2021-22 may be referred.

Professional Elective Courses(PEC):

A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course out of five courses. The minimum students' strength for offering professional electives is 10.

However, this conditional shall not be applicable to cases where the admission to the programme is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled for the open electives offered by their parent Department. However, they can opt an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor.

Selection of an open elective shall **not be allowed** if,

(i) The candidate has studied the same course during the previous semesters of the program.

(ii) The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.

(iii) A similar course, under any category, is prescribed in the higher semesters of the program.

In case, any college is desirous of offering a course (not included in the Open Elective List of the University) from streams such as Law, Business

(MBA), Medicine, Arts, Commerce, etc., can seek permission, at least one month before the commencement of the semester, from the University bysubmitting a copy of the syllabus along with the details of expertise available to teach the same in the college.

The minimum students' strength for offering open electives is 10. However, this conditional shall not be applicable to cases where the admission to the programme is less than 10.

Mini-project work: Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications.

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for allthe batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

VII semester Class work and Research Internship /Industry Internship (21INT82)

Swapping Facility

Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate research internship/

industry internship after the VI semester**.**

(2) Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Elucidation:

At the beginning of IV year of the programme i.e., after VI semester, VII semester classwork and VIII semester Research Internship /Industrial Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for internship. In other words, a good percentage of the class shall attend VII semester classwork and similar percentage of others shall attend to Research Internship or Industrial Internship.

Research/Industrial Internship shall be carried out at an Industry, NGO, MSME, Innovation centre, Incubation centre, Start-up, Centers of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations / institutes. The intership can also be rural internship.

The mandatory Research internship /Industry internship is for 24 weeks. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during the subsequent University examination after satisfying the internship requirements.

INT21INT82Research Internship/ Industry Internship/Rural Internship

Research internship: A research internship is intended to offer the flavour of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

The faculty coordinator or mentor has to monitor the students' internship progress and interact with them to guide for the successful completion of the internship.

The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of internship.

S J P N Trust's
Hirasugar Institute of Technology, Nidasoshi.
Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi
Recognized under 2(f) & 12B of UGC Act, 1956
Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE

IQAC
File I-11
AY:2023-24 (Even)
Rev: 01

ACADEMIC CALENDAR OF EVENTS-02 (CoE-02) OF IV& VI SEMs FOR THE AY: 2023-24

Ref: 1) VTU CoE Revised Notification No.: VTU/BGM/AC-MBA/2023-24/6901, Dated 27th March 2024
2) VTU Tentative Academic Calendar Notification No.: VTU/BOS/AC-PG-6th sem BE/2023-24 /239, Dated 15th April 2024

April -2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	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				

May-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			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	

June-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30						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

July-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	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			

August-2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				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

Date	Events & Holidays
2nd April 2024	Technovision-24
9th April 2024	GH: Yugadi Festival
11th April 2024	GH: Kutub-A-Ramjan
22nd April. 2024	Commencement of IV Semester Classes
29th April. 2024	Commencement of VI Semester Classes
30th April 2024	Institute Sports Events
1st May 2024	GH: Labours Day
7th May 2024	GH: Lok Sabha Election
2nd -6th May 2024	Fun Week (Social & Cultural Activities)
8th May 2024	HSIT Shambhrama-24 & World- Red-Cross Day
9th May 2024	Graduation Day-24
10th May 2024	GH: Basav Jayanti/Akhsay Trutiya
13th May 2024	Final Year Project Exhibition
29th -31st May 2024	1st IA Test for IV & VI Sems.
31st May 2024	1st Feedback on Teaching-Learning (IV & VI Sems.)
5th June 2024	Display of 1st IA Test Marks of IV & VI Sems.
21st -22nd June 2024	Lab IA Test-I (IV & VI Sem. 2021 & 2022 Schemes)
21st June 2024	International Yoga Day
27th -29th June 2024	2nd IA Test for IV & VI Sems.
29th June 2024	2nd Feedback on Teaching-Learning (IV & VI Sems.)
3rd July 2024	Display of 1st IA Test Marks of IV & VI Sems.
17th June 2024	GH: Bakreed
3rd July 2024	International Plastic Bag Free Day
11th July 2024	World Population Day
15th July 2024	World Youth Skills Day
17th July 2024	GH: Last Day of Moharam
25th -27th July 2024	3rd IA Test for IV & VI Sems.
28th July 2024	World Nature Conservation Day
30th July 2024	Display of 3rd IA Test Marks of IV & VI Sems.
29th -30th July 2024	Lab IA Test-II (IV & VI Sem. 2021 & 2022 Schemes)
31st July 2024	Last Working Day of the VI Semester Classes
7th August 2024	Last Working Day of the IV Semester Classes
12th August 2024	International Youth Day
15th August 2024	GH: Independence Day Celebration
8th -17th August 2024	VTU IV Sem Practical Examinations
19th Aug. -12th Sept. 2024	VTU IV Sem Theory Examinations
1st -10th August 2024	VTU VI Sem Practical Examinations
12th Aug. -14th Sept. 2024	VTU VI Sem Theory Examinations
20th August 2024	Sadbhavna Diwas
26th August 2024	Women's Equality Day
16th Sept. 2024	Commencement of V Sem of AY: 2024-25

GH: General Holiday, RH: Local Holiday

Dr.S.N.Topannavar
IQAC Coordinator & Dean (Academics)

Dr.S.C.Kamate
Principal

Nidasoshi, Taq: Hukkeri, Dist: Belagavi, Karnataka - 591 236
Phone:+91-8333-278887, Fax:278886, Web:www.hsit.ac.in, Mail:principal@hsit.ac.in

Page 1 of 2

Subject Title	**Technological Innovation Management &**		
Subject Code	21EC61	**CIE Marks**	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	**SEE Marks**	50
Total Number of Lecture Hrs	40 (08 Hrs/Module)	**Exam Hours**	03
Credits: 03			

FACULTY DETAILS:		
Name: Prof. S. R. Malluramath	**Designation:** Assistant Professor	**Experience:** 10 Years
No. of times course taught: 01	**Specialization:** Industrial Electronics	

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.
- Identify the Management functions and social responsibilities.
- Understand the identification of Business, drafting the Business plan and sources of funding.

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs
C312.1	Understand the fundamental concepts of Management and its functions	L2, L3	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C312.2	2. Understand the different functions to be performed by managers/Entrepreneur.	L2, L3	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C312.3	Understand the social responsibilities of a Business.	L2, L3,L4	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C312.4	Understand the Concepts of Entrepreneurship and to identify Business opportunities.	L2, L3,L4	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C312.5	Understand the components in developing a business plan and awareness about various sources of funding and Institutions supporting Entrepreneur.	L2, L3,L4	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(Text 1).

Module 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization-Process Departmentalization, Purpose Departmentalization ,Committees– Meaning, Types of Committees.

Staffing: Need and Importance, Recruitment and Selection Process.

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 (Text 1).

Module 3

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 (Text 1).

Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance (Text 1).

Module 4

Entrepreneurship: Introduction, Evolution of the concept of Entrepreneurship, Entrepreneurship today,Types of Entrepreneurs, Entrepreneurship, Entrepreneurial competencies, Capacity Building for Entrepreneurs.

Identification of Business Opportunities: Introduction, Mobility of Entrepreneurs, Business opportunities in India, Models for Opportunity Evaluation.

Module 5

Business plans: Introduction, purpose of a Business plan, contents of a Business plan, presenting a Business plan, why do some Business plan fail? Procedure for setting up an Enterprise.

Institutions supporting Business opportunities: Central level institutions- National Board for micro, small & medium Enterprises(NBMSME),MSME-DO, National Small Industries Corporation. State level institutions- state Directorate Industries and commerce, District Industries Centres, state financial Corporations, State Industrial Development Corporation(SIDC),State Industrial Area Development Board (SIADB). Other Institutions - NABARD, Technical consultancy organization (TCO), Small Industries Development Bank of India(SIDBI), Export Promotion Councils, Non governmental Organizations'.

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.

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://nptel.ac.in/courses/110107094
02) https://nptel.ac.in/courses/110106141
03) https://nptel.ac.in/courses/122106031

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

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)
6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks.

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 , Art & Profession	
	5	**Planning:** Nature & Importance, Types.	
	6	Steps and Limitation of Planning	
	7	Decision Making-Meaning, Types	
	8	Decision Making, Steps in Decision making.	
2	9	**Organizing and Staffing:** Meaning, Characteristics, Process of Organizing.	40
	10	Principles of organizing, Span of Management.	
	11	Departmentalization-Process Departmentalization	
	12	Purpose Departmentalization ,Committees– Meaning, Types of Committees	
	13	**Staffing-**Need and Importance, Recruitment and selection process.	
	14	**Directing and Controlling:** Meaning and Requirements of Effective Direction, Giving Orders.	
	15	Motivation-Nature of Motivation, Motivation Theories.	
	16	Communication-Meaning, Importance and purposes of communication	
3	17.	**Leadership**-Meaning, Characteristics, Behavioral Approach of Leadership	60
	18	Coordination-Meaning, Types, Techniques of Coordination	
	19	Controlling – Meaning, Need for Control System	
	20	Benefits of Control, Essentials of Effective Control System	
	21	Steps in Control Process	
	22	**Social Responsibilities of Business**: Meaning of Social Responsibility.	
	23	Social Responsibilities of Business towards Different Groups.	
	24	Business Ethics and Corporate Governance.	
4	25	**Entrepreneurship:** Introduction, Evolution of the concept of Entrepreneurship,	80
	26	Entrepreneurship today	
	27	Types of Entrepreneurs	
	28	Intrapreneurship, Entrepreneurial competencies	
	29	Capacity Building for Entrepreneurs	
	30	**Identification of Business Opportunities:** Introduction, Mobility of Entrepreneurs	
	31	Business opportunities in India	
	32	Models for Opportunity Evaluation.	

5	33	Business plans: Introduction, purpose of a Business plan	100
	34	Contents of a Business plan, presenting a Business plan,	
	35	Why do some Business plan fail? Procedure for setting up an Enterprise.	
	36	Institutions supporting Business opportunities: Central level institutions- National Board for micro, small & medium Enterprises(NBMSME),MSME-DO	
	37	National Small Industries Corporation. State level institutions- state Directorate Industries and commerce, District Industries Centers,	
	38	state financial Corporations, State Industrial Development Corporation(SIDC),State Industrial Area Development Board (SIADB)	
	39	Other Institutions - NABARD, Technical consultancy organization (TCO), Small Industries Development Bank of India(SIDBI)	
	40	Export Promotion Councils, Non governmental Organizations'	

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	4	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	9	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

14.0 QUESTION BANK

MODULE -1

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?
11. Define the term planning and explain its different characteristics.
12. Explain the importance and purpose of planning process.
13. What are the different steps in planning processes explain each step in detail.

14. What are the objectives of planning process?
15. How organizational plans can be broadly classified.
16. What is decision making and write down the characteristics of it.
17. Write notes on a) strategic planning b) tactical planning c) operational planning.
18. Draw a block diagram showing hierarchy of plans.

MODULE -2

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.
13. Explain the meaning of directing. What are the different features of directing?
14. What is leadership? and what are the different leader ship styles.
15. What is motivation? Write down its characteristics.
16. Write a note on Maslow's hierarchy of needs theory with a block diagram.
17. Write a note on the two-factor theory.
18. Compare the Maslow's theory and Herzberg theory.
19. Distinguish between theory X and theory Y.
20. Explain McClelland's three need model, VROOM'S VALANCE EXPECTANCY Theory.
21. What is communication and write down the importance of communication
22. Explain the term coordination and write down its importance.
23. What is controlling and what are the different steps involved in controlling.

MODULE -3

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.
5. \What is entrepreneurship explain the concept.
6. Differentiate between Manager and Entrepreneur
7. What are the functions of entrepreneur?
8. Write a note on types of entrepreneurs.
9. Differentiate between entrepreneur and entrepreneur.
10. What is the role of entrepreneurs in economy development?

11. Write a note on barriers to entrepreneurship.
12. Write a note on entrepreneurship in India.

MODULE -4

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

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.
8. Explain the concept of Financial opportunity identification.
9. Explain the concept of Non banking Institutions & Agencies.
10. Explain Pre launch,Launch and Post launch requirements.
11. Write the procédure for getting License and Registration.
12. What are the Challenges and Difficulties in starting an Enterprise.
13. Give the Introduction to Project Design and Network Analysis.
14. Explain the concept of Origin of PERT and CPM.
15. Explain the need for Network Techniques.
16. What are the steps in PERT.
17. Give the Limitations and differences of PERT & CPM.

15.0 University Result

Examination	FCD	FC	SC	% Passing
Jan- 2023	28	14	04	100
Jan-2022	11	16	02	100

Prepared by	Checked by		
Prof. S. R. Malluramath	Prof. S. S. Malaj	HOD	Principal

Subject Title	**MICROWAVE THEORY AND ANTENNAS**		
Subject Code	**21EC62**	**IA Marks (20) +Assignments (10) + CIE Marks for Laboratory Component of IPCC (20)**	50
Number of Lecture Hrs /	**03+02(tutorial)**	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	**40(08Hrs/Module)+12 Lab slots**	**Exam Hours**	**03**
CREDITS – 04			

FACULTY DETAILS:		
Name: Prof. S.S. Malaj	Designation: Asst. Professor	Experience: 21 years
No. of times course taught:03	Specialization: M. E (E & TC)	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	V	Electromagnetic Waves
02	ECE	IV	Principles of Communication Systems

2.0 Course Objectives

The course will enable students to:

1. Describe the microwave properties and its transmission media.
2. Describe the microwave devices for several applications.
3. Understand the basic concepts of antenna theory.
4. Identify antenna types for specific applications.

3.0 Course Outcomes

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

	Course Outcome	RBT Level	PO's
C313.1	Describe the use and advantages of microwave transmission.	L1, L2	1,2,3,10,12
C313.2	Analyze various parameters related to transmission lines.	L1, L2	1,2,3,10,12
C313.3	Identify microwave devices for several applications.	L1,L2,L3	1,2,3,10,12
C313.4	Analyze various antenna parameters and their significance in building the RF system	L1, L2, L3,	1,2,3,10,12
C313.5	Identify various antenna configurations for suitable applications.	L1, L2, L3	1,2,3,10,12
Total Hours of instruction		40	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1	10	L1, L2,L3
Microwave Sources : Introduction ,Gunn Diode(Text 2: 7.1,7.1,1.7,1,2) Microwave Transmission Lines: Microwave Frequencies, Microwave devices, Microwave Systems, Transmission Line equations and solutions, Reflection Coefficient and Transmission Coefficient, Standing Wave and Standing Wave Ratio, Smith Chart, Single Stub matching. (Text 2: 0.1, 0.2, 0.3, 3.1, 3.2, 3.3, 3.5, 3.6 Except Double stub matching)		
Module -2	10	L1, L2,L3
Microwave Network theory: Introduction, S matrix representation of Multi-Port Networks. (Text 1: 6.1,6.3,6.3.1,6.3.2,) Microwave Passive Devices: Coaxial Connectors and Adapters, Attenuators, Phase Shifters, Waveguide Tees, Magic tee, Circulator, Isolator. (Text 1: 6.4.2, 6.4.14,6.4.15, 6.4.16,6.4.17 A,B)		
Module-3	10	L1,L2, L3
Strip Lines: Introduction, Micro Strip lines, Parallel Strip lines, . (Text 2: 11.1,11.2) Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Antenna Aperture Effective Height, Bandwidth, Radio Communication Link, Antenna Field Zones(Text 3: 2.1- 2.7,2.9-2.11, 2.13,)		
Module-4	10	L1,L2, L3,
Point Sources and Arrays: Introduction, Point Sources, Power Patterns, Power Theorem, Radiation Intensity, , Arrays of 2 Isotropic Point Sources, Pattern Multiplication, Linear Arrays of n Isotropic sources of equal Amplitude and Spacing.(Text 3: 5.1 – 5.6,5.9, 5.13) Electric Dipole, Introduction, Short Electric Dipole, Fields of a short dipole,), Radiation Resistance of a Short Dipole, Thin Linear Antenna (Field Analyses), R. (Text 3: 6.1 -6.5)		
Module-5	10	L1, L2, L3
Loop and Horn Antenna: Introduction, Small loop, Comparison of Far fields of Small Loop and Short Dipole, Radiation Resistance of small loop, Horn antennas, Rectangular Antennas.(Text 3: 7.1,7.2,7.4,7.6,7.7,7.8,7.19,7.20) Antenna Types: The Helix geometry, Helix modes, Practical design consideration for mono-filar axial mode Helical Antenna, Yagi Ud array, Parabolic Reflector(Text 3 : 8.3.8.4,8.5,8.8,9.5)		

5.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Antenna Simulation using Software's

6.0 Books Used and Recommended to Students

Text Books
1. Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010.
2. Microwave Devices and circuits- Liao, Pearson Education.
3. Antennas and Wave Propagation, John D. Krauss, Ronald J Marhefka and Ahmad S Khan,4th Special Indian Edition , McGraw- Hill Education Pvt. Ltd., 2010.

Reference Books
1. Microwave Engineering – David M Pozar, John Wiley India Pvt. Ltd. 3rdEdn, 2008. 2. Microwave Engineering – Sushrut Das, Oxford Higher Education, 2ndEdn, 2015. 3. Antennas and Wave Propagation – Harish and Sachidananda: Oxford University, Press, 2007.

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

Website and Internet Contents References
1) *nptel.ac.in* 2) *VTU e-learning notes*

8.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	Microwave Devices	*www.ieee.org*

9.0 Examination Note

Assessment Details both (CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of IPCC:

Two tests each of **20 marks (duration 01 hour)**

i) First test at the end of 5th week of the semester.
ii) Second test at the end of the 10th week of the semester.

Two assignments each of **10 marks**

i) First assignment at the end of 4th week of the semester.
ii) Second assignment at the end of 9th week of the semester.

Scaled down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for 30 marks.

CIE for the practical component of IPCC:

- On completion of every experiment / program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks** shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for **10 marks**. Marks of all experiments write ups are added and scaled down to 15 marks.
- The laboratory test (duration 03 hours) at the end of the 15th week of the semester / after completion of all the experiments (whichever is early) shall be conducted for **50 marks** and scaled down to **05 marks**.

Scaled down marks of write up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC:

Theory SEE will be conducted by university as per the scheduled time table with common question papers for the course (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE & SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component.

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks - 30) in the theory component and 08 (40% of maximum marks – 20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50.

10.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	% of Portion
1	1	Introduction, Gunn Diode	20
	2	Gunn Diode	
	3	Microwave Frequencies and Devices, Microwave Systems	
	4	Transmission Line equations and solutions	
	5	Reflection coefficient and Transmission Coefficient	
	6	Standing Wave and standing wave ratio	
	7	Smith Charts	
	8	Single Stub Matching	
	9	Numerical problems	
	10	Numerical problems	
2	11	Introduction	40
	12	S matrix representation of multi port networks	
	13	Co-Axial connectors and Adapters	
	14	Attenuators	
	15	Phase Shifters	
	16	Wave guide Tees-Magic Tee	
	17	Circulator	
	18	Isolator	
	19	Numerical Problems	
	20	Numerical problems	

3	21	Strip Lines-Introduction	60
	22	Micro-strip Lines	
	23	Parallel Strip Lines	
	24	Antenna Basics-Introduction	
	25	Basic Antenna Parameters	
	26	Beam Area, Radiation Intensity	
	27	Beam Efficiency, Directivity and Gain	
	28	Antenna Aperture Effective Height	
	29	Bandwidth, Radio communication link	
	30	Antenna Field zones	
4	31	Point Sources-Introduction	80
	32	Power Pattern and Power Theorem	
	33	Radiation Intensity	
	34	Array of 2 Isotropic point sources, Pattern Multiplication	
	35	Linear Antenna Arrays of n isotropic sources of equal amplitude and spacing	
	36	Electric Dipole-Short Electric Dipole	
	37	Fields of a short Electric Dipole	
	38	Radiation Resistance of a short dipole	
	39	Thin Linear Antenna(Field Analyses)	
	40	Thin Linear Antenna(Field Analyses)	
5	41	Loop & Horn Antennas-Introduction, Small Loop	100
	42	Comparison of Far fields of small loop and short dipole	
	43	Radiation Resistance of small loop, Horn Antenna	
	44	Horn Antennas	
	45	Rectangular antennas	
	46	Helix geometry, Helix modes	
	47	Practical design considerations for monofilar axial mode, helix modes	
	48	Helical Antenna, Yagi Uda Array	
	49	Parabolic Reflector	
	50	Numerical Problems	

11.0 QUESTION BANK

Module – 1

1. Explain Gunn diode.
2. Explain microwave system with neat diagram
3. List four applications of transmission line
4. Draw the elementary section of transmission line and determine the transmission line equations in general form. or
5. Derive the Voltage and Current equations for a general transmission line.
6. A transmission line has following parameters:
   R=2Ω/m G=0.5mʊ/m f=1GHz
   L=8 nH/m C=0.23pF.
   Calculate a) Characteristic impedance b) Propagation constant
7. Explain Standing wave ratio of transmission line with relevant equations and sketches.
8. Explain the relation between the reflection coefficient and SWR with the curve.
9. A transmission line has a characteristic impedance of 50+j0.01Ω & is terminated in a load impedance of 73-j42.5Ω.Calculate
   a) Reflection coefficient b) Standing Wave ratio

10. Explain the construction and working of Smith Chart.
11. Explain steps involved in finding Vmax, Vmin, SWR from the smith chart
12. Explain single stub matching process with the help of smith chart with necessary steps
13. Explain different methods of impedance matching foe a transmission line.

Module-2

1. Explain the need of S- parameters
2. Show that impedance and admittance matrices are same for reciprocal network.
3. Explain the Scattering matrix and Scattering Parameters.
4. Explain S matrix representation of multi-port networks.
5. Explain the properties of S-Parameters
6. Two transmission lines of characteristic impedance Z_1& Z_2 are joined at plane PP'. Express S-parameters in terms of impedance.
7. What are Multi-Port network? Derive the 'S' matrix.
8. Explain the coaxial connectors and adapters.
9. Explain Attenuator.
10. Explain precision type variable attenuator.
11. Explain the working of phase shifter s and variable phase shifter s with relevant sketches.
12. Explain Magic –T and obtain it's S-Matrix for both the planes
13. Explain the construction and working of Circulator and Isolator.
14. Draw the construction of E-Plane and H-Plane tee and derive the 'S' matrix for both.
15. A 20mW signal is fed into one of collinear port 1 of a lossless H-plane T-junction.Calculate the power delivered through each port when other ports are terminated in matched load.

Module-3

1. Explain the construction and field pattern of micro-strip line.
2. Derive expression for characteristic impedance of micro-strip line.
3. Explain Parallel Strip Lines with neat diagram. `
4. Explain the losses in micro strip lines.
5. Explain ohmic skin losses and radiation losses in micro-strip lines.
6. Define Antenna.
7. Write a note on antenna field zones.
8. An antenna has field pattern given by $E(\theta)= \cos^2\theta$ for $0\leq \theta\leq \prod/2$. Find the beam area and directivity.
9. Explain various terms related to antenna
   a) beam width b)Radiation pattern c) directivity d) Gain & efficiency.
10. The effective apertures of transmitting and receiving antennas in a communication system are $8\lambda^2$ and $12\lambda^2$ respectively. With a separation of 1.5km between them. The EM wave travelling with frequency of 6MHz and the total input power is 25KW. Find the power received by the antenna.
11. Draw a radio link & explain various blocks.

Module -4

1. Derive an expression and draw field pattern for an array of 2 isotropic point sources with same amplitude and phase spaced $\lambda/2$ apart.
2. Show that the radiation resistance of dipole antenna is 73ohm.
3. A source has cosine intensity radiation pattern given by $U= U_m\cos\theta$ for $0\leq \theta\leq \prod/2$ and $0\leq Ø\leq 2\prod$. Find the total power directivity.
4. Derive an expression for the far field components of short Electric dipole.

5.Explain the principle of pattern multiplication with an example.
6.Define power theorem.
7.Obtain the field pattern for a linear uniform array of isotropic antennas, satisfy the following n=5, d=λ/2, δ= -dr.
8. Explain Thin Linear Antenna.

Module -5

1.Write short notes on
i) Yagi uda array antenna ii) parabolic reflector
2. Derive the expression for strength Eθ and HØ in case of small loop.
3.Explain the working and design considerations of Helical antenna.
4.A 16 turn helical beam antenna has a circumference of λ and turn spacing λ/4. Find i) HPBW ii) axial ratio iii) directivity.
5.Obtain the expression for radiation resistance of small loop antenna
6.Compare thefields of small loop and short electric dipole
7.Draw the structure of pyramidal horn antenna.

12.0 University Result

Examination	S+	S	A	B	C	D	E	% Passing
July/August 2022	--	3	9	7	7	--	--	89.65
July/August 2023	-	-	6	6	9	22	-	95.65

PRACTICAL COMPONENT OF IPCC

Sl.No	Experiments
1	Study of characteristics of Magic Tee
2	Coupling and Isolation characteristics of microstrip directional coupler.
3	Determination of power division of microstrip power divider.
4	Determination of resonance characteristics of microstrip ring resonator and computation of dielectric constant of the substrate.
5	Measurement of frequency, guide wavelength ,power and attenuation in a microwave Test bench.
6	Study of characteristics of of E plane Tee/H plane Tee.
7	To measure unknown impedance using Smith chart through test bench setup.
8	Measurement of VSWR and reflection coefficient and attenuation in a microwave test bench setup.
9	Obtain the radiation pattern of a Yagi-Uda Antenna array and calculate its directivity.
10	Calculate the aperture of a Dipole Antenna.
11	Obtain the near and far fields of a given antenna and compare the fields.
12	Obtain the bandwidth of a given Antenna.

Question Bank

Q1. What are microwaves.
Q2. What is Magic Tee.
Q3. Explain the coupling and Isolation characteristics of Microstrip directional coupler.
Q4. What is microstrip power divider.
Q5. What is ring resonator. Explain the computation of dielectric constant of the substrate.
Q6. Explain the measurement of frequency, guide wavelength ,power and attenuation in a microwave test Bench.
Q7. Explain the study of characteristics of E plane Tee.
Q8. Define the following: 1) VSWR 2) Reflection Coefficient
Q9. Define the following 1) Antenna 2) Bandwidth 3) Dipole Antenna 4) Directivity
Q10. List the types of Different Antenna.
Q11. Define Yagi-Uda Antenna.
Q12. Define Aperture of an antenna.
Q13. Define bandwidth of an antenna.

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

Subject Title	**VLSI Design and Testing**		
Subject Code	21EC63	**IA Marks**	50
Number of Lecture Hrs. /Week	03 L	**Exam Marks**	50
Total Number of Lecture Hrs.	40	**Exam Hours**	03

FACULTY DETAILS:		
Name: Prof. S S. Kamate	**Designation:** Asst. Professor	**Experience:21** yrs
No. of times course taught:08	**Specialization:** Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Analog Electronic Circuits
02	ECE	III	Digital Electronics

2.0 Course Objectives

1. Impart knowledge of MOS transistor theory and CMOS technologies.
2. Learn the operation principles and analysis of inverter circuits.
3. Design Combinational, sequential and dynamic logic circuits as per the requirements.
4. Infer the operation of Semiconductors Memory circuits.
5. Demonstrate the concepts of CMOS testing.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and analyze.

	Course Outcome	Cognitive Level	POs
C314.1	**Design and simulate combinational and sequential digital circuits using Verilog HDL**	**U**	**PO1 to PO12**
C314.2	**Understand the Synthesis process of digital circuits using EDA tool**	**U**	**PO1 to PO12**
C314.3	**Perform ASIC design flow and understand the process of synthesis, synthesis**	**U**	**PO1 to PO12**
C314.4	**Design and simulate basic CMOS circuits like inverter, common source amplifier**	**U**	**PO1 to PO12**
C314.5	**Perform RTL-GDSII flow and understand the stages in ASIC design**	**U**	**PO1 to PO12**
Total Hours of instruction		**40**	

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VII	VLSI Lab	VLSI Design of Circuits
02	VIII	Projects on VLSI	Projects and Research

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Analyze different types of VLSI Designs
02	Design of different types of VLSI chips

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: VLSI Lab
02	NPTEL	Demonstration and Application

8.0 Books Used and Recommended to Students

Text Books
Text Books: 1. "CMOS VLSI Design- A Circuits and Systems Perspective", Neil H E Weste, and David Money Harris 4th Edition, Pearson Education. 2. "CMOS Digital Integrated Circuits: Analysis and Design", Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill. 3. "Digital Circuit Testing and Testability", Lala Parag K, New York, Academic Press, 1997.
Reference Books
Reference Books: 1. "Basic VLSI Design", Douglas A Pucknell, Kamran Eshraghian, 3rd Edition, Prentice Hall of India publication, 2005. 2. "Essential of Electronic Testing for Digital, Memory and Mixed Signal Circuits", Vishwani D Agarwal, Springer, 2002
Additional Study material & e-Books
3. VTU on line notes.

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

Website and Internet Contents References
01) https://www.youtube.com/watch?v=oL8SKNxEaHs&list=PLLy_2iUCG87Bdulp9brz9AcvW_TnFCUmM 02) https://www.youtube.com/watch?v=lRpt1fCHd8Y&list=PLCmoXVuSEVHlEJi3SwdyJ4EICffuyqpjk 03) https://www.youtube.com/watch?v=yLqLD8Y4-Qc 04)https://nptel.co.in 05) http://m.noteboy.in/vtuflies 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	IEEE Xplorer	http://ieee.com
2	International Journal of Science and Technology	http://www.sciencedirect.com/science/journal/00207683
3	Journal of Communication Engineering	http://ieee.com

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20. **Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by university as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored **out of 100 shall be reduced proportionally to 50 marks**

12.0 Course Delivery Plan

Course Delivery Plan:

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Introduction: A Brief History of MOS transistors	
	2	MOS Transistors	
	3	CMOS Logic	
	4	Introduction MOS Transistor Theory	
	5	Long-channel I-V Characteristics	
	6	Non-ideal I-V Effects	
	7	DC Transfer Characteristics	
	8	Cont'd…	

2	9	Introduction to CMOS Fabrication	
	10	Introduction to CMOS Fabrication	
	11	Stick diagram	
	12	Layout	
	13	Layout	
	14	Introduction CMOS Technologies	
	15	Layout Design Rules	
	16	**Delay**: Introduction	
	17	Transient Response	
	18	RC Delay	
	19	Linear Delay Model	
	20	Logical Efforts of Paths	
	23	Introduction to Transient Response	60
	24	RC Delay Model	
	25	Linear Delay Model	
	26	Logical Efforts of Paths	
4	27	Introduction	80
	28	Dynamic Random Access Memory	
	29	Cont'd…	
	30	Cont'd…	
	31	Static Random Memory	
	32	Cont'd…	
	31	Cont'd…	
	32	Nonvolatile Memory Flash Memory	
	33	Ferroelectric Random Access Memory	
5	36	Failures and faults	100
	37	Modelling of faults	
	38	Temporary faults	
	39	Fault diagnosis of digital circuits	
	40	Test generation techniques for combinational circuits	
	41	Detection of multiple faults in combinational logic circuits.	
	42	Cont'd…	
	43	Detection of multiple faults in combinational logic circuits	
	44	Cont'd…	

13.0 QUESTION BANK

MODULE -1

1. Define of Moore's Law and explain with graph.
2. Explain nMOS enhancement mode MOSFET operation with neat sketch, relevant equations and necessary graphs.
3. Derive an expression for current in nMOS enhancement mode transistor in triode and saturation regions.
4. Explain CMOS logic with an example and it's advantages.
5. Draw the schematic of given expressions F= $\overline{AB}$, $\overline{AB+CD}$, $\overline{A+B}$, $\overline{A+BC}$, etc.
6. Briefly explain resoring and non restoring type tristate circuits.
7. Explain the Multiplexer with it's CMOS schematic diagram.
8. Write a note on pass transistors and transmission gate
9. Explain the following terms briefly

   i) Threshold Voltage ii) Body effect iii) Velocity Saturation and mobility degradation

iv) Channel length modulation v) Subthreshold Conduction vi) Temperature Dependence

10. Find the value of body effect parameter and threshold voltage, when the applied substrate bias is 3V. Given Vtho = 0.4V, $N_A = 10^{16}/cm^3$, thermal voltage is 26mV, ni = $1.5x10^{10}/cm^3$, tox = 40nm, εr (si) =11.9, εr(ox) = 3.9
11. Explain CMOS inverter transfer characteristics highlighting the five regions of the operation.

MODULE -2

1. With a neat diagram explain the inverter cross-section.
2. With neat diagrams explain Fabrication process of inverter.
3. Explain VLSI design flow with neat sketch and relevant diagrams.
4. Explain layout design rules
5. Draw the stick diagram and layout of the following expressions $F = \overline{A}$, $F=\overline{(A+B+C)}\,D$, $F = \overline{ABC}$, $F= \overline{A+B}$
6. What is transient response?
7. Explain transient response of an inverter.
8. Explain RC delay model
9.. Explain Linear delay model.

MODULE -3

1. What are the different timing considerations?
2. Depending upon area requirement, power dissipation & volatility, discuss following memory elements –
   i) Dynamic shift registers cell
   ii) a 3- Transistor dynamic RAM cell
   iii) a I-transistor dynamic memory cell.
3. Draw & explain a pseudo static RAM cell.
4. Draw circuit diagram of4-transistor dynamic shift register cell & explain read and write operation with sense amplifier.
5. Sketch three transistor DRAM cell and explain it's read and write operations of with timing diagrams.
6. Sketch one transistor DRAM cell and explain it's read and write operations of with timing diagrams.
7. Draw the Memory structure of SRAM and explain read and write operations with timing diagrams.

MODULE-4 &5

1. What is testing?
2. Explain logic Verification Principles
3.. Explain Manufacturing Test Principles.
4. Write a note on Design for testability.
5. Explain logic verification in testing and verification process.
6. Explain observability and controllability
7. Explain different fault models in manufacturing test principles.
8. Explain scan based methods in testing.
9. Explain Built In Self Test (BIST) method in testing.
10. Explain Built In Self Test (BILBO) method in testing.

15.0 University Result

Examination	FCD	FC	SC	% Passing
New Subject				

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

Subject Title	**ARTIFICIAL NEURAL NETWORKS**		
Subject Code	21EC641	**IA Marks (60) + Assignments (20) + Quiz(20)**	50(Scaled down)
Number of Lecture Hrs/Week / Total Number of Lecture Hrs	04(L) 40Theory	**Exam Marks (appearing for)** **Exam Hours**	50 (100) 03
CREDITS – 03			

FACULTY DETAILS:		
Name: Dr. S. S. Ittannavar	**Designation:** Associate Professor	**Experience:**11 years
No. of times course taught: 01	**Specialization:** Digital Signal Processing	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	1,3,4	Basic Electronics , BSP, DSP

2.0 Course Objectives

This course will enable students to

Preparation: To prepare students with fundamental knowledge and comprehensive understanding of artificial neural networks.

Core Competence: To equip students to develop and configure ANNs with different types of learning algorithms for real world problems.

Professionalism & Learning Environment: To inculcate an engineering student an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

Teaching-Learning Process (General Instructions)

The sample strategies, which the teacher can use to accelerate the attainment of the various course outcomes are listed in the following:

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various learning algorithms.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
6. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
C315.1	Compare and contrast the biological neural network and ANN.	U	1,2,3,4,6,7,9,10,11,12
C315.2	Discuss the ANN for pattern classification.compare their performance.	U	1,2,3,4,5,6,7,9,10
C315.3	Develop and configure ANN's with different types of functions and learning algorithms.	U	1,2,3,4,5,6,7,9,10,11,12
C315.4	Apply ANN for real world problems.	U	1,2,3,4,5,6,7,9,10,11,12
Total Hours of instruction		**40**	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1		
Introduction: Neural Networks, Application Scope of Neural Networks. **Artificial Neural Network: An Introduction**. - Fundamental Concept, Evolution of Neural Networks, Basic models of Artificial Neural Networks (ANN), Important Technologies of ANNs, McCulloch-Pitts Neuron, Linear Separability. **Text 1**: 1,1.1,1.2,2.1,2.2,2.3,2.4,2.5,2.6.	**08**	**L1, L2**
Module -2		
Hebb Network and simple problems **Supervised Learning Network – Introduction** –Perceptron Networks-Theory, Perceptron learning rule, architecture, flowchart for training Process, Perceptron training algorithm for single output classes, Perceptron training algorithm for Multiple output classes, Perceptron Network Testing Algorithm, Adaptive Linear Neuron- Theory, Delta rule, Architecture, flowchart, Training, Testing algorithm (Adaline), Multiple Adaptive Linear Neurons -Theory, Architecture, Flowchart, Training algorithm.	**08**	**L1, L2,L3**
Module-3		
Back–Propagation Network - Theory, Architecture, Flowchart for training process, Training Algorithm, Learning Factors of Back Propagation Network, Testing Algorithm of Back-Propagation Network. Radial Basis Function Network, Time Delay Neural Network, Functional Link Networks. **Text 1**: 3.5,3.6,3.7,3.8.	**08**	**L1, L2,L3**
Module-4		
Associative Memory Network – Introduction, Training algorithm for Pattern association- Hebb Rule. Associative Memory Network - Theory, Architecture, Flowchart, Training algorithm, Testing Algorithm, Hetero associative Memory Network- Theory, architecture, testing algorithm, Hopfield Networks – Discrete Hopfield Network – architecture, Training algorithm, Testing algorithm of Discrete Hopfield Network. **Text 1**: 4.1,4.2,4.3,4.4,4.6.	**08**	**L1, L2,L3**
Module-5		
Unsupervised Learning Networks – Introduction, Fixed weight competitive nets – Maxnets, Architecture, Testing/application algorithm of Maxnet. Mexican Hat Net-Architecture, Flowchart, algorithm, Kohonen Self organizing Feature Maps – Theory, architecture. Learning Vector quantization – Theory, Architecture. **Text 1: 5.1,5.2-5.2.1,5.2.2,5.3- 5.3.1,5.3.2,5.4- 5.4.1,5.4.2.**	**08**	**L1, L2, L3**

5.0 Relevance to future subjects

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

6.0 Relevance to Real World

SL. No	Real World Mapping
01	Analyze different signals in real time applications
02	Model creation for analysis

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	NPTEL	Introduction to Artificial Neural Networks https://nptel.ac.in/courses/117105084
02	NPTEL	Neural Networks for Signal Processing https://nptel.ac.in/courses/108108148

8.0 Books Used and Recommended to Students

Text Books
1. S N Sivanandam and S N Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd., 2014.
Reference Books
2. Simon Haykin, "Neural Networks: A comprehensive foundation", 2nd Edition, PHI, 1998.

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

Website and Internet Contents References
04) https://nptel.ac.in/courses/117105084 05) https://nptel.ac.in/courses/108108148

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Explorer	https://www.journals.elsevier.com/digital-signal-processing
2	International Journal of Science and Technology	https://signalprocessingsociety.org/
3	PC World	http://www.imanagerpublications.com/JournalIntroduction.aspx?journal=JournalonDigitalSignalProcessing

11.0 Examination Note

Assessment Details (both CIE and SEE)

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be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

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Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks** (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	% of Portion
1.	1	**Introduction:** Neural Networks, Application	Chalk and talk	20
	2	Scope of Neural Networks.	Chalk and talk	
	3	**Artificial Neural Network: An Introduction**. - Fundamental Concept	Chalk and talk	
	4	Evolution of Neural Networks, Basic models of Artificial Neural Networks (ANN)	Chalk and talk	
	5	Important Technologies of ANNs	Chalk and talk	
	6	McCulloch-Pitts Neuron	Chalk and talk	
	7	Linear Separability	Chalk and talk	
	8	Problems	Chalk and talk	
2.	9	Hebb Network and simple problems	Chalk and talk	20
	10	**Supervised Learning Network – Introduction** – Perceptron Networks-Theory	Chalk and talk	
	11	Perceptron learning rule, architecture, flowchart for training Process	Chalk and talk	
	12	Perceptron training algorithm for single output classes	Chalk and talk	
	13	Perceptron training algorithm for Multiple output classes	Chalk and talk	
	14	Perceptron Network Testing Algorithm, Adaptive Linear Neuron- Theory, Delta rule, Architecture, flowchart, Training,	Chalk and talk	
	15	Testing algorithm (Adaline), Multiple Adaptive Linear Neurons -Theory	Chalk and talk	
	16	Architecture, Flowchart, Training algorithm.	Chalk and talk	
3.	17	**Back–Propagation Network** - Theory	Chalk and talk	20
	18	Architecture, Flowchart for training process	Chalk and talk	
	19	Training Algorithm, Learning Factors of Back Propagation Network	Chalk and talk	
	20	Testing Algorithm of Back-Propagation Network.	Chalk and talk	
	21	Radial Basis Function Network	Chalk and talk	
	22	Time Delay Neural Network	Chalk and talk	
	23	Functional Link Networks.	Chalk and talk	
	24	Problems	Chalk and talk	
4.	25	**Associative Memory Network** – Introduction, Training algorithm for Pattern association- Hebb Rule.	Chalk and talk	20
	26	Associative Memory Network - Theory	Chalk and talk	
	27	Architecture, Flowchart, Training algorithm	Chalk and talk	
	28	Testing Algorithm, Hetero associative Memory Network- Theory	Chalk and talk	
	29	Architecture, testing algorithm	Chalk and talk	
	30	Hopfield Networks – Discrete Hopfield Network – architecture	Chalk and talk	
	31	Training algorithm	Chalk and talk	
	32	Testing algorithm of Discrete Hopfield Network.	Chalk and talk	

5.	33	**Unsupervised Learning Networks** – Introduction	Chalk and talk	20
	34	Fixed weight competitive nets – Maxnets	Chalk and talk	
	35	Architecture, Testing/application algorithm of Maxnet	Chalk and talk	
	36	Mexican Hat Net- Architecture	Chalk and talk	
	37	Flowchart, algorithm	Chalk and talk	
	38	Kohonen Self organizing Feature Maps – Theory	Chalk and talk	
	39	Architecture. Learning Vector quantization	Chalk and talk	
	40	Theory, Architecture.	Chalk and talk	

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 Module-1, 2 & 3 of the syllabus	Students study the Topics and will prepare for Final Exam.	Module-1, 2 & 3 of the syllabus	9	Individual Activity	Text Book 1
2	Assignment 2: University Questions on Module-3,4 & 5 of the syllabus	Students study the Topics and will prepare for Final Exam.	Module-3,4 & 5 of the syllabus	12	Individual Activity.	Text Book 1

14.0 University Result

Examination	S+	S	A	B	C	D	E	F	% of passing
First Time Introduced	-	-	-	-	-	-	-	-	-

15.0 QUESTION BANK

1. Explain the block diagram of multidisciplinary point of view of network.
2. Calculate the net input for the network whose input to the network are $[x_1, x_2] = [0.2, 0.6]$ and the weights are $[w_1, w_2] = [0.3, 0.7]$ with the bias $b=0.45$.
3. Explain advantages of neural networks.
4. Obtain the output of the neuron Y for the network whose inputs are given as $[x_1, x_2, x_3] = [0.8,0.6,0.4]$ and the weights are $[w_1, w_2, w_3] = [0.1,0.3, -0.2]$ with the bias $b=0.35$ using activation functions as: i) binary sigmoidal ii) bipolar sigmoidal.
5. Explain application scope of neural network
6. With the block diagram explain multilayer feed forward network.
7. Define artificial neural network. Explain architecture of simple artificial neural net.
8. Illustrate comparison between biological neuron and artificial neuron.

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

Subject Title	PROJECT MANAGEMENT		
Subject Code	21ME651	**IA Marks**	50
Number of Lecture Hrs / Week	03	**SEE**	50
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Nagaraj. T. Kambar	**Designation:** Asst.Professor	**Experience:**05
No. of times course taught:00	**Specialization:**Thermal Engineering	

1.0 Course Objectives

1. To understand how to break down a complex project into manageable segments and use of effective project managementtoolsandtechniquestoarriveatsolutionandensurethattheprojectmeetsitsdeliverablesandis completed within budget and on schedule.
2. To impart knowledge on various components, phases and attributes of a project.
3. To prepares dents to plan, develop, lead, manage and successfully implement and deliver projects within their chosen practice area.

2.0 Course Outcomes

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

1. Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
2. Understand the work breakdown structure by integrating it with organization also the scheduling and uncertainty in projects.
3. Understand risk management planning using project quality tools also the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.
4. Determine project progress and results through balanced score card approach.
5. Drawthenetworkdiagramtocalculatethedurationoftheprojectandreduceitusingcrashing.

3.0 Course Content

MODULE – 1

INTRODUCTION

Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles Project Selection and Prioritization–Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment–dentifying potential projects, methods of selecting projects, financial mode/scoring models to select projects, prioritizing projects, securing and negotiating projects. **08 hours**

MODULE 2

Planning Projects: Defining the project scope, Project scope check list, Project priorities, Work Break down Structure (WBS), Integrating WBS with organization, coding the WBS for the information system.

Scheduling Projects: Purpose of a project schedule, historical development, how projects chedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.

08hours

MODULE 3

Resourcing Projects: Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project team composition issues.

Budgeting Projects: Cost planning, cost estimating, cost budgeting , establishing cost control.

Project Risk Planning: Risk Management Planning, risk identification, risk analysis, risk response planning,

Project Quality Planning and Project Kickoff: Development of quality concepts, project quality management plan, project quality tools, kick off project, baseline and communicate project management plan using Microsoft Project for project baselines. **08 hours**

MODULE 4

Performing Projects: Project supply chain management: -Plan purchasing and acquisitions, plan contracting, contact types, project partnering and collaborations, project supply chain management.

P**roject Progress and Results:** Project Balanced Scorecard Approach, Internal project, customer, financial issues,

Finishing the project: Term in at eproject early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure.

08 hours

MODULE 5

Network Analysis: Introduction, network construction - rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method (CPM) to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project ;crashing of simple projects.

4.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Planning Projects, Scheduling Projects, Resourcing Projects, Budgeting Projects and Performing Projects.

5.0 Relevance to Real World

Sl. No	Real World Mapping
01	While working in an industry on project.

6.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Agile Project Management
02	Tutorial	Topic: Project Manager
03	Tutorial	Topic: Human Factors and Project Team

7.0 Books Used and Recommended to Students

Text Books
1 ProjectManagementTimothyJKloppenborgCengageLearningEdition2009
2 ProjectManagement-AsystemsapproachtoplanningschedulingandcontrollingHaroldkerznerCBSpublication
3 ProjectManagementSChoudhuryMcGrawHillEducation(India)Pvt.Ltd.NewDelhi2016

Reference Books
1 Project Management Penning ton Lawrence McGraw Hill 2 ProjectManagementAModerJosephandPhillipsNewYarkVanNostrandReinhold 3 Project Management, Bhavesh M.Patel Vikas publishing House
Additional Study material & e-Books
4. "Contemporary project management" by Thimothy J Kloppenberg

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

Website and Internet Contents References
3) https://en.wikipedia.org/wiki/Project_management *4) https://www.manage.gov.in/studymaterial/PPM-E.pdf* 5) https://www.scribd.com/document/475871105/FINAL-Word 6) https://www.planview.com/resources/guide/what-is-project-management/

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Project management journal	https://journals.sagepub.com/toc/pmxa/current
2	International journal of project management	https://www.sciencedirect.com/science/article/pii/S0263786315001027
3	Complexity in project management	https://www.sciencedirect.com/science/article/pii/S1877050917323001
4	**Project management planning and control**	https://www.sciencedirect.com/book/9780081020203/project-management-planning-and-control

10.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passingmarkfortheCIEis40% of the maximum marks (20marksoutof 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

ThreeUnitTestseachof**20Marks (duration01hour**)

- Firsttestattheendof5th weekofthesemester
- Secondtestattheendofthe10th week of the semester
- Thirdtestattheendofthe15th weekofthesemester Two

assignments each of **10 Marks**

- Firstassignmentattheendof4th weekofthesemester
- Secondassignmentattheendof9th weekofthesemester

Groupdiscussion/Seminar/quizanyoneofthreesuitablyplannedtoattaintheCosandPosfor

20Marks (**duration01 hour**)

- At the end ofthe13th weekofthesemester

The sum of three tests, two assignments, and quiz/seminar/groupdiscussionwillbeoutof100marksandwillbe **scaled down to 50 marks**

(To have less stressed CIE, theportionofthesyllabusshouldnotbecommon/repeatedforanyofthemethodsofthe CIE. Each method of CIE should have a different syllabus portion of the course).

CIEmethods/questionpaperisdesignedtoattainthedifferentlevelsofBloom'staxonmy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the subject (**duration 03 hours)**

- The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be reduced proportionally to 50 marks
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

Thestudentshavetoanswer5full questions, selecting one full question from each module **Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passingmarkfortheCIEis40% of the maximum marks (20marksoutof 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

ThreeUnitTestseachof**20Marks (duration01hour**)

- Firsttestattheendof5th weekofthesemester
- Secondtestattheendofthe10th weekofthesemester
- Thirdtestattheendofthe15th weekofthesemester Two

assignments each of **10 Marks**

- Firstassignmentattheendof4th weekofthesemester
- Secondassignmentattheendof9th weekofthesemester

Groupdiscussion/Seminar/quizanyoneofthreesuitablyplannedtoattaintheCosandPosfor **20Marks(duration01 hours)**

- At the end ofthe13th weekofthesemester

The sum of three tests, two assignments and quiz/seminar/groupdiscussionwillbeoutof100marksandwillbe **scaled down to 50 marks**

(To have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIEmethods/questionpaperisdesignedtoattainthedifferentlevelsofBloom'staxonomyaspertheoutcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the subject (**duration 03 hours)**

- The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be reduced proportionally to 50 marks
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- Thestudentshavetoanswer5full questions, selecting one full question from each module.

11.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1:	1	Introduction to Project Management, Definition of project, characteristics of projects, understand projects	20
	2	types of projects, scalability o project tools	
	3	project roles Project Selection and Prioritization – Strategic planning process	
	4	Strategic analysis, strategic objectives	
	5	portfolio alignment – identifying potential projects	
	6	methods of selecting projects	
	7	financial mode / scoring models to select projects	
	8	Prioritizing projects, Securing and negotiating projects.	
Module 2:	9	**Planning Projects:** Defining the project scope, Project scope checklist	20
	10	Project priorities, Work Breakdown Structure (WBS)	
	11	Integrating WBS with organization, coding the WBS for the information system.	
	12	**Scheduling Projects:** Purpose of a project schedule	
	13	historical development, how project schedules are limited and created	
	14	develop project schedules	
	15	uncertainty in project schedules	
	16	Gantt chart.	
Module 3:	17	**Resourcing Projects:** Abilities needed when resourcing projects, estimate resource needs	20
	18	creating staffing management plant, project team composition issues	
	19	**Budgeting Projects:** Cost planning, cost estimating	
	20	Cost budgeting, establishing cost control.	
	21	**Project Risk Planning**: Risk Management Planning, risk identification, risk analysis, risk response planning	
	22	**Project Quality Planning and Project Kick off:** Development of quality concepts, project quality management plan	
	23	project quality tools, kick off project, baseline and	
	24	Communicate project management plan using Microsoft Project for project baselines.	
Module 4:	25	**Performing Projects and Project supply chain management:** - Plan purchasing and acquisitions, plan contracting	20
	26	Contact types, project partnering and collaborations, project supply chain management.	
	27	**Project Progress and Results:** Project Balanced Scorecard Approach	
	28	Internal project, customer, financial issues	
	29	**Finishing the project:** Terminate project early, finish projects on time	
	30	secure customer feedback and approval	
	31	Knowledge management	
	32	Perform administrative and contract closure.	
Module 5:	33	**Network Analysis:** Introduction	20
	34	network construction - rules	
	35	Fulkerson's rule for numbering the events, AON and AOA diagrams	
	36	Critical path method (CPM) to find the expected completion time of a project floats	
	37	PERT for finding expected duration of an activity and project	
	38	determining the probability of completing a project	
	39	predicting the completion time of project	
	40	Crashing of simple projects.	

12.0 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:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1& 2 of the syllabus	4	Individual Activity.	Books 1, 2 and 3 of the text book list
2	Assignment 2:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3,4 & 5 of the syllabus	9	Individual Activity.	Books 1, 2 and 3 of the text book list

13.0 QUESTION BANK

Module 1

1. What is a project?
2. What is project management?
3. What types of constraints are common to most projects?
4. Which deliverable authorizes the project team to move from Selecting & Initiating to Planning?
5. At what stage of a project life cycle are the majority of the "hands-on" tasks completed?
6. What are the five process groups of project management?
7. What are the 10 project management knowledge areas?
8. What two project dimensions are components of project performance?
9. How do you define project success?
10. How do you define project failure?
11. List four common causes of project failure.
12. What are three common ways of classifying projects?
13. List and describe each step in the strategic planning process.
14. Name five things that may be negotiated between a client company and a contractor company
15. What are some common reasons for project failure?

Module 2

1. List three reasons why understanding stake holders important to successful project management.
2. What is the difference between an internal and external stakeholder?
3. Which three criteria should you consider when prioritizing stakeholders?
4. Describe an AGILE "stand-up" meeting.
5. What three tasks comprise the "define scope" process?
6. Why is scope definition important?
7. What are two common causes of scope creep?
8. What does the acronym WBS stand for?
9. What are the advantages of using a WBS?
10. List three ways of organizing a WBS.
11. The lowest level of the WBS is known as?
12. What items are typically included in a work package description?
13. What is rolling wave planning?
14. What is uncontrolled change known as?
15. Why do project teams use change control systems?
16. List the major sections that should be included in a change request form, and tell why each is important.
17. When can the first draft of a project schedule be constructed?
18. What is the difference between an activity and a work package?
19. How can a **Gantt chart** be helpful in project planning?

Module 3

1. In addition to technical skills, what other skill must a project manager have in order to successful resource a project?
2. Why is it important to involve workers in the planning phase of a project when possible?
3. What are two techniques used to compress a project schedule?
4. When crashing a project, what two criteria are considered when deciding which activities to speed up?
5. What type of costs does not depend on the size of a project?
6. During which phase of a project do recurring costs typically occur?
7. What are some examples of expedited costs?
8. What is the purpose of an order of magnitude cost estimate?
9. What is the "time value of money," and why is it relevant to project management?
10. For a routine project, what is a typical percentage of total project costs that should be placed into contingency reserves? For an unusual project?
11. Should a project manager alone identify potential risks for the project? Why or why not?
12. During which stage of a project are most risks typically uncovered?
13. Are both qualitative and quantitative risk analyses used on all projects? Why or why not?
14. What is an example of transferring risk?
15. In the risk register, why should only one person be assigned "owner" of a risk?
16. Identify similarities and differences among TQM, ISO, and Six Sigma. What strengths and weaknesses are inherent in each of these approaches?
17. Discuss the areas of ISO. Which do you feel is most important and why?
18. Describe the process of achieving stakeholder satisfaction. Why is it important to consider stakeholder satisfaction?
19. Describe the three outputs of quality control.
20. List the project quality tools you expect to use on your project. Tell where you plan to use each tool and why it is important.

Module 4

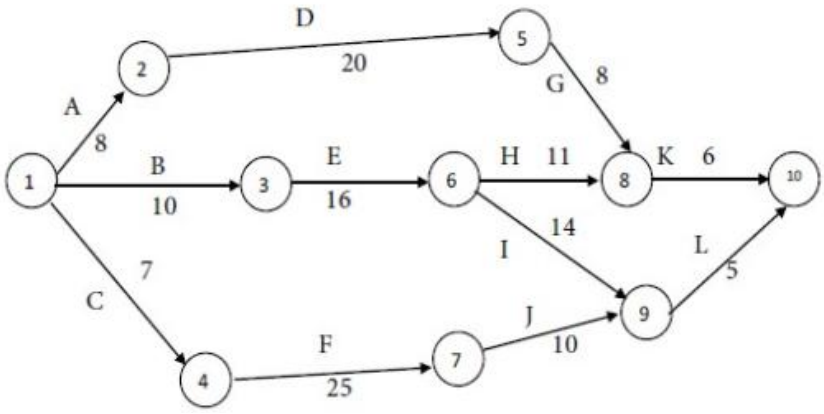
1. Do small businesses often outsource project work? Why or why not?
2. Which is the first of the four processes that make up project procurement management?
3. In supply chain management, what are some other names for the seller? What are some other names for the buyer?
4. List three functional areas that are frequently outsourced by business organizations.
5. What are some potential issues related to outsourcing?
6. What are four potential information sources that organizations can use to identify potential sellers?
7. Describe two methods that can be used to evaluate potential suppliers.
8. What items are generally included in a request for proposal?
9. What is the primary reason for determining project progress and results?
10. Which five aspects of project success are evaluated in the balanced scorecard approach?
11. Give three categories of internal project issues and an example of each.
12. In addition to the WBS, what might trigger project work to be authorized and performed?
13. What is an advantage of letting workers self-control their work?
14. How does one calculate schedule variance?
15. What does cost performance index (CPI) measure?
16. When does a project move into the closing stage?
17. What is validate scope?
18. What is the purpose of a "punch list"?
19. What should a project manager refer back to in order to make sure that all planned work has, in fact, been completed?
20. When might a contract clause be invoked?
21. If an early termination of his project seems likely, what two avenues can a project manager explore to increase the likelihood of being able to continue the project?

Module 5

1. What is network analyses? Write its salient feature.
2. Define following
   i) Pert ii) CPM
3. How 20 key project manager actions are organized? Explain.
4. What is material requirement planning (MRP)? define it with suitable example
5. How MRP is a 'push' system while JIT is a 'pull' system? explain it
6. Determine the critical path, the critical activities and the project completion time
   The following details are available regarding a project:

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

7. Find out the completion time and the critical activities for the following project:



8. Draw the network diagram and determine the critical path for the following project

Activity	Time estimate (Weeks)
1- 2	5
1- 3	6
1- 4	3
2 -5	5
3 -6	7
3 -7	10
4 -7	4
5 -8	2
6 -8	5
7 -9	6
8 -9	4

9. Develop a network diagram for the project specified below

Activity	Immediate Predecessor Activity
A	-
B	A
C, D	B
E	C
F	D
G	E, F

14.0 University Result

New scheme subject

Prepared by	Checked by		
Prof. Girish Zulapi& Prof. Nagaraj T. Kambar	Prof. M A Hipparagi	HOD	Principal
Course coordinator	Module coordinator		

Subject Title	**RENEWABLE ENERGY RESOURCES**		
Subject Code	21EE652	**CIE Marks**	50
Number of Lecture Hrs / Week(L:T:P:S)	3:0:0:0	**SEE Marks**	50
Total Hours of Pedagogy	40	**Exam Hours**	03
			CREDITS – 03

FACULTY DETAILS:		
Name: Prof.O. B. Heddurshetti	**Designation:** Asst. Professor	**Experience:**18
No. of times course taught:01	**Specialization:** Power Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	PUC	1st&2nd Year	Physics, Mathematics

2.0 Course Objectives

- To discuss causes of energy scarcity and its solution, energy resources and availability ofrenewable energy.
- To explain sun – earth geometric relationship, Earth – Sun Angles and their Relationships.
- To discuss about solar energy reaching the Earth's surface and solar thermal energy applications.
- To discuss types of solar collectors, their configurations and their applications.
- To explain the components of a solar cell system, equivalent circuit of a solar cell, its characteristics and applications.
- To discuss benefits of hydrogen energy, production of hydrogen energy, storage its advantagesand disadvantages.
- To discuss wind turbines, wind resources, site selection for wind turbine.
- To discuss geothermal systems, their classification and geothermal based electric powergeneration
- To discuss waste recovery management systems, advantages and disadvantages.
- To discuss biomass composition, production, types of biomass gasifiers, properties of producergas benefits.
- To discuss tidal energy resources, energy availability, power generation.
- To explain motion in the sea wave, power associated with sea wave and energy availabilityand the devices for harnessing wave energy.

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs
C320.1	Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy, energy from sun, energy reaching the Earth's surface and solar thermal energy applications	L2	1,2,6,7,8,12
C320.2	Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.	L2	1,2,6,7,8,12
C320.3	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.	L2	1,2,6,7,8,12
C320.4	Discuss production of energy from biomass, biogas.	L2	1,2,6,7,8,12
C320.5	Summarize tidal energy resources, sea wave energy and ocean thermal energy.	L2	1,2,6,7,8,12

4.0 Course Content

Module-1

Introduction: Causes of Energy Scarcity, Solution to Energy Scarcity, Factors Affecting Energy Resource Development, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.

Energy from Sun: Sun- earth Geometric Relationship, Layer of the Sun, Earth – Sun Angles and their Relationships, Solar Energy Reaching the Earth's Surface, Solar Thermal Energy Applications.

Module-2

Solar Thermal Energy Collectors: Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors, Material Aspects of Solar Collectors, Concentrating Collectors, Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine, Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems, Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooing, Solar Cookers, Solar pond.

Solar Cells: Components of Solar Cell System, Elements of Silicon Solar Cell, Solar Cell materials, Practical Solar Cells, I – V Characteristics of Solar Cells, Efficiency of Solar Cells, Photovoltaic panels (series and parallel arrays).

Module-3

Hydrogen Energy: Benefits of Hydrogen Energy, Hydrogen Production Technologies, Hydrogen Energy Storage, Use of Hydrogen Energy, Advantages and Disadvantages of Hydrogen Energy, Problems Associated with Hydrogen Energy.

Wind Energy: Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection.

Geothermal Energy: Geothermal Systems, Classifications, Geothermal Resource Utilization,Resource Exploration, Geothermal Based Electric Power Generation, Associated Problems,environmental Effects.

Solid waste and Agricultural Refuse: Waste is Wealth, Key Issues, Waste Recovery Management Scheme, Advantages and Disadvantages of Waste Recycling, Sources and Types of Waste, Recyclingof Plastics.

Module-4

Biomass Energy: Biomass Production, Energy Plantation, Biomass Gasification, Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification, Updraft, Downdraft and Cross-draft Gasifiers, Fluidized Bed Gasification, Use of Biomass Gasifier, Gasifier Biomass Feed Characteristics, Applications of Biomass Gasifier, Cooling and Cleaning of Gasifiers.
Biogas Energy: Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas, Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their
Characteristics.
Tidal Energy: Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India, Leading Country in Tidal Power Plant Installation, Energy Availability in Tides, Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power, Problems Faced in Exploiting Tidal Energy.

Module-5

Sea Wave Energy: Introduction, Motion in the sea Waves, Power Associated with Sea Waves, Wave Energy Availability, Devices for Harnessing Wave Energy, Advantages and Disadvantages of Wave Power.
Ocean Thermal Energy: Introduction, Principles of Ocean Thermal Energy Conversion (OTEC), Ocean Thermal Energy Conversion plants, Basic Rankine Cycle and its Working, Closed Cycle, Open Cycle and Hybrid Cycle, Carnot Cycle, Application of OTEC in Addition to Produce Electricity, Advantages, Disadvantages and Benefits of OTEC.

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VII &VIII	Project work	Implementation of renewable energy based projects

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Electrical power generation using renewable energy sources like wind and solar.
02	Generation of heat energy by using solar and biomass.
03	Conservation of non-renewable energy sources.

7.0 Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Practical Assignment	Practical assignments could be given to the students to construct a model to demonstrate generation of heat and electricity using solar and wind energy.
02	Industrial visit	To provide practical exposure to the students' industrial visit to solar power plants and wind mills could be arranged.

8.0 Books Used and Recommended to Students

Text Books
1. Nonconventional Energy Resources, Shobh Nath Singh, Pearson, 1st Edition, 2015.
Reference Books
1. Nonconventional Energy Resources, B.H. Khan, McGraw Hill, 3rd Edition. 2. Renewable Energy; Power for a sustainable Future, Godfrey Boyle, Oxford, 3rd Edition, 2012. 3. Renewable Energy Sources: Their Impact on global Warming and Pollution, TasneemAbbasi S.A. Abbasi, PHI,1st Edition, 2011.
Additional Study material & e-Books
1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition

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

Website and Internet Contents References
• E-book URL: https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html • E-book URL: https://www.pdfdrive.com/non-conventional-energy-systems-nptel- d17376903.html • E-book URL: https://www.pdfdrive.com/renewable-energy-sources-and-their-applications-e33423592.html • E-book URL: https://www.pdfdrive.com/lecture-notes-on-renewable-energy-sourcese34339149.html • https://onlinecourses.nptel.ac.in/noc18ge09/preview

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Energy & Environment	https://en.wikipedia.org/wiki/Energy_%26_Environment
2	Journal of Renewable and Sustainable Energy	https://en.wikipedia.org/wiki/Journal_of_Renewable_and_Sustainable_Energy
3	Solar Energy Journal	https://en.wikipedia.org/wiki/Solar_Energy_(journal)
4	Renewable and Sustainable Energy Reviews	https://en.wikipedia.org/wiki/Renewable_and_Sustainable_Energy_Reviews

11.0 Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semesterTwo assignments each of **10 Marks**
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marksand will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of themethods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomyas per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapers for the subject (**duration 03 hours)**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Causes of Energy Scarcity, Solution to Energy Scarcity	20
	2	Factors Affecting Energy Resource Development, Energy Resources and Classification,	
	3	Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.	
	4	Sun- earth Geometric Relationship	
	5	Layer of the Sun	
	6	Earth – Sun Angles and their Relationships	
	7	Solar Energy Reaching the Earth's Surface	
	8	Solar Thermal Energy Applications	

2	9	Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors	20
	10	Material Aspects of Solar Collectors, Concentrating Collectors	
	11	Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine	
	12	Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems	
	13	Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooing, Solar Cookers, Solar pond	
	14	Components of Solar Cell System, Practical Solar Cells	
	15	Elements of Silicon Solar Cell, Solar Cell materials	
	16	I – V Characteristics of Solar Cells, Efficiency of Solar Cells, Photovoltaic panels (series and parallel arrays)	
3	17	Benefits of Hydrogen Energy, Hydrogen Production Technologies, Hydrogen Energy	20
	18	Storage, Use of Hydrogen Energy, Advantages and Disadvantages of Hydrogen Energy, Problems Associated with Hydrogen Energy	
	19	Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection	
	20	Geothermal Systems, Classifications, Geothermal Resource Utilization, Resource	
	21	Exploration, Geothermal Based Electric Power Generation, Associated Problems, environmental Effects	
	22	Waste is Wealth, Key Issues	
	23	Waste Recovery Management Scheme, Advantages and Disadvantages of Waste Recycling	
	24	Sources and Types of Waste, Recycling of Plastics	
4	25	Biomass Production, Energy Plantation, Biomass Gasification	20
	26	Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification, Updraft, Downdraft and Cross-draftGasifiers	
	27	Fluidized Bed Gasification, Use of Biomass Gasifier, Gasifier Biomass Feed Characteristics, Applications of Biomass Gasifier, Cooling and Cleaning ofGasifiers	
	28	Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas	
	29	Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their Characteristics	
	30	Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India	
	31	Leading Country in Tidal Power Plant Installation, Energy Availability in Tides	
	32	Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power, Problems Faced in Exploiting Tidal Energy	

5	33	Introduction, Motion in the sea Waves, Power Associated with Sea Waves	20
	34	Wave Energy Availability, Devices for Harnessing Wave Energy, Advantages and Disadvantages of Wave Power	
	35	Introduction	
	36	Principles of Ocean Thermal Energy Conversion (OTEC)	
	37	Ocean Thermal Energy Conversion plants, Basic Rankine Cycle and its Working	
	38	Closed Cycle, Open Cycle and Hybrid Cycle, Carnot Cycle	
	39	Application of OTEC in Addition to Produce Electricity	
	40	Advantages, Disadvantages and Benefits of OTEC	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Introduction to Renewable Energy Sources, Solar Energy	Students study the Topics and write answer. Get practice to solve university questions.	1,2 module of the syllabus	04	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 1: Wind Energy, Biomass energy, wave energy, tidal energy, OTEC and green energy.	Students study the Topics and write answer. Get practice to solve university questions.	3,4 module of the syllabus	09	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
3	Quiz: All the module	Students study the Topics and prepare the multiple choice questioner with answer.	5 Module of the syllabus	13	Group Activity.	Book 1, 2 of the reference list. Website of the Reference list

15.0 QUESTION BANK

Sample Questions	Questions
I	**Module 1** 1. Explain principles of renewable energy 2. Explain Energy and sustainable development, 3. Give fundamentals and social implications. 4. Describe worldwide renewable energy availability and renewable energy availabilityin India 5. Briefly describe solar energy 6. Briefly describe wind energy 7. Briefly describe tidal energy 8. Briefly describe wave energy 9. Briefly describe ocean thermal energy 10. Briefly describe biomass energy 11. Briefly describe geothermal energy and oil shale. 12. Explain Introduction to Internet of energy (IOE)
II	**Module 2** 1. Explain Solar Radiation geometry 2. discuss Estimation of solar radiation on horizontal and inclined surfaces 3. Explain solar radiation Measurements- Pyrheliometers, Pyrometer, SunshineRecorder. 4. Explain with sketch working of solar Flat plate collector 5. Explain with sketch working of Solar distillation 6. Explain with sketch working of solar pond electric power plant. 7. Explain Principle of Solar cell, 8. Explain with sketch working of Photovoltaic system for electric power generation, 9. Give advantages, Disadvantages solar photovoltaic system 10. Give applications of solar photovoltaic system.

	Module 3 1. What is wind power explain briefly? 2. Describe with a neat sketch the working of wind energy system with main components 3. How power extracted by wind turbine? 4. List out type of wind turbine and what are the wind power plants are grouped 5. Discuss the advantages and disadvantages of horizontal and vertical axis wind mill. 6. What methods are used to overcome the fluctuate power generation of wind mill? 7. What are the advantages and disadvantages of wind turbine? 8. How performance of the wind turbine is determined? Explain its operational characteristics. 11. What is biomass, bio-fuel, bio energy and biogas? 12. What are the methods used for biomass conversion to energy? Explain in brief? 13. What are the factors affecting the generation of bio gas? 14. What are the constituents of biomass materials? 15. What is fermentation, aerobic and anaerobic, hydrolysis explain each. 16. Explain fixed dome bio digester with sketch 17. With a neat sketch explain downdraft biomass gasifiier?
IV	**Module 4** 1. What is tide? Explain tidal energy and its conversion with neat diagram 2. Explain the basic components of a tidal thermal power plant 3. Whate are advantages and disadvantages tidal power generation. 4. What is the nature of tidal power extracted from single basin arrangement and double basin arrangement? 5. What are the wave energy conversion machines, explain any one conversion methods. 6. What is the basic principle of ocean thermal energy conversion? 7. What are the main types of OTEC power plants? Describe their working in brief. 8. What are advantages and disadvantages
V	**Module 5** 1. What are Fuel cells 2. Classify of fuel cells 3. Explain Operating principles of fuel cells 4. Explain Zero energy Concepts. 5. What are Benefits of hydrogen energy 6. Explain hydrogen production technologies electrolysis method 7. Describe hydrogen energy storage 8. Give applications of hydrogen energy 9. What are problems associated with hydrogen energy.

Prepared by	Checked by		
26/4/24	26/4/24	26/4	
Prof. O. B. Heddurshetti	**Prof. O. B. Heddurshetti**	**HOD**	**Principal**

Subject Title	**PROGRAMMING IN JAVA**		
Subject Code	**21CS654**	**IA Marks**	50
Number of Lecture Hrs / Week	03	**Exam Marks**	50
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. Prasanna Patil	**Designation:** Asst. Professor	**Experience:** 10.5 Years
No. of times course taught:02	**Specialization:** Computer Science and Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	CPS

2.0 Course Objectives

This course will enable students to

1. Learn fundamental features of object-oriented language and JAVA.
2. To create, debug and run simple Java programs.
3. Learn object-oriented concepts using programming examples.
4. Study the concepts of importing of packages and exception handling mechanism.
5. Discuss the String Handling examples with Object Oriented concepts.

3.0 Course Outcomes

After studying this course, students will be able to

CO	Course Outcome	RBT Level	POs
C320.1	Develop JAVA programs using OOP principles and proper program structuring.	L1, L2, L3	1,2,3,8,10 ,12
C320.2	Develop JAVA program using packages, inheritance and interface.	L1, L2, L3	1,2,3,8,10 ,12
C320.3	Develop JAVA programs to implement error handling techniques using exception handling.	L1, L2, L3	1,2,3,8,10 ,12
C320.4	Demonstrate string handling concepts using JAVA.	L1, L2, L3	1,2,3,8,10 ,12
Total Hours of instruction		**40**	

4.0 Course Content

Module 1 (8 Hours)

An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and **Arrays:** Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings

Module 2 (8 Hours)

Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, **Control Statements:** Java‟s Selection Statements, Iteration Statements, Jump Statements.

Module 3 **(8 Hours)**

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, **A Closer Look at Methods and Classes:** Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, **Inheritance:** Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class.

Module 4 **8 Hours)**

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, **Exception Handling:** Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.

Module 5 **(8 Hours)**

Enumerations, Type Wrappers: I/O Basics, Reading Console Input, Writing Console Output, The Print Writer Class, Reading and Writing Files, **String Handling:** The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using value Of( ), Changing the Case of Characters Within a String , Additional String Methods, String Buffer, String Builder.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Java

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Development of a software applications

7.0 Books Used and Recommended to Students

Text Books
1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 2, 3, 4, 5, 6,7, 8, 9,10, 12,15)
Reference Books
1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806. 2. Rajkumar Buyya,S Thamarasiselvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited. 3. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies. 4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

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

Website and Internet Contents References
1. www.nptelvideos.com/**java**/**java**_video_lectures_tutorials.php
2. https://www.cse.**iit**b.ac.in/~nlp-ai/**java**lect_august2004.html
3. www.nptel.ac.in/courses/106105084/28

9.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	**Java Magazine - Oracle**	www.oracle.com/technetwork/java/javamagazine/
2	Java - IEEE Conferences, Publications, and Resources	https://www.computer.org/software-magazine/
3	Java Developer's Journal - Steven Gould	https://jserd.springeropen.com/

10.0 Examination Note

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall bedeemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:
Three Unit Tests each of 20 Marks (duration 01 hour)
1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester
Two assignments each of 10 Marks
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)
6. At the end of the 13th week of the semester
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).
CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
The students have to answer 5 full questions, selecting one full question from each module.

11.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE 1	1	Object-Oriented Programming, A First Simple Program, A Second Short Program,	20%
	2	Two Control Statements, Using Blocks of Code, Lexical Issues,	
	3	The Java Class Libraries, Data Types, Variables	
	4	Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers	
	5	Floating-Point Types, Characters, Booleans, A Closer Look at Literals,	
	6	Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions,	
	7	Arrays	
	8	A Few Words About Strings	

MODULE 2	9	Operators: Arithmetic Operators	20%
	10	The Bitwise Operators,	
	11	Relational Operators, Boolean Logical Operators	
	12	The Assignment Operator, The ? Operator	
	13	Operator Precedence, Using Parentheses	
	14	Control Statements: Java's Selection Statements	
	15	Iteration Statements	
	16	Jump Statements.	
MODULE 3	17	Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables,	20%
	18	Introducing Methods, Constructors, The this Keyword,	
	19	Garbage Collection, The finalize( ) Method, A Stack Class,	
	20	A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects,	
	21	Recursion, Introducing Access Control, Understanding static, Introducing final	
	22	Arrays Revisited, Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy	
	23	When Constructors Are Called, Method Overriding, Dynamic Method Dispatch	
	24	Using Abstract Classes, Using final with Inheritance, The Object Class.	
MODULE 4	25	Packages, Access Protection, Importing Packages,	20%
	26	Interfaces,	
	27	Exception Handling: Exception-Handling Fundamentals, Exception Types, ,	
	28	Uncaught Exceptions, Using try and catch, Multiple catch Clauses,	
	29	Nested try Statements, throw, throws,	
	30	finally, Java's Built-in Exceptions,	
	31	Creating Your Own Exception Subclasses	
	32	Chained Exceptions, Using Exceptions.	
MODULE 5	33	I/O Basics, Reading Console Input, Writing Console Output,	20%
	34	The Print Writer Class, Reading and Writing Files,	
	35	String Handling: The String Constructors, String Length,	
	36	Special String Operations, Character Extraction, String Comparison,	
	37	Searching Strings, Modifying a String, Data Conversion Using valueOf( ),	
	38	Changing the Case of Characters Within a String	
	39	Additional String Methods,	
	40	String Buffer, String Builder.	

12.0 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: Some important University Questions on Module one and two.	Students study the Topics and write the Answers. Get practice to solve questions.	Module one and two of the syllabus	4	Individual Activity. Witten solutions expected.	Text book
2	Assignment 2: Some important University Questions on Module three and four	Students study the Topics and write the Answers. Get practice to solve questions.	Module three and four of the syllabus	9	Individual Activity. Witten solutions expected.	Text book
3	Assignment 3: QUIZ	Students study the Topics and attend the QUIZ.	Module five of the syllabus	14	Individual Activity. Correct answers expected.	Text book, online material

13.0 QUESTION BANK

Module 1:

1. Explain the features of Java.
2. Elucidate how Java is a platform independent language, with neat sketches
3. List and explain Java buzzwords.
4. Explain the process of creating and running Java programs.
5. Explain the structure of a Java program and its keywords with an example.
6. Write & demonstrate a Java program to initialize & display different types of integers & floating type variables.
7. Explain different access specifiers in Java & their scope.
8. Define type casting. Explain with an example.
9. Explain type conversion, with an example.
10. What is type casting? Illustrate with an example. What is meant by automatic type promotion?
11. How are arrays defined in Java? Explain with an example.

Module 2:

1. Discuss operators in Java.
2. What is a jump statement? Explain with examples.
3. Explain :i) >>> ii)short circuit logical operators iii) for each
4. With an example explain the working of >> and >>> (unsigned right shift)
5. Write a Java program to print the factorial of the number 'n' using the "for" loop.
6. Write a program to calculate the average among the elements {8, 6, 2, 7} using "for each" in Java. How is "for each" different from "for" loop?
7. Write a Java program to sum only the first five elements of the array {1,2,3,4,5,6,7,8,9,10} using "for each" version of the for loop.
8. Write a java program to sum only first five elements of the array using for each looping.
9. Explain the operation of the following operators with examples. i) % ii) >>> iii) &&
10. How to declare two dimensional arrays in java? Explain with a simple example.
11. Write a Java program to illustrate the use of multidimensional arrays.

Module 3:

1. Define inheritance. List the different types of inheritance. (Jan-2018)
2. Discuss the following terms with an example: i) super ii) final (Jan-2019)
3. Define inheritance. Explain the multilevel hierarchy with an example program,
4. Write a Java program to define an interface called Area which contains method called Compute( ) and calculate the areas of rectangle (ℓ * b) and triangle (1/2 * b * h) using classes Rectangle and Triangle.
5. With an example program explain the method overriding?
6. Compare and contrast method overloading and method overriding with suitable examples.
7. When constructors are called in the class hierarchy?
8. Distinguish between method overloading and overriding in Java, with suitable examples.

Module 4:

1. Explain the package and its types and import commands in Java with examples.
2. Describe the various levels of access protections available for packages and their implications.
3. Which is the alternative method to implement multiple inheritance in Java? Explain with an example.
4. Explain the role of interfaces while implementing multiple inheritance in Java.
5. Give the basic form of an exception handling block.
6. Define the role of Exception handling in software development.
7. What is an exception? Give an example for nested try statements.
8. Define exceptions. Explain the exception handling mechanism with an example.
9. Explain Java's built-in exceptions.
10. What is the importance of the clause finally?
11. Create a try block that is likely to generate three types of exception and incorporate necessary catch block to catch and handle them.
12. Write a Java program for illustrating the exception handling when a number is divided by zero and an array has a negative index value.

Module 5:

1. Write a note about a Print Writer Class.
2. Write a note on Native Methods.
3. Write a note on Special String Operations.
4. Write a note on String Buffer.
5. Write a note on String Builder.

14.0 University Result

Examination	Total Students	PASS (P)	FAIL (F)	% Passing
2021 Feb/March	**41**	**40**	**01**	**97.5 %**
2022 July	**23**	**23**	**00**	**100%**
2023 June / July	**41**	**39**	**02**	**95.12%**

Prepared by	Checked by		
Prof. P. G. Patil	Prof. M. G. Huddar	HOD	Principal

Subject Title	**VLSI LABORATORY**		
Subject Code	**21ECL66**	**IA Marks**	40
Number of Lecture Hrs / Week	2 Hrs. Lab	**Exam Marks**	100
Total Number of Lecture Hrs	40	**Exam Hours**	03

FACULTY DETAILS:		
Name: Prof. S. S. KAMATE	**Designation:** Asst. Professor	**Experience:** T-21.Yrs, I-00Yrs
No. of times course taught: 04	**Specialization:** Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics & Communication Engineering	III	Digital Electronics
02	Electronics & Communication Engineering	V	Fundamentals of CMOS VLSI
03	Electronics & Communication Engineering	VI	Microelectronics Circuits

2.0 Course Objectives

This course will enable students to:
•Design, model, simulate and verify CMOS digital circuits
• Design layouts and perform physical verification of CMOS digital circuits
• Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist
• Perform RTL-GDSII flow and understand the stages in ASIC design.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	POs
C324.1	Design and simulate combinational and sequential digital circuits using Verilog	U	PO1 to PO12
C324.2	Understand the Synthesis process of digital circuits using EDA tool	U	PO1 to PO12
C324.3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level net list	U	PO1 to PO12
C324.4	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.	U	PO1 to PO12
C324.5	Perform RTL-GDSII flow and understand the stages in ASIC design	U	PO1 to PO12
Total Hours of instruction		**40**	

4.0 Course Content

Laboratory Experiments

Part – A

ASIC Digital Design
1. 4-Bit Adder
• Write Verilog Code
• Verify the Functionality using Test-bench
• Synthesize the design by setting proper constraints and obtain the netlist.

From the report generated identify Critical path, Maximum delay, Total number of cells, Power requirement and Total area required
2. 4-Bit Booth Multiplier
• Write Verilog Code
• Verify the Functionality using Test-bench
• Synthesize the design by setting proper constraints and obtain the netlist.
From the report generated identify Critical path, Maximum delay, Total number of cells, Power requirement and Total area required

3. 32-Bit ALU Supporting 4-Logical and 4-Arithmetic operations, using case and if statement for ALU Behavioral Modeling
• Write Verilog Code
• Verify functionality using Test-bench
• Synthesize the design targeting suitable library and by setting area and timing constraints
• Tabulate the Area, Power and Delay for the Synthesized netlist
• Identify Critical path
.
4. Latch and Flip-Flop
 Synthesize the design and compare the synthesis report (D, SR, JK)

Part - B
ASIC Analog Design
5. a) Capture the schematic of CMOS inverter with load capacitance of 0.1pF and set the widths of Inverter with Wn = Wp,
Wn = 2Wp, Wn = Wp/2 and length at selected technology.
Carry out the following:
i. Set the input signal to a pulse with rise time, fall time of 1ns and pulse width of 10nsand the time period of 20ns and plot the input voltage and output voltage of designed inverter?
ii. From the simulation result compute tpHL, tpLH and td for all three geometrical settings of width?
iii. Tabulate the results of delay and find the best geometry for minimum delay for CMOS inverter?
b) Draw layout of inverter with Wp/Wn = 40/20, use optimum layout methods. Verify for DRC and LVS, extract parasitic
and perform post layout simulations, compare the results with pre layout simulations. Record the observations.
6. a) Capture the schematic of 2-input CMOS NAND gate having similar delay as that of CMOS inverter computed in experiment above. Verify the functionality of NAND gate and also find out the delay td for all four possible combinations
of input vectors. Table the results. Increase the drive strength to 2X and 4X and tabulate the results.
b) Draw the layout of NAND with Wp/Wn = 40/20, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre layout simulations. Record the observations.
7. a) Capture schematic of Common Source Amplifier with PMOS Current Mirror Load and find it stransient response and
AC response? Measure the Unit Gain Bandwidth (UGB), amplification factor by varying transistor geometries, study the impact of variation in width to UGB.
b) Draw Layout of common source amplifier, use optimum layout methods. Verify for DRC & LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.
8. a) Capture schematics of two-stage operational amplifier and measure the following:
i. UGB
ii. dB Bandwidth
iii. Gain Margin and phase margin with and without coupling capacitance
iv. Use the op-amp in the inverting and non-inverting configuration and verify its functionality.
v. Study the UGB, 3dB bandwidth, gain and power requirement in op-amp by varying the
stage wise transistor geometries and record the observations.
b) Draw layout of two-stage operational amplifier with minimum transistor width set to 300 (in180/90/45 nm technology),
choose appropriate transistor geometries as per the results obtained in part a. Use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.

Demonstration Experiments (For CIE)

9. UART
• Write Verilog Code
• Verify the Functionality using Test-bench
• Synthesize the design targeting suitable library and by setting area and timing constraints
• Tabulate the Area, Power and Delay for the Synthesized netlist, Identify Critical path
10. For synthesized netlist carry out the following:
• Floor planning
• Placement and Routing
• Record the parameters such as no. of metal layers used for routing, flip method for placement of standard cells
• Physical Verification and record the DRC and LVS reports
• Generate GDSII

5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics
01	VIII	Project work	VLSI based projects
02	Higher	VLSI era	Exposure to the VLSI flow and different types of design.

6.0 Relevance to Real World

SL. No.	Real World Mapping
01	VLSI design
02	Miniaturization of different designs to provide more flexibility for the designers

7.0 Gap Analysis and Mitigation

SL. No	Delivery Type	Details
02	NPTEL	VLSI design methods

8.0 Books Used and Recommended to Students

Text Books
1.**"**Basic VLSI Design" by Douglas A. Pucknell and Kamran Eshaghian 2. "CMOS VLSI Design"- A Circuits and Systems Perspective**"**- Neil H.E. Weste,David Harris, Ayan Banerjee, 3rd Edition, Pearson Education. 3."FPGA Based System Design"-Wayne Wolf, Pearson Education, 2004,Technology and Engineering

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

Website and Internet Contents References
1) https://vtu.ac.in 2) http://www.bookspar.com/engineering-vtu 3) http://www.slideshare.net/farohalolya/8086-microprocessor-lab-manual 4) https://www.youtube.com/results?search_query=microprocessor

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 (20 Marks)

- Lab work, Assignment, Technical quiz: 5Marks.
- Internal Assessment test Average of two Tests out of Three tests): 15marks.

SCHEME OF EXAMINATION:

Two questions to be set each from Module.

Student has to answer both full questions. 80marks Marks divided in three parts Write up 12marks, Conduction 56marks & Viva 12marks.

12.0 Course Delivery Plan

Experiment	Lecture No.	Content	% of Portion
1.		4-Bit Adder • Write Verilog Code • Verify the Functionality using Test-bench • Synthesize the design by setting proper constraints and obtain the netlist. From the report generated identify Critical path, Maximum delay, Total number of cells, Power requirement and Total area required	
2.		2 4-Bit Booth Multiplier • Write Verilog Code • Verify the Functionality using Test-bench • Synthesize the design by setting proper constraints and obtain the netlist. From the report generated identify Critical path, Maximum delay, Total number of cells, Power requirement and Total area required	
3.		32-Bit ALU Supporting 4-Logical and 4-Arithmetic operations, using case and if statement for ALU Behavioral Modeling • Write Verilog Code • Verify functionality using Test-bench • Synthesize the design targeting suitable library and by setting area and timing constraints • Tabulate the Area, Power and Delay for the Synthesized netlist • Identify Critical path	
4.		Latch and Flip-Flop Synthesize the design and compare the synthesis report (D, SR, JK)	

Part - B **Digital Design**			
5.	5	a) Capture the schematic of CMOS inverter with load capacitance of 0.1pF and set the widths of Inverter with Wn = Wp, Wn = 2Wp, Wn = Wp/2 and length at selected technology. Carry out the following: i. Set the input signal to a pulse with rise time, fall time of 1ns and pulse width of 10ns nand the time period of 20ns and plot the input voltage and output voltage of designed inverter? ii. From the simulation result compute tpHL, tpLH and td for all three geometrical settings of width? iii. Tabulate the results of delay and find the best geometry for minimum delay for CMOS inverter? b) Draw layout of inverter with Wp/Wn = 40/20, use optimum layout methods. Verify for DRCand LVS, extract parasitic and perform post layout simulations, compare the results with pre layout simulations. Record the observations. 6 a) Capture the schematic of 2-input CMOS NAND gate having similar delay as that of CMOS inverter computed in experiment above. Verify the functionality of NAND gate and also find out the delay td for all four possible combinations of input vectors. Table the results. Increase the drive strength to 2X and 4X and tabulate the results. b) Draw the layout of NAND with Wp/Wn = 40/20, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre layout simulations. Record the observations. 7 a) Capture schematic of Common Source Amplifier with PMOS Current Mirror Load and find its transient response and AC response? Measure the Unit Gain Bandwidth (UGB), amplification factor by varying transistor geometries, study the impact of variation in width to UGB. b) Draw Layout of common source amplifier, use optimum layout methods. Verify for DRC & LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations. 8 a) Capture schematics of two-stage operational amplifier and measure the following: i. UGB ii. dB Bandwidth iii. Gain Margin and phase margin with and without coupling capacitance iv. Use the op-amp in the inverting and non-inverting configuration and verify its functionality. v. Study the UGB, 3dB bandwidth, gain and power requirement in op-amp by varying thestage wise transistor geometries and record the observations. b) Draw layout of two-stage operational amplifier with minimum transistor width set to 300 (in180/90/45 nm technology), choose appropriate transistor geometries as per the results obtained in part a. Use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations.	
6.	6	a) Capture the schematic of 2-input CMOS NAND gate having similar delay as that of CMOS inverter computed in experiment above. Verify the functionality of NAND gate and also find out the delay td for all four possible combinations of input vectors. Table the results. Increase the drive strength to 2X and 4X and tabulate the results. b) Draw the layout of NAND with Wp/Wn = 40/20, use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre layout simulations. Record the observations	

7.	7	a) Capture schematic of Common Source Amplifier with PMOS Current Mirror Load and find its transient response and AC response? Measure the Unit Gain Bandwidth (UGB), amplification factor by varying transistor geometries, study the impact of variation in width to UGB. b) Draw Layout of common source amplifier, use optimum layout methods. Verify for DRC & LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record the observations	
8.	8	a) Capture schematics of two-stage operational amplifier and measure the following: i. UGB ii. dB Bandwidth iii. Gain Margin and phase margin with and without coupling capacitance iv. Use the op-amp in the inverting and non-inverting configuration and verify its functionality. v. Study the UGB, 3dB bandwidth, gain and power requirement in op-amp by varying the stage wise transistor geometries and record the observations. b) Draw layout of two-stage operational amplifier with minimum transistor width set to 300 (in 180/90/45 nm technology), choose appropriate transistor geometries as per the results obtained in part a. Use optimum layout methods. Verify for DRC and LVS, extract parasitic and perform post layout simulations, compare the results with pre-layout simulations. Record theobservations.	
9.	9	UART • Write Verilog Code • Verify the Functionality using Test-bench • Synthesize the design targeting suitable library and by setting area and timing constraints • Tabulate the Area, Power and Delay for the Synthesized netlist, Identify Critical path.	
10.	10	For synthesized netlist carry out the following: • Floor planning • Placement and Routing • Record the parameters such as no. of metal layers used for routing, flip method for placement of standard cells • Physical Verification and record the DRC and LVS reports • Generate GDSII	

13.0 VIVA BANK

1. The minimum voltage to keep the MOS transistor in on state is known as
2. 'Pinch off of the channel takes place in which region.
3. Which of 'the following equation is true for liner region?

a)Vds< Vgs -Vt b) Ids> Vgs - Vt c) Vds = Vgs - Vt d) None

4. The oxide layer used in the MOS fabrication is
5. Which of the following Well process is superior?

a) P-well b)N-well c) Both P-well and N-well d) None

6. What is the advantage of CMOS technology?
7. Transit time is given by----------
8. When the VTC of the CMOS inverter shifts towards left,
9. The demarcation line has to be drawn in----------stick diagram.
10. If the value of lambda is 1micrometer then the minimum feature size o the transistor is ?
11. The scaling factor for the Gate capacitance Cg is given by
12. The scaling factor for power-speed product is given by
13. If the gate voltage and the input voltage of the NMOS transistor is 5V and threshold voltage of the transistor is O. 7V, then the output voltage
14. The mobility of the electrons is---------- than the holes.

15. As the width of the transistor increases the number of contact cuts----------
16. Transmission gate is----------
17. The CMOS schematic diagram of NAND gate consists of----------
18. If the size of the transistors in an inverter increases, then the input capacitance
19. The minimum value of the scaling factor in a cascaded inverter circuit to drive large capacitive load
20. In a lambda-based rules, the distance between two MI layers is
21. Match the following;

A	B
a) CMOS technology	i) Strong '0'
b) Bipolar technology	ii) Strong' 1'
c) Transmission gate	iii) High input impedance
d) PMOS transistor	iv) Low input impedance
e) NMOS transistor	v) Bi-directional switch

22. What is rise time & fall time of Inverter.
23. Define Symmetrical inverter.
24. What is the value of e in case of load handling by inverter.
25. What is Pass transistor?
26. Give the disadvantage of Pass transistor.
27 What is the advantage of Transmission gate over Pass transistor.
28. What is a Flip-flop?
29. What is a master slave Flip-flop?
30. What is a race-around condition?
31. What is RC extraction?
32. What is Back annotation?
33. What do you mean by DC-analysis?
34. What do you mean by AC-analysis?
35. What is the Gain of common drain amplifier?
36. How the common source amplifier is formed.
37. What is speed Vs area tradeoff?
38. What is DRC & ERC.
39. Differentiate Serial & Parallel adder.
32. Explain booth multiplier

51.

14.0 University Result

Examination	FCD	FC	SC	% Passing

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