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 center 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 management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

STUDENT HELP DESK

Sr.No	Name of the faculty	Activities
1	Dr.M.C.Sarasamba	GATE / Preplacement Coaching
		Students Mentor
		Module Coordinator
		Research Center Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
2	Prof. S. S. Malaj	GATE / Preplacement Coaching
		Adv.Comm. Lab In charge
		Students Mentor
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		NIRF Coordinator
3	Prof. S. S. Kamate	GATE / Preplacement Coaching
		VLSI Lab In charge
		Students Mentor
		Module Coordinator
		IEEE Coordinator/ IA Cordinator
		Dept. NAAC Criteria Sub Coordinator
		Project Coordinator
		NBA Criteria Coordinator
4	Prof. D. M. Kumbhar	GATE / Preplacement 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

Sr.No	Name of the faculty	Activities
5	Prof. S. S. Patil	GATE / Preplacement Coaching
		ARM & ES Lab In charge
		Students Mentor
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Admission Coordinator
		Module Coordinator
6	Prof. D. B. Madihalli	GATE / Preplacement 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 / Preplacement Coaching
		HDL Lab In charge
		Students Mentor
		NBA Criteria Coordinator
		T&P Cell Coordinator
		Alumni Coordinator
8	Dr. S. S. Ittannavar	GATE / Preplacement Coaching
		BSP /DSP Lab In charge
		Students Mentor
		Module Coordinator
		News Letter / Technical Magazine
		AICTE Coordinator
9	Prof. B. P. Khot	GATE / Preplacement 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 / Preplacement Coaching
		Students Mentor
		AICTE Activity Coordinator
		NBA Criteria Coordinator
11	Prof. K.S.Patil	GATE / Preplacement Coaching. Students Mentor
		AICTE Activity Coordinator
		NBA Criteria Coordinator

CONTENTS

FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty.	09	17.00Y
2	Technical supporting staff.	04	22.08Y
3	Helper staff	02	22.00Y

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	35.51
2	Analog Electronics (ED &I) Lab	92	8.24	6	Project Lab	95	--
3	Advanced Commn & Commn + LIC Lab	92	20.50	7	Research/E-Yantra/DSP & C.N.Lab	71	16.49
4	HDL/MC / EMD Lab	71	19.57	8	Power Electronics Lab	--	4.86
Total Investment In The Department						**Rs. 95.31 Lacs**	

FACULTY DETAILS

TEACHING FACULTY

S.N.	Name and Designation	Qualification	Specialization	Professional Membership	Teaching Exp.	Contact No.
1	Prof. M.C.Sarasamba	Ph.D	E&C	LMISTE	18Y.05M	9480714746
2	Assoc.Prof.S .S .Ittannavar	Ph.D	DSP	LMISTE	10Y.05M	9964299498
3	Asst.Prof. S. S. Malaj	M.E.	E & TC	LMISTE	26Y.01M	9731795803
4	Asst.Prof.S.S.Kamate	M.Tech	Digital Electronics	LMISTE	20Y.06M	9008696825
5	Asst.Prof. D.M. Kumbhar	M.Tech	Electronics	LMISTE	19Y.04M	09373609880
6	Asst.Prof. Sachin .S. Patil	M.Tech	VLSI & Embedded	LMISTE	19Y.02M	9448102010
7	Asst.Prof .D.B. Madihalli	M.Tech	Industrial Electronics	LMISTE	16Y.01M	9902854324
8	Asst.Prof.P.V.Patil	M.Tech	VLSI & Embedded	LMISTE	10Y.10M	9731104059
9	Asst.Prof. B. P. Khot	M.Tech	Microelectronics & Control Systems	LMISTE	7Y.05M	9964019501
10	Asst.Prof. S.R.Mallurmath	M.Tech	Industrial Electronics	LMISTE	10Y.04M	7259865769
11	Asst.Prof. K.S.Patil	M.Tech	VLSI	LMISTE	29Y.00M	9902682781

TECHNICAL SUPPORTING STAFF

S.N.	Name	Qualification	Experience (in years)
1.	Sri. P. S. Desai	DEC	23Y-.01M
2.	Sri. V. V. Guruwodeyar	DEC	31Y-08 M
3.	Sri.M.A.Attar	DEC	13Y-03M

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E. in Electronics and Communication Engineering Scheme of Teaching and Examinations2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2023-24)

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	BEC501	Technological Innovation and Management Entrepreneurship	TD- ECE/ETEPSB-ECE/ETE	3	0	0		03	50	50	100	3
2	IPCC	BEC502	Digital Signal Processing	TD- ECE/ETE PSB-ECE/ETE	3	0	2		03	50	50	100	4
3	PCC	BEC503	Digital Communication	TD- ECE/ETE PSB-ECE/ETE	4	0	0		03	50	50	100	4
4	PCCL	BECL504	Digital Communication Lab	TD- ECE/ETE PSB-ECE/ETE	0	0	2		03	50	50	100	1
5	PEC	BEC515x	Professional Elective Course	TD- ECE/ETE PSB-ECE/ETE	3	0	0		03	50	50	100	3
6	PROJ	BEC586	Mini Project	TD- ECE/ETE PSB-ECE/ETE	0	0	4		03	100		100	2
7	AEC	BRMK557	**Research Methodology and IPR**		2	2	0		02	50	50	100	3
8	MC	BESK508	Environmental Studies	Any Department	2	0	0		02	50	50	100	2
9	MC	BNSK559	National Service Scheme (NSS)	NSS coordinator	0	0	2			100		100	0
		BPEK559	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK559	Yoga	Yoga Teacher									
										550	**350**	**900**	**22**

Professional Elective Course

BEC515A	**Intelligent Systems and Machine Learning Algorithms**	BEC515C	Data Structure using C++
BEC515B	Digital Switching and Finite Automata Theory	BEC515D	Satellite and Optical Communication

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SXX**:

	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:2024-25 (Odd) Rev: 02

REVISED ACADEMIC CALENDAR OF EVENTS (CoE)

AY: 2024-25 (Odd Sems.: I, III, V & VII) (w.e.f.: 17th Sept. 2024)

Ref: 1. VTU CoE Revised Notification No.: VTU/BGM/BoS/Academic Calendar/2024-25/2623, Dated 4th Sept. 2024
2. VTU Circular No.: VTU/BGM/BoS/V sem/625/2024-25/26112, Dated 5th Sept. 2024

Calendar

September -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					

October-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		

November -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

December -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				

January -2025

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
19th Aug. 2024	Commencement of III Sem Classes
5th Sept. 2024	Teachers Day (NSS & Dept. Associations)
7th Sept. 2024	GH: Varasidhi Vinayaka Vratha
9th Sept. 2024	LH: Shri Math Mahadasoha
9th Sept. 2024	Commencement of VII Sem Classes
15th Sept. 2024	National Engineer's Day (NSS)
16th Sept. 2024	GH: ID-E-Milad
17th Sept. 2024	Commencement of V Sem Classes, I Sem Induction Program & Viswakarma Day (Skill & Creativity Day by TP Cell)
28th Sept. 2024	Commencement of I Sem Classes & Engg. Orientation & About VTU
2nd Oct. 2024	GH: Mahatma Gandhi's Birthday & Mahalaya Amavasya UBA Sp. Gram Sabha/International Day of Non-violence
8th Oct. 2024	Ideathon & Project Synopsis Presentation (Mini & Major)
11th -12th Oct. 2024	GH: Mahanavami, Ayudh Pooja & Vijayadashami
15th & 16th Oct. 2024	National Women Farmers Day (WEC) & World Food Day (NSS)
17th Oct. 2024	GH: Maharshi Valmiki Jayanti (NSS)
18th October 2024	III Sem Welcome-Function & Inauguration of Dept. Association Activities
22nd October 2024	Academic Audit of AY:2023-24 (Odd & Even)
24th -26th Oct. 2024	1st IA Test for I , III, V & VII Sems. (On 01 CO/Module)
26th Oct. 2024	1st Feedback on Teaching & Learning by I, III, V & VII Sems
29th Oct. 2024	Mini-Anveshana-24 by AGASTYA International Foundation
29th Oct. 2024	Fresher's Day Celebration & Parents Meet
30th Oct. 2024	Display of 1st IA Test Marks of I, III, V & VII Sems
31st Oct. 2024	GH: Narak Chaturdashi
1st Nov. 2024	GH: Kannada Rajyotsav
2nd Nov. 2024	GH: Balipadyami Deepavali
9th Nov. 2024	Blood Donation Camp & Health Check-up Camp (YRC & NSS)
18th Nov. 2024	GH: Kanakdas Jayanti
20th & 21st Nov. 2024	1st Lab IA Test for I, III, V & VII Sems. (On 02 COs/5 Expts)
22nd -23rd Nov. 2024	HSIT-QUEST-2024
26th Nov. 2024	Constitution Day (NSS)
28th -30th Nov. 2024	2nd IA Test for I, III, V & VII Sems. (On 02 COs/Modules covered after 1st IAT)
30th Nov. 2024	2nd Feedback on Teaching & Learning by I, III, V & VII Sems. Students.
4th Dec. 2024	Display of 2nd IA Test Marks of I, III, V & VII Sems
3rd , 4th & 5th Dec. 2024	National Agriculture Education Day (NSS), Women in Agriculture Day (WEC) & World Soil Day (NSS)
9th Dec. 2024	International Anti-Corruption Day (NSS)
13th -14th Dec. 2024	Indoor Sports Competitions (By Sports & Yoga Dept.)
16th -18th Dec. 2024	3rd IA Test for III, V & VII Sems. (On 02 COs/Modules covered after 2nd IAT)
19th Dec. 2024	Final Lab IA Test for III, V & VII Sems. (On remaining 03 COs/5 Expts)
20th Dec. 2024	Display of 2nd IA Test Marks of I Sem & 3rd IA Test Marks of III,V&VII Sems.
20th Dec. 2024	Project Exhibition (Mini & Major) (Dept. Associations)
21st Dec. 2024	Last Working Day of III, V & VII Sems
25th Dec. 2024	GH: Christmas
27th -28th Dec. 2024	International Conference (R&D)
23rd Dec.24 – 1st Jan. 25	VTU Practical /Viva Examinations of III, V & VII Sems.
6th Jan. -4th Feb. 2025	VTU Theory Examinations of III, V & VII Sems.
10th Feb. 2025	Commencement of IV, VI & VIII Sems.
14th Jan. 2025	GH: Makhara Sankranti
15th & 16th Jan. 2025	Final Lab IA Test for I Sem. (On remaining 03 COs/5 Expts.)
20th -22nd Jan. 2025	3rd IA Test for I Sem. (On remaining 02 COs/Modules)
22nd Jan. 2025	Display of 3rd IA Test Marks of I Sem
25th Jan. 2025	Alumni Meet (By Alumni Association)
26th Jan. 2025	GH: Republic Day (NSS)
27th Jan. 2025	Last Working Day of I Sem
28th Jan-6th Feb. 2025	VTU Practical /Viva Examinations of I Sem.
7th Feb.-5th Mar. 2025	VTU Theory Examinations of I Sem.
10th Mar.. 2025	Commencement of II Sem.

GH: General Holiday, LH: Local Holiday, NSS: National Service Scheme, WEC: Women Empowerment Cell, YRC: Youth Red-Cross, CO: Course Outcome

07/10/2024

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

Hirasugar Institute of Technology NIDASOSHI PIN-591236 HSIT:Belgaum.

Dr.S.C.Kamate
Principal

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

Subject Title	**Technological Innovation and Management Entrepreneurship**		
Subject Code	BEC501	**CIE Marks**	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	**SEE Marks**	50
Total Number of Lecture Hrs	40 (08 Hrs/Module)	**Exam Hours**	03
Credits: 03			

FACULTY DETAILS:		
Name: Prof. S. J. Patil	**Designation:** Assistant Professor	**Experience:**13 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:

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 economic development, creativity and Innovation.
- Understand the Ideation Process, creation of Business Model, Feasibility Study and sources of funding..

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs
C301.1	UnderstandthefundamentalconceptsofManagementandEntrepreneurshipandopportunities in order to setup a business	**L1,L2**	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.2	Describe the functions of Managers, Entrepreneursandtheirsocial responsibilities	**L1,L2**	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.3	Understand the components in developing a business plan, along with the integration of CSR-Corporate Social Responsibility.	**L1,L2**	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.4	Describetheimportanceofsmallscaleindustriesineconomicdevelopmentandinstitutional support to start a small scale industry and understand the concepts of Creativity and Innovation and Identification of Business Opportunities	**L1,L2**	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
C301.5	Awareness about various sources off unding and institution supporting entrepreneurs	**L1,L2, L3**	PO1,PO2,PO3,PO4,PO6,PO8, PO9,PO10,PO11,Po12
Total Hours of instruction		**40**	

4.0 Course Content

Module 1

Management: Nature and Functions of Management–Importance, Definition, ManagementFunctions,LevelsofManagement,RolesofManager,ManagerialSkills, Management & Administration, Management as a Science, Art & Profession **(Selected topics of Chapter 1, Text1).**

Planning: Planning-Nature,Importance,Types,StepsandLimitationsofPlanning;DecisionMaking–Meaning,TypesandStepsinDecisionMaking

Module 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing,PrinciplesofOrganizing,SpanofManagement(meaningandimportance only), Departmentalization, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **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; 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

Module 3

Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship

Module 4

Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only)

Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.

Module 5

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

Financing and How to start a Business? Financial opportunity identification; Banking sources; Nonbanking Institutions and Agencies; Venture Capital – Meaning andRoleinEntrepreneurship;GovernmentSchemesforfundingbusiness;Prelaunch, LaunchandPostlaunchrequirements;ProcedureforgettingLicenseandRegistration; Challenges and Difficulties in Starting an Enterprise

Project Design and Network Analysis: Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VII	Internship	Internship documentation, Internship Report
02	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. PrinciplesofManagement–P.CTripathi,P.NReddy,McGrawHillEducation,6thEdition, 2017. ISBN-13:978-93-5260-535-4.
2. EntrepreneurshipDevelopmentSmallBusinessEnterprises-PoornimaMCharantimath, Pearson Education 2008, ISBN 978-81-7758-260-4.
3. DynamicsofEntrepreneurialDevelopmentandManagementbyVasantDesai.HPH2007, ISBN: 978-81-8488-801-2.
4. RobertD.Hisrich,MathewJ.Manimala,MichaelPPetersandDeanA.Shepherd, "Entrepreneurship",8th Edition,TataMc-grawHillPublishingCo.ltd.-newDelhi,2012.

Reference Books
1. Essentials of Management: An International, Innovation and Leadership perspective by HaroldKoontz,Heinz WeihrichMcGrawHillEducation,10thEdition2016. 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:

There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks

Any two assignment methods mentioned in the 22OB4.2, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two

assignments shall be scaled down to 25 marks)

The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks. Internal Assessment Test 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 course (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.
1. Marks scored shall be proportionally reduced 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, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility	
	12	**Staffing**-Need and Importance**,** Recruitment and Selection Process.	
	13	**Directing and Controlling:** Meaning and Requirements of Effective Direction, Giving Orders	
	14	Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory	
	15	Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioral Approach of Leadership.	

	16	Coordination-Meaning, Types, Techniques of Coordination; Controlling – Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process	
3	17.	**Social Responsibilities of Business:** Meaning of Social Responsibility	60
	18	Social Responsibilities of Business towards Different Groups	
	19	Social Audit, Business Ethics and Corporate Governance	
	20	**Entrepreneurship**: Definition of Entrepreneur, Importance of Entrepreneurship,	
	21	concepts of Entrepreneurship Characteristics of successful Entrepreneur	
	22	Classification of Entrepreneurs Myths of Entrepreneurship, development cycle	
	23	. Entrepreneurial Development models, Entrepreneurial	
	24	Problems faced by Entrepreneurs and capacity building for Entrepreneurship	
4	25	**Modern Small Business Enterprises:** Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises,	80
	26	Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India	
	27	Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only)	
	28	**Idea Generation and Feasibility Analysis-** Idea Generation; Creativity and Innovation; Identification of Business Opportunities	
	29	Market Entry Strategies; Marketing Feasibility	
	30	Financial Feasibilities; Political Feasibilities	
	31	Economic Feasibility; Social and Legal Feasibilities	
	32	Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities..	
5	33	**Business model**– Meaning, designing, analyzing and improvising; Business Plan –Meaning, Scope and Need; Financial, Marketing	100
	34	Human Resource and Production/Service Plan; Business plan Formats, Project report preparation and presentation; Why some Business Plan fails?	
	35	**Financing and How to start a Business?** Financial opportunity identification; Banking sources; Nonbanking Institutions and Agencies	
	36	Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business, Prelaunch, Launch and Post launch requirements	
	37	Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise	
	38	**Project Design and Network Analysis:** Introduction, Importance of Network Analysis, Origin of PERT and CPM	
	39	Network, Network Techniques, Need for Network Techniques	
	40	Steps in PERT, CPM, Advantages, Limitations and Differences**.**	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Management, Administration, Planning.	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	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 the span of management
4. What is meant by formal and informal organization?
5. With neat block diagram explain line, military or scalar organization.
6. Draw a neat block diagram showing the functional organizational chart and explain it.

7. Write down the different application of functional organization.
8. List the applications line and staff organization.
9. Write down the advantages and disadvantages of Depart mentation.
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.
24. Explain the nature and importance of staffing.
25. What are the various elements of staffing? Explain.
26. Explain the techniques of selection.
27. What are different types of interview techniques
28. Explain group discussion.
29. What is recruitment? Explain various sources of recruitment.
30. Differentiate between recruitment and selection
31. What is leadership? Describe the functions of a leader.
32. Explain the basic steps in the control process
33. Point out some important qualities that make for successful leadership. Define the concept of empathy.

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 are the role of small scale industries
2. Explain impact globalization and WTO on SSI's
3. What are the Govt. policy & development of the small scale sector in india
4. What are the problems for small scale industries
5. Explain growth and performance of small scale industries in india
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 Feasibilities.

MODULE -5

1. Explant in the meaning of 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 a and presentation.
7. Whysome Business Plan fails ?Explain.
8. Explain the concept of Financial opportunity identification.
9. Explain the concept of Nonbanking Institutions &Agencies.
10. ExplainPrelaunch,Launch and Post launchrequirements.
11. Write the procedure 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 Origine of PERT and CPM.
15. Explain the need for Network Techniques.
16. What are the steps in PERT.
17. Give the Limitations and différences of PERT & CPM.

15.0 University Result

Examination	FCD	FC	SC	% Passing
June -2024				**100**
Jan- 2023	28	14	04	100
Jan-2022	11	16	02	100

Prepared by	Checked by		
			
Prof.S. J. Patil	**Prof. S. S. Patil**	**HOD**	**Principal**

Subject Title	**Digital Signal Processing**		
Subject Code	BEC502	**IA Marks (20) +Assignments (10) + CIE Marks for Laboratory Component of IPCC (20)**	50
Number of Lecture Hrs/Week /	03(L)	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	40Theory + 13 Lab Slots	**Exam Hours**	03
CREDITS – 04			

FACULTY DETAILS:		
Name: Dr.M C Sarsamba	**Designation:** Professor	**Experience: 21** 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 & 2	Basic Electronics

2.0 Course Objectives

This course will enable students to:

Preparation: To prepare students with fundamental knowledge/ overview in the field of Digital Signal Processing.

Core Competence: To equip students with a basic foundation of Signal Processing by delivering the basics of Discrete Fourier Transforms & their properties, design of filters and overview of digital signal processors.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
CO1	Analyses the different types of signals and systems used in digital signal processing.	U	1,2,3,4,6,7,9,10, 11,12
CO2	Compute the response of an LTI system using time and frequency	U	1,2,3,4,5,6,7,9,1
CO3	Develop algorithms for the efficient computations of DFT and IDFT.	U	1,2,3,4,5,6,7,9,1 0,11,12
CO4	Design of digital FIR filters for the given specifications using different window methods	U	1,2,3,4,5,6,7,9,1 0,11,12
CO5	Design of digital IIR digital filters using bilinear transformation method.	U	1,2,3,4,5,6,7,9,1 0,11,12
Total Hours of instruction		**40**	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1		
Introduction: Signals, Systems and Signal Processing, Classification of Signals, The Concept of Frequency in Continuous Time and Discrete Time Sinusoidal Signals. **[Text1: 1.1, 1.2, 1.3: 1.3.1, 1.3.2]** **Discrete Time Signals and Systems**: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems**.** **[Text 1: 2.1.1, 2.1.2, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2, 2.3.3, 2.3.5]**	**08**	**L1, L2, L3**
Module -2		
Z-Transforms: The z-Transform, Properties of the z-Transform (Statements only), The System Function of a Linear Time Invariant system. **Text1:3.1, 3.2, 3.3.3.** **The Discrete Fourier Transform:** Frequency Domain sampling and Reconstruction of Discrete Time Signals, The DFT, The DFT as Linear Transformation. Properties of DFT: Periodicity, Linearity and Symmetry for real valued sequence, Multiplication of two DFTs and Circular Convolution. **[Text1: 7.1.1, 7.1.2, 7.1.3, 7.2: 7.2.1, 7.2.2]**	**08**	**L1, L2, L3**
Module-3		
DFT Properties: Time reversal of a sequence, Circular Time shift of a sequence, Circular frequency shift, Complex conjugate property, Multiplication of two sequences, Perceval's theorem. Linear Filtering Methods based on the DFT. **(Text 1: 7.3].** **Efficient Computation of the DFT- FFT Algorithms**: Direct Computation of the DFT, Radix-2 FFT Algorithms: computation of DFT and IDFT in decimation in time. **[Text1: 8.1: 8.1.1, 8.1.3].**	**08**	**L1, L2, L3**
Module-4		
Design of FIR Filters: Characteristics of practical frequency-selective filters, Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR (low pass and High pass) filters using windows - Rectangular, Bartlett, Hanning, Hamming and Blackman windows. Structure for FIR Systems: Direct form and Cascade form. [**Text1: 10.1.2, 10.2.1, 10.2.2]**	**08**	**L1, L2, L3**
Module-5		
IIR Filter Design: Infinite Impulse response Filter Format, Bilinear Transformation Design Method, Analog Filters using Low pass prototype transformation, Normalized Butterworth Functions, Bilinear Transformation and Frequency Warping, Bilinear Transformation Design Procedure, Digital Butterworth Filter Design (Lowpass and Highpass) using BLT. Realization of IIR Filters in Direct form I and II. **[Text2: 8.1, 8.2, 8.3 (Butterworth filter design), 8.8.1**	**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	Tutorial	https://dspguru.com/dsp/tutorials/
02	NPTEL	http://nptel.ac.in/courses/108105055/

8.0 Books Used and Recommended to Students

Text Books
1. Proakis & Manolakis, "Digital Signal Processing - Principles Algorithms & Applications", 4th Edition, Pearson education, New Delhi, 2007. ISBN: 81-317-1000-9. 2. Li Tan, Jean Jiang, "Digital Signal processing - Fundamentals and Applications", Academic Press, 2013, ISBN: 978-0-12-415893. 3. Vinay K. Ingle, John G Proakis , "Digital Signal Processing Using MATLAB, A problem Solving Companion", Cengage Learning, 2018, ISBN: 93-86668-11-4
Reference Books
1. Simon Haykin and Barry Van Veen, "Signals and Systems", 2nd Edition, 2008, Wiley India. ISBN9971-51- 239-4. 2. Sanjit K Mitra, "Digital Signal Processing, A Computer Based Approach", 4th Edition, McGraw Hill Education, 2013. 3. Oppenheim & Schaffer, "Discrete Time Signal Processing", PHI, 2003. 4. D Ganesh Rao and Vineeth P Gejji, "Digital Signal Processing" Cengage India Private Limited, 2017, ISBN: 9386858231

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

Website and Internet Contents References
04) http://nptel.ac.in/courses/108105055/ 05) https://dspguru.com/dsp/tutorials/ 06) http://nptel.ac.in/courses/117102060/

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):

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.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	% of Portion
1. Discrete Time Signals and Systems	1	Signals, Systems and Signal Processing,	Chalk and talk	20
	2	Classification of Signals	Chalk and talk	
	3	The Concept of Frequency in Continuous Time	Chalk and talk	
	4	Discrete Time Sinusoidal Signals	Chalk and talk	
	5	Discrete Time Signals	Chalk and talk	
	6	Discrete Time Systems	Chalk and talk	
	7	Analysis of Discrete Time	Chalk and talk	
	8	Linear Time Invariant Systems	Chalk and talk	
2. Z-Transforms and The Discrete Fourier Transform	9	The z-Transform	Chalk and talk	20
	10	Properties of the z-Transform (Statements only)	Chalk and talk	
	11	The System Function of a Linear Time Invariant system	Chalk and talk	
	12	Frequency Domain sampling and Reconstruction of Discrete Time Signals	Chalk and talk	
	13	The DFT, The DFT as Linear Transformation	Chalk and talk	
	14	The DFT, The DFT as Linear Transformation	Chalk and talk	
	15	Symmetry for real valued sequence	Chalk and talk	
	16	Multiplication of two DFTs and Circular Convolution	Chalk and talk	
3.DFT Properties and Efficient Computation of the DFT- FFT Algorithms	17	Time reversal of a sequence, Circular Time shift of a sequence	Chalk and talk	20
	18	Time reversal of a sequence, Circular Time shift of a sequence	Chalk and talk	
	19	Multiplication of two sequences	Chalk and talk	
	20	Perceval's theorem	Chalk and talk	
	21	Linear Filtering Methods based on the DFT	Chalk and talk	
	22	Direct Computation of the DFT	Chalk and talk	
	23	Radix-2 FFT Algorithms	Chalk and talk	
	24	Computation of DFT and IDFT in decimation in time	Chalk and talk	

4. Design of FIR Filters:	25	Characteristics of practical frequency-selective filters	Chalk and talk	20
	26	Symmetric and Antisymmetric FIR filters	Chalk and talk	
	27	Design of Linear-phase FIR	Chalk and talk	
	28	FIR (low pass and High pass) filters using windows	Chalk and talk	
	29	Rectangular, Bartlett, Hanning	Chalk and talk	
	30	Hamming and Blackman windows	Chalk and talk	
	31	Structure for FIR Systems	Chalk and talk	
	32	: Direct form and Cascade form	Chalk and talk	
5. IIR Filter Design	33	Infinite Impulse response Filter Format	Chalk and talk	20
	34	Bilinear Transformation Design Method	Chalk and talk	
	35	Analog Filters using Low pass prototype transformation	Chalk and talk	
	36	Normalized Butterworth Functions	Chalk and talk	
	37	Bilinear Transformation and Frequency Warping	Chalk and talk	
	38	Bilinear Transformation Design Procedure	Chalk and talk	
	39	Digital Butterworth Filter Design (Lowpass and High pass) using BLT	Chalk and talk	
	40	Realization of IIR Filters in Direct form I and II.	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 DFT, Properties of DFT and FFT	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 FIR filter, IIR filter Design and Digital signal processors.	Students study the Topics and will prepare for Final Exam.	Module-3,4 & 5 of the syllabus	12	Individual Activity.	Text Book 1& Text Book 2

14.0 University Result

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

15.0 QUESTION BANK

MODULE -1

1. Define signal.
2. Define system.
3. What are the major classifications of the signal.
4. Define discrete time signals and classify them.
5. Define continuous time signals and classify them.
6. Define discrete time unit step and unit impulse.
7. Define continuous time unit step and unit impulse.
8. Define unit ramp signal.
9. Define periodic signal and non-periodic signal.
10. Define even and odd signal.
11. Define energy and power signal.

MODULE -2

1) With appropriate diagrams describe overlap-save method and overlap-add method.
2) Compare various FFT algorithms
3) Write short notes on
   a. Butterfly computation b. In place computation c. Bit reversal
4) Determine number of bits required to compute an FFT of 1024 points with signal to noise ratio of 30 dB.
5) Explain different sectional convolution methods.
6) State and prove Parsevals theorem.
7) Compute complex additions, complex multiplications for N=128, 256.
8) Given x(n)={1,0,-1,1,2,3,1,0,-2,2,1,3,0,1,-1} and h(n)={1,2} find the linear convolution of the above sequence using Overlap save method.
9) Compute the linear convolution of above sequence using Overlap add method.
10) Use the 8 point radix -2 DIT-FFT algorithm to find the DFT of the sequence

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

11) First 5 points of the 8-point DFT of a real valued sequence is given by X(0)=0, X(1)=2+j2, X(2) = -4
12) X (3) = 2-j2, X(4) = 0 determine the remaining points. Hence find the original sequence x(n) using Decimation in frequency FFT algorithm
13) Calculate the IDFT of X(k) = {0,28284-j28284,0,0,0,0,0, 28284+j28284} using Inverse Radix – 2 DIT FFT algorithm
14) Draw the flow graph for the implementation of 8 point DIT FFT of the following sequence

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

MODULE -3

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

   $H(w) = e^{-jwt}$ for $|w|<=wc$

   a. $= 0$ otherwise
6) The length of the filter should be 7 and wc=1 rad/sec. use rectangular window
7) Design the FIR filter above example 5 using hanning window
8) Explain Kaiser Window.
9) Design an FIR linear phase filter using Kaiser window to meet the following specifications

   i. $0.99 <= |H(ejw)| <= 1.01$ $0<= |w| <= 0.19\backslash$

   1. $|H(ejw)| <= 0.01$ $0.21\prod <= |w| <= \prod$

MODULE -4

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

MODULE -5

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

Prepared by	Checked by		
			
Dr. M.C.Sarsamba	**Dr. M.C.Sarsamba**	**HOD**	**Principal**

Subject Title	**Digital Signal Processing Lab**		
Subject Code	BEC502	**Conduction of experiments (15)+ Laboratory Test (10)**	25
Number of Lecture Hrs/Week /	2(P)	**Exam Marks**	50
Total Number of Lecture Hrs	8-10 Lab Slots	**Test Hours**	03
CREDITS – 02			

FACULTY DETAILS:		
Name: Dr. S. S. Ittannavar	**Designation:** Associate Professor	**Experience:**12 years
No. of times course taught: 02	**Specialization:** Digital Signal Processing	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	3	Basic Signal Processing

2.0 Course Objectives

This course will enable students to:

Preparation: To prepare students with fundamental knowledge/ overview in the field of Digital Signal Processing.

Core Competence: To equip students with a basic foundation of Signal Processing by delivering the basics of Discrete Fourier Transforms & their properties, design of filters and overview of digital signal processors.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
CO1	Analyse the different types of signals and systems used in digital signal processing.	U	1,2,3,4,6,7,9,10,11,12
CO2	Compute the response of an LTI system using time and frequency domain techniques.	U	1,2,3,4,5,6,7,9,10,11,12
CO3	Develop algorithms for the efficient computations of DFT and IDFT.	U	1,2,3,4,5,6,7,9,10,11,12
CO4	Design of digital FIR filters for the given specifications using different window methods.	U	1,2,3,4,5,6,7,9,10,11,12
CO5	Design of digital IIR digital filters using bilinear transformation method.	U	1,2,3,4,5,6,7,9,10,11,12
Total Hours of instruction		**20**	

4.0 Course Content

Practical Component of IPCC		
Experiments	**Teaching Hours**	**Bloom's Taxonomy (RBT) level**
1. Program to generate the following discrete time signals. a) Unit sample sequence, b)Unit step sequence, c) Exponential sequence, d)Sinusoidal sequence, e) Random sequence	02	L3
2. Program to perform the following operations on signals. a) Signal addition, b) Signal multiplication, c)Scaling, d) Shifting, e)Folding	02	L3
3. Program to perform convolution of two given sequences (without using built-in function) and display the signals.	02	L3
4. Consider a causal system y(n) = 0.9y(n-1)+x(n). a) Determine H(z) and sketch its pole zero plot. b) Plot |H(ejω)| and ∠ H(ejω) c) Determine the impulse response h(n).	02	L3
5. Computation of N point DFT of a given sequence (without using built-in function) and to plot the magnitude and phase spectrum.	02	L3
6. Using the DFT and IDFT, compute the following for any two given sequences a)Circular convolution b) Linear convolution	02	L3
7. Verification of Linearity property, circular time shift property & circular frequency shift property of DFT..	02	L3
8. Develop decimation in time radix-2 FFT algorithm without using built-in functions.	02	L3
9. Design and implementation of digital low pass FIR filter using a window to meet the given specifications.	02	L3
10. Design and implementation of digital high pass FIR filter using a window to meet the given specifications.	02	L3
11. Design and implementation of digital IIR Butterworth low pass filter to meet the given specifications.	02	L3
12. Design and implementation of digital IIR Butterworth high pass filter to meet the given specifications.	02	L3

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VI	Mini Project	DSP
02	VIII	Project Work	DSP based projects

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	Tutorial	Topic: Solving different types of programs

8.0 Books Used and Recommended to Students

1. Lab Manual

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

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

10.0 Magazines/Journals Used and Recommended to Students

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

11.0 Examination Note

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 **10 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 **10 marks**.

Scaled down marks of write up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.

12.0 Course Delivery Plan

Experiments	% of portion
1. Program to generate the following discrete time signals. a) Unit sample sequence, b)Unit step sequence, c) Exponential sequence, d)Sinusoidal sequence, e) Random sequence	8.3
2. Program to perform the following operations on signals. a) Signal addition, b) Signal multiplication, c)Scaling, d) Shifting, e)Folding	16.6
3. Program to perform convolution of two given sequences (without using built-in function) and display the signals.	25
4. Consider a causal system y(n) = 0.9y(n-1)+x(n). a) Determine H(z) and sketch its pole zero plot. b) Plot |H(ejω)| and ∠ H(ejω) c) Determine the impulse response h(n).	33.3
5. Computation of N point DFT of a given sequence (without using built-in function) and to plot the magnitude and phase spectrum.	41.6
6. Using the DFT and IDFT, compute the following for any two given sequences a)Circular convolution b) Linear convolution	50
7. Verification of Linearity property, circular time shift property & circular frequency shift property of DFT..	58.3
8. Develop decimation in time radix-2 FFT algorithm without using built-in functions.	66.6
9. Design and implementation of digital low pass FIR filter using a window to meet the given specifications.	75
10. Design and implementation of digital high pass FIR filter using a window to meet the given specifications.	83.3
11. Design and implementation of digital IIR Butterworth low pass filter to meet the given specifications.	91.6
12. Design and implementation of digital IIR Butterworth high pass filter to meet the given specifications.	100

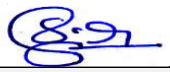
13.0 University Result

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

14.0 VIVA QUESTIONS

1. What is DSP?
2. What are advantages of DSP?
3. What are applications of DSP?
4. Why DFT? What is need of Sampling DTFT?
5. What is the necessity of processing of signal
6. What do you mean by discrete signal?
7. When a discrete time signal is called periodic?
8. What is anti aliasing filter? Can it be Digital filter? Justify.
9. What is impulse response and what is its significance?
10. What do you mean by real time signal? Give example.
11. What are linear and non-linear systems?
12. Why linear convolution is important in DSP?
13. What do you mean by aliasing in circular convolution?
14. Why circular convolution is important in DSP?
15. How to perform linear convolution using circular convolution?
16. What are the applications of Correlation?
17. What is auto-correlation and cross correlation?
18. What is Finite Impulse Response?
19. What is infinite Impulse Response?
20. What is the need of FFT?
21. DFT gives discrete spectrum or continuous spectrum? Justify?
22. How efficient is the FFT?
23. FFT is faster than DFT. Justify.
24. What do you mean by Decimation?
25. Why Radix-2 algorithms are fast compared to radix-3 algorithms. ?
26. What is the drawback in Fourier Transform and how it is overcome?
27. Why sectioned convolution is performed?
28. What is Zero padding? Why it is needed?
29. What are the two methods of sectioned convolution?
30. In what way zero padding is implemented in overlap save method?
31. Compare the overlap add and overlap save method of sectioned convolution.
32. What is periodicity and aperiodicity
33. What is the Nyquist rate
34. What is stable and unstable
35. What do you mean by casual and non casual
36. Distinguish linear and non linear

37. Give the memory signal and memory less signal
38. What is FIR and IIR
39. Give the 1st order,2nd order system
40. State sampling theorem? What is the necessary condition?
41. On what signal Fourier transform and Fourier series applied
42. State convolution theorem
43. Necessity of convolution theorem
44. Define Impulse signal and its timing properties
45. Differentiate between linear convolution and circular convolution
46. What do you mean by filter
47. Define auto correlation and cross correlation
48. Give the phase and magnitude equation of calculation
49. What do you mean by macros
50. What is necessity of function in C programming
51. Give the different data types in C
52. What is file extension of C programs
53. What is the file extension for C++ programs
54. Give the mathematical header available in C.
55. What are conditional statements in C programming

Prepared by	Checked by		
			
Dr. S. S. Ittannavar	**Dr. M. C. Sarsamba**	**HOD**	**Principal**

Subject Title	**Digital Communication**		
Subject Code	BEC503	**IA Marks (60) +Assignments (20) + Quiz/Seminar (20) out of 100 scale down to 50 Marks**	50
Number of Lecture Hrs/Week /	04(L)	**Exam Marks (appearing for)**	50 (100)
Total Number of Lecture Hrs	50 Theory	**Exam Hours**	03
CREDITS – 04			

FACULTY DETAILS:		
Name: Dr. S. S. Ittannavar	**Designation:** Associate Professor	**Experience:**12 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 & 2	Basic Electronics, Principles of Communication system

2.0 Course Objectives

This course will enable students to:

- Understand the concept of signal processing of digital data and signal conversion to symbols at the transmitter and receiver.
- Compute performance metrics and parameters for symbol processing and recovery in ideal and corrupted channel conditions.
- Understand the principles of spread spectrum communications.
- Understand the basic principles of information theory and various source coding techniques.
- Build a comprehensive knowledge about various Source and Channel Coding techniques.
- Discuss the different types of errors and error detection and controlling codes used in the communication channel.
- Understand the concepts of convolution codes and analyze the code words using time domain and transform domain approach.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
CO1	Apply the concept of signal conversion to vectors in communication transmission and reception.	U	1,2,3,4,6,7,9,10, 11,12
CO2	Perform the mathematical analysis of digital communication systems for different modulation techniques.	U	1,2,3,4,5,6,7,9,1 0,11,12
CO3	Apply the Source coding and Channel coding principles for the discrete memoryless channels.	U	1,2,3,4,5,6,7,9,1 0,11,12
CO4	Compute the code words for the error correction and detection of a digital data using Linear Block Code, Cyclic Codes and Convolution Codes.	U	1,2,3,4,5,6,7,9,1 0,11,12
CO5	Design encoding and decoding circuits for Linear Block Code, Cyclic Codes and Convolution Codes.	U	1,2,3,4,5,6,7,9,1 0,11,12
Total Hours of instruction		**50**	

4.0 Course Content

Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1		
Band pass Signals to Equivalent Low pass: Hilbert Transform, Pre-envelopes, Complex envelopes of Band-pass Signals, Canonical Representation of Bandpass signals. Signaling over AWGN Channels- Introduction, Geometric representation of signals, Gram-Schmidt Orthogonalization procedure, Conversion of the continuous AWGN channel into a vector channel , Optimum receivers using coherent detection: ML Decoding, Correlation receiver, matched filter receiver.	**10**	**L1, L2,L3**
Module -2		
Digital Modulation Techniques: Phase shift Keying techniques using coherent detection: generation, detection and error probabilities of BPSK and QPSK, M–ary PSK, M–ary QAM. Frequency shift keying techniques using Coherent detection: BFSK generation, detection and error probability. BFSK using Noncoherent Detection, Differential Phase Shift Keying.	**10**	**L1, L2,L3**
Module-3		
Information theory: Introduction, Entropy, Source Coding Theorem, Lossless Data Compression Algorithms, Discrete Memoryless Channels, Mutual Information, Channel capacity, Channel Coding Theorem, Information Capacity Law (Statement).	**10**	**L1, L2,L3**
Module-4		
Error Control Coding: Error Control Using Forward Error Correction, **Linear Block Codes:** Definitions, Matrix Descriptions,	**10**	**L1, L2,L3**

Syndrome and its properties, Minimum distance Considerations, Syndrome Decoding, **Hamming Codes. Cyclic Codes:** Properties, Generator and Parity Check Polynomial and matrices, Encoding, Syndrome computation, Examples.		
Module-5		
Convolutional Codes: Convolutional Encoder, Code tree, Trellis Graph and State graph, Recursive systematic Convolutional codes, Optimum decoding of Convolutional codes, Maximum Likelihood Decoding of Convolutional codes: The Viterbi Algorithm, Examples.	**10**	**L1, L2, L3**

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Design Communication system
02	VIII	Wireless Communication	Modulation Techniques

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Digital Communication Technologies are digital tools that allow two or more people to communicate with one another.
02	These can be written, verbal, visual or audible communication

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Digital Modulation Techniques, Spread Spectrum Modulation Techniques.
02	NPTEL	ISI, Equalizers.

8.0 Books Used and Recommended to Students

Text Books
1. Simon Haykin, "Digital Communication Systems", John Wiley & sons, 2014, ISBN 978-81-265-4231-4.
Reference Books
1. B.P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems",4th Edition, Oxford University press, ISBN: 9780198073802, 2017 2. K Sam Shanmugam, "Digital and analog communication systems", Wiley India Pvt. Ltd, 2017, ISBN:978- 81-265-3680-1,. 3. K.N Hari Bhat, D. Ganesh Rao, "Information Theory and Coding", Cengage Learning India Pvt Ltd, 2017, ISBN: 93-866-5092-4.

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

Website and Internet Contents References
1. Principles of Communication Systems Part II, https://onlinecourses.nptel.ac.in/noc19_ee47/preview

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Transactions on Communication systems	ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4547466
2	Digital Communications and Networks - Journal - Elsevier	www.journals.elsevier.com/digital-communications-and-networks/
3	International Journal of Digital Communication and Networks	ijdcn.co.in
4	Journal of Communication - Wiley Online Library	onlinelibrary.wiley.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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures 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:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB4.2, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test 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 course (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.
4. Marks scored shall be proportionally reduced to 50 marks.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	% of Portion
1. Band pass Signals to Equivalent Low pass	1	**Band pass Signals to Equivalent Low pass:** Hilbert Transform,	Chalk and talk	20
	2	Pre-envelopes,	Chalk and talk	
	3	Complex envelopes of Band-pass Signals, Canonical Representation of Bandpass signals.	Chalk and talk	
	4	Signaling over AWGN Channels- Introduction, Geometric representation of signals,	Chalk and talk	
	5	Gram- Schmidt Orthogonalization procedure,	Chalk and talk	
	6	Problems on Gram Schmidt	Chalk and talk	
	7	Conversion of the continuous AWGN channel into a vector channel ,	Chalk and talk	
	8	Optimum receivers using coherent detection: ML Decoding,	Chalk and talk	
	9	Correlation receiver	Chalk and talk	
	10	Matched filter receiver.	Chalk and talk	
2. Digital Modulation Techniques	11	**Digital Modulation Techniques:** Phase shift Keying techniques using coherent detection: generation, detection	Chalk and talk	20
	12	Error probability of BPSK	Chalk and talk	
	13	Error probability of QPSK,.	Chalk and talk	
	14	M–ary PSK,	Chalk and talk	
	15	M–ary QAM.	Chalk and talk	
	16	Frequency shift keying techniques using Coherent detection: BFSK generation, detection	Chalk and talk	
	17	Error probability of BFSK.	Chalk and talk	
	18	BFSK using Non coherent Detection,	Chalk and talk	
	19	Differential Phase Shift Keying	Chalk and talk	
	20	Problems on DPSK and Probability of error	Chalk and talk	
3. Information theory	21	**Information theory:** Introduction,	Chalk and talk	20
	22	Entropy, Source Coding Theorem,	Chalk and talk	
	23	Lossless Data Compression Algorithms,	Chalk and talk	
	24	Discrete Memoryless Channels,	Chalk and talk	
	25	Mutual Information,	Chalk and talk	
	26	Channel capacity,	Chalk and talk	
	27	Channel Coding Theorem	Chalk and talk	
	28	Information Capacity Law (Statement).	Chalk and talk	
	29	Problems on Entropy	Chalk and talk	
	30	Problems on Channel coding theorem	Chalk and talk	
4. Error Control Coding	31	**Error Control Coding:** Error Control Using Forward Error Correction,	Chalk and talk	20
	32	**Linear Block Codes:** Definitions, Matrix Descriptions,	Chalk and talk	
	33	Syndrome and its properties,	Chalk and talk	
	34	Minimum distance Considerations,	Chalk and talk	
	35	Syndrome Decoding,	Chalk and talk	
	36	**Hamming Codes.**	Chalk and talk	
	37	**Cyclic Codes:** Properties,	Chalk and talk	

	38	Generator and Parity Check Polynomial and matrices,	Chalk and talk	
	39	Encoding, Syndrome computation, Examples.	Chalk and talk	
	40	Problems	Chalk and talk	
5. Convolutional Codes	41	**Convolutional Codes:** Convolutional Encoder	Chalk and talk	20
	42	Code tree,	Chalk and talk	
	43	Trellis Graph and State graph,	Chalk and talk	
	44	Recursive systematic Convolutional codes,	Chalk and talk	
	45	Optimum decoding of Convolutional codes,	Chalk and talk	
	46	Maximum Likelihood Decoding of Convolutional codes	Chalk and talk	
	47	The Viterbi Algorithm, Examples.	Chalk and talk	
	48	Problems on Convolution codes	Chalk and talk	
	49	Problems on Convolution codes	Chalk and talk	
	50	Problems on Viterbi Algorithm	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 Digital Modulation Techniques, Signaling Communication through Band Limited AWGN Channels and Information theory	Students study the Topics and will prepare for Final Exam.	Module-1, 2 & 3 of the syllabus	9	Individual Activity	Text Book 1& Text Book 2
2	Assignment 2: University Questions on Source Coding, Error Coding and Convolution codes.	Students study the Topics and will prepare for Final Exam.	Module-4 & 5 of the syllabus	12	Individual Activity.	Text Book 1& Text Book 2

14.0 University Result

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

15.0 QUESTION BANK

1. Explain about geometric representation of signals.
2. Explain about Gram-Schmidt Orthogonalization procedure.
3. Explain about Conversion of the continuous AWGN channel into a vector channel.
4. Explain Nyquist criterion for distortion less transmission.
5. Explain Properties of matched filter.
6. Explain correlative coding.
7. Discuss baseband M-ary PAM systems.
8. Explain Coherent & Non coherent detection.
9. Explain Differential phase shift keying with block diagram.
10. The bit stream 1011100011 is to be transmitted using DPSK. Determine the encoded Sequence & transmitted phase sequence.
11. Explain QPSK.
12. Explain ASK.
13. Explain BPSK.
14. Explain BFSK.
15. Explain the block diagram of baseband transmission of binary data.
16. Explain Nyquist criterion for distortion less transmission.
17. What is meant by raised cosine channel?
18. Explain EYE pattern with neat sketches.
19. Discuss baseband M-ary PAM systems.
20. Explain Spread spectrum modulation & give the applications of spread spectrum modulation.
21. Explain Model of Spread spectrum Digital Communication System.
22. Explain generation of pseudo-noise sequences & Maximum length sequences.
23. Explain properties of Maximum length sequences.
24. Explain principle of DSSS & DPSK TX & RX.
25. Define Processing gain.
26. Explain applications of DSSS.
27. Explain principle of FHSS & list types of FHSS.

Prepared by	Checked by		
			
Dr. S. S. Ittannavar	**Dr. M.C.Sarsamba**	**HOD**	**Principal**

Subject Title	**Digital Communication Lab**		
Subject Code	BECL504	**Conduction of experiments (15)+ Laboratory Test (5)**	20
Number of Lecture Hrs/Week /	2(P)	**Exam Marks**	50
Total Number of Lecture Hrs	16 Lab Slots	**Test Hours**	03
CREDITS – 02			

FACULTY DETAILS:		
Name: S. S. Kamate	**Designation:** Asst. Professor	**Experience:22** years
No. of times course taught: 01	**Specialization:** Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	3/4	Communication system

2.0 Course Objectives

This laboratory course enables students to

- Design of basic digital modulation techniques using electronic hardware. Simulation of vector computations and derive the orthonormal basis set using Gram Schmidt procedure.
- Simulate the digital transmission and reception in AWGN channel
- Simulate the digital modulations using software and display the signals and its vector representations.
- Implement the source coding algorithms using a suitable software platform.
- Simulate the channel coding techniques and perform decoding for error detection and correction.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	PO's
CO1	Design the basic digital modulation and demodulation circuits for different engineering applications.	U	1,2,3,4,6,7,9,10,11,12
CO2	Design of optimum communication receivers for AWGN channels. its equivalent vector representations.	U	1,2,3,4,5,6,7,9,10,11,12
CO3	Illustration of different digital modulations using the signals and its equivalent vector representations.	U	1,2,3,4,5,6,7,9,10,11,12
CO4	Implement the source coding and channel coding procedures using suitable software	U	1,2,3,4,5,6,7,9,10,11,12
Total Hours of instruction		**26**	

4.0 Course Content

Practical Component			
Sl.No.	**Experiments**	**Teaching Hours**	**Bloom's Taxonomy (RBT) level**
13.	Generation and demodulation of the Amplitude Shift Keying signal.	02	L3
14.	Generation and demodulation of the Phase Shift Keying signal.	02	L3
15.	Generation and demodulation of the Frequency Shift Keying signal.	02	L3
16.	Generation of DPSK signal and detection of data using DPSK transmitter and receiver.	02	L3
17.	Gram-Schmidt Orthogonalization: To find orthogonal basis vectors for the given set of vectors and plot the orthonormal vectors.	02	L3
18.	Simulation of binary baseband signals using a rectangular pulse and estimate the BER for AWGN channel using matched filter receiver	02	L3
19.	Perform the QPSK Modulation and demodulation. Display the signal and its constellation	02	L3
20.	Generate 16-QAM Modulation and obtain the QAM constellation.	02	L3
21.	Encoding and Decoding of Huffman code	02	L3
22.	Encoding and Decoding of binary data using a Hamming code.	02	L3
23.	For a given data, use CRC-CCITT polynomial to obtain the CRC code. Verify for the cases, a) Without error b) With error	02	L3
24.	Encoding and Decoding of Convolution code	02	L3

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VI	Mini Project	DC
02	VIII	Project Work	DC based projects

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	Tutorial	Topic: Solving different types of programs

8.0 Books Used and Recommended to Students

2. Lab Manual

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

Website and Internet Contents References
5. https://vemu.org/uploads/lecture_notes/19_12_2022_753995718.pdf 6. https://atria.edu/assets/ece/manuals/cnl.pdf 7. https://www.azdocuments.in/2021/05/communication-laboratory-18ecl67_23.html

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	Journal of Communication Engineering	http://www.imanagerpublications.com/JournalIntroduction.aspx?journal=JournalonDigitalSignalProcessing

11.0 Examination Note

CIE for the practical component:

CIE marks for the practical course is **50 Marks**.
The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):
SEE marks for the practical course is 50 Marks.
SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

12.0 Course Delivery Plan

Sl. No.	Experiments	% of portion
1.	Generation and demodulation of the Amplitude Shift Keying signal.	8
2.	Generation and demodulation of the Phase Shift Keying signal.	16
3.	Generation and demodulation of the Frequency Shift Keying signal.	25
4.	Generation of DPSK signal and detection of data using DPSK transmitter and receiver.	33
5.	Gram-Schmidt Orthogonalization: To find orthogonal basis vectors for the given set of vectors and plot the orthonormal vectors.	42
6.	Simulation of binary baseband signals using a rectangular pulse and estimate the BER for AWGN channel using matched filter receiver	50
7.	Perform the QPSK Modulation and demodulation. Display the signal and its constellation	58
8.	Generate 16-QAM Modulation and obtain the QAM constellation.	67
9.	Encoding and Decoding of Huffman code	75
10.	Encoding and Decoding of binary data using a Hamming code.	84
11.	For a given data, use CRC-CCITT polynomial to obtain the CRC code. Verify for the cases, a) Without error b) With error	92
12.	Encoding and Decoding of Convolution code	100

.013.0 University Result

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

14.0 VIVA QUESTIONS

- State different types of Digital modulation techniques?
- What is shift keying?
- What is a binary modulation technique?
- Define ASK?
- Define FSK?
- Define PSK?
- Define QPSK and DPSK?
- Why QPSK is called quadrature shift keying?
- What is Gram-Schmidt Orthogonalization?
- What is BER?
- What is Encoding and Decoding of Huffman code, explain with an example.
- With an example explain encoding and decoding of binary data using a Hamming code.
- Explain encoding and decoding of convolution code

Prepared by	Checked by		
			
Prof. S. S. Kamate	**Dr. S. S. Ittannavar**	**HOD**	**Principal**

Subject Title	**Satellite and Optical Communication**		
Subject Code	BEC515D	**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:22** yrs
No. of times course taught:01	**Specialization:** Digital Electronics	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Communication subjects
02	ECE	III	Communication Labs

2.0 Course Objectives

- Understand the basic principle of satellite orbits and trajectories.
- Study of electronic systems associated with a satellite and the earth station.
- Understand the various technologies associated with the communication satellite.
- Learn the basic principle of optical fiber communication with different modes of light propagation.
- Understand the transmission characteristics and losses, optical components and it applications in optical communication.

3.0 Course Outcomes

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

	Course Outcome	Cognitive Level	POs
C307.1	Describe the satellite orbits and its trajectories with the definitions of parameters associated with it..	U	PO1, PO2, PO6, PO8, PO10
C307.2	Describe the Electronic hardware systems associated with the satellite subsystem and earth station	U	PO1, PO2, PO6, PO8, PO10
C307.3	Describe the communication satellite with the focus on national satellite system	U	PO1, PO2, PO6, PO8, PO10
C307.4	Classification and characterization of optical fibers with different modes of signal propagation	U	PO1, PO2, PO6, PO8, PO10
C307.5	Describe the constructional features and the characteristics of optical fiber and optical devices used for	U	PO1, PO2, PO6, PO8, PO10
Total Hours of instruction		**40**	

4.0 Course Content

Course Content:

Module	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1: **Satellite Orbits and Trajectories:** Definition, Basic Principles, Orbital parameters, Injection, velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle. [Text 1: 2.1,2.2,2.3,2.4,2.5,3.3,3.4,3.5,3.6,3.7	**08 Hours**	**L1, L2**
Module 2: **Satellite subsystem**: Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload. **Earth Station:** Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking. [Text 1: 4.1,4.5,4.6,4.7,4.8, 8.1,8.2,8.3,8.4,8.5,8.6,8.7]	**08 Hours**	**L1,L2**
Module 3: **Communication Satellites:** Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Telephony, Satellite Television, Satellite radio, Regional satellite Systems, National Satellite Systems. [Text 1: 9.1,9.2,9.3,9.4,9.5,9.6,9.7,9.8,9.10]	**08 Hours**	**L1,L2**
Module 4: **Optical Fiber Structures**: Optical Fiber Modes and Configurations, Mode theory for circular waveguides, Single mode fibers, Fiber materials. Attenuation and Dispersion: Attenuation, Absorption, Scattering Losses, Bending loss, Signal Dispersion: Modal delay, Group delay, Material dispersion. [Text 2 : 2.3[2.3.1 to 2.3.4], 2.4[2.4.1, 2.4.2],2.5, 2.7],3.1, 3.2	**08 Hours**	**L1,L2**
Module 5: **Optical Sources and detectors**: Light Emitting Diode: LED Structures, Light source materials, Quantum efficiency and LED power, Laser Diodes: Modes and threshold conditions, Rate equations, External quantum efficiency, Resonant frequencies, Photodetectors: The pin Photodetector, Avalanche Photodiodes. **WDM Concepts:** Overview of WDM, Isolators and Circulators, Fiber grating filters (No derivation), Dielectric thin-film filters, Diffraction Gratings. [Text 2: 4.2 ,4.3, 6.1, 10.1, 10.3, 10.4, 10.5, 10.7]	**08 Hours**	**L1,L2**

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VI	Communication subjects	--
02	VIII	Projects	Projects and Research

6.0 Relevance to Real World

SL. No.	Real World Mapping
01	Analyze satellite communication subjects
02	Analyze optical communication subjects

7.0 Gap Analysis and Mitigation

Sl. No.	Delivery Type	Details
01	Video	Topic: Indian satellites
02	NPTEL	Demonstration and Application

8.0 Books Used and Recommended to Students

Text Books
Text Books: 1.Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015, ISBN: 978-81-265-2071-8. 2. Gerd Keiser, Optical Fiber Communication, 5th Edition, McGraw Hill Education (India) Private Limited, 2016. ISBN:1-25-900687-5..
Reference Books
Reference Books: 1.Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006 2. Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd. , 2017, ISBN: 978-81-265-0833-4 3. John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3 4. Theodore Rappaport, Wireless Communications: Principles and Practice, 2nd Edition,
Additional Study material & e-Books
3. VTU online notes.
4. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf

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

Website and Internet Contents References
01) https://ieeexplore.ieee.org 02) https://www.youtube.com/watch?v=CLS3bjeDp_g&list=PLANsADRSK3O4Nf9ih74msINMf7Ghqwi20&index=2 03) https://www.youtube.com/watch?v=vAooT6aKLMc&list=PLANsADRSK3O4Nf9ih74msINMf7Ghqwi20&index=3 03) https://www.youtube.com/watch?v=y_hEbgWWuQs&list=PLF4DeZAfqGSar69xWgw5TpFuszBd1FSJJ 04) https://www.youtube.com/watch?v=Bts4c-sPOiE&list=PLF4DeZAfqGSar69xWgw5TpFuszBd1FSJJ&index=4 05)https://www.youtube.com/watch?v=eRx8OCVbq_4&list=PLF4DeZAfqGSar69xWgw5TpFuszBd1FSJJ&index=2

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 **25 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 15 **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 10Marks (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 meth ods 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	Satellite Orbits and Trajectories	20
	2	Definition and Basic Principles	
	3	Orbital parameters	
	4	Injection velocity and satellite trajectory	
	5	Types of Satellite orbits	
	6	Orbital perturbation	
	7	Satellite stabilization	
	8	Orbital effects on satellite's performance	
	9	Eclipses	
	10	Look angles: Azimuth angle Elevation angle,	
2	11	Satellite subsystem:	40
	12	Power supply subsystem	
	13	Attitude and Orbit control	
	14	Tracking, Telemetry and command subsystem,	
	15	Payload	
	16	Earth Station: Types of earth station	
	17	Architecture	
	18	Design considerations and Testing,	
	19	Earth station Hardware	
	20	Satellite tracking.	
3	21	Introduction	60
	22	Related Applications	
	23	Frequency Bands,	
	24	Payloads, Satellite Vs. Terrestrial Networks,	
	25	Satellite Telephony, Satellite Television	
	26	Satellite radio	
	27	Regional satellite Systems	
	28	National Satellite Systems	
4	29	Optical Fiber Modes and Configurations	80
	30	Mode theory for circular waveguides, Single	
	31	Fiber materials.	
	32	Attenuation, Absorption, Scattering Losses	
	33	Bending loss, Signal Dispersion	
	34	Modal delay, Group delay, Material dispersion	
5	35	Light Emitting Diode: LED Structures, Light	100
	36	Quantum efficiency and LED power, Laser	
	37	External quantum efficiency, Resonant	
	38	The pin Photo detector,	
	39	Avalanche Photodiodes	
	40	Overview of WDM	
	41	Isolators and Circulators, Fiber grating filters	
	42	Dielectric thin-film filters, Diffraction Gratings	

13.0 QUESTION BANK

MODULE -1

1. Define orbit and Trajectory
2. Explain Newton's law of gravitation
3. Define Newton's Second Law of motion
4. Explain Kepler's three laws of satellite motion.
5. Define Orbital Parameters of satellite.
6. Explain types of Satellite Orbits
7. Explain Three-axis or Body Stabilization
8. An Earth station is located at 300W longitude and 600N latitude. Determine the Earth Station's azimuth and elevation angles with respect to a geostationary satellite located at 500W longitude. The orbital radius is 42164 km. (Assume the radius of the Earth to be6378km.)
9. Define Solar and Lunar eclipses
10. Define GEO,MEO and LEO satellites

MODULE -2

1. Explain different subsystems comprising a typical satellite.
2. Explain Power Supply Subsystem
3. With a neat diagram explain telemetry and tracking command system.
4. Explain payload.
5. Explain earth station hardware
6. Explain types of earth stations

MODULE -3

1. Explain frequency Allocations for satellite services.
2. Explain advantages of satellite over terrestrial networks.
3. Explain basic elements of satellite communication system
4. Explain satellite point to point communication system
5. Explain typical satellite Television system
6. Explain Satellite radio system.
7. Write a note on regional satellite Systems
8. Briefly explain national Satellite Systems

MODULE-4

1. Explain the different optical Fiber modes and Configurations.
2. Explain Mode theory for circular waveguides.
3. Explain single mode fibers.

4. Describe Step Index Fiber Structure.
5. Explain Fiber materials.
6. State and explain advantages and disadvantages of fiber optic communication systems.
7. State and explain in brief the principle of light propagation
8. Explain Attenuation, Absorption, Scattering loss, Bending loss, Signal dispersion.
9. Explain Modal delay, Group delay, Material Dispersion.
10. State and explain advantages and disadvantages of fiber optic communication systems
11. Consider a multimode silica fiber that has a core refractive index n1=1.48 and a cladding index n2= 1.46.find a) Critical angle b) Numerical Aperture c) Acceptance angle
12. A step index fiber has a normalized freq V=26.6 at a 1300 nm wavelength .If the core radius is 25µm.What is numerical aperture.

MODULE 5

1. Explain LED Structure.
2. Explain Light source materials.
3. What is Quantum efficiency and LED power.
4. Explain Laser Diodes: Modes and threshold conditions.
5. Explain Rate equations, External quantum efficiency, Resonant frequencies.
6. What is a photodetector? Explain pin Photodetector with neat diagram.
7. Explain avalanche Photodiode
8. Explain Isolators and Circulators.
9. Explain Fiber grating filters, Dielectric thin-film filters, Diffraction Gratings.
10. A low loss fiber has average loss of 3dB/km at 900 nm. Compute the length over which – a) Power decreases by 50 % b) Power decreases by 75 %.

15.0 University Result

Examination	FCD	FC	SC	% Passing
New Subject				

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

Subject Title	**Research Methodology & Intellectual Property Rights**		
Subject Code	BRMK557	CIE Marks	50
Number of Lecture Hrs/Week / Total Number of Lecture Hrs	02 L : 02 T 25 Hours	**Exam Marks (appearing for)** **Exam Hours**	50(100) 03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. S.S.Malaj	**Designation:** Assistant Professor	**Experience:**25 years
No. of times course taught: Nil	**Specialization:** E & TC	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	1 & 2	Professional Skills in Writing English

2.0 Course Objectives

This course will enable students to :

1. To understand the knowledge on basics of research and its types.
2. To learn the concept of Literature Review, Technical Reading, Attributions and Citations.
3. To learn Ethics in Engineering Research.
4. To Discuss the concepts of Intellectual property Rights in Engineering.

3.0 Course Outcomes

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

	Course Outcome	Cognitiv	PO's
CO1	To know the meaning of engineering research	U	1,2,3,4,6,7,9,10
CO2	To know the procedure of Literature Review and Technical Reading.	U	1,2,3,4,5,6,7,9, 10,11,12
CO3	To know the fundamentals of the patent laws and drafting procedure .	U	1,2,3,4,5,6,7,9, 10,11,12
CO4	Understanding the copyright laws and subject matters of copyrights and designs	U	1,2,3,4,5,6,7,9, 10,11,12
CO5	Understanding the basic principles of design rights .	U	1,2,3,4,5,6,7,9, 10,11,12
Total Hours of instruction		**25**	

4.0 Course Content

Theory		
Modules	**Teaching Hours**	**Bloom's Taxonomy (RBT) level**
Module 1		
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct,Ethical Issues Related to Authorship.	08	L1,L2,L3
Module -2		
Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. **Attributions and Citations**: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	08	L1,L2,L3
Module-3		
Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society,IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting.Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models. **Process of Patenting**. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.	08	L1,L2,L3
Module-4		
Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright.Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint	08	L1,L2,L3

Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases. **Trademarks**: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.		
Module-5		
Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co. **Geographical Indications**: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India. **Case Studies on Patents.** Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. **IP Organizations In India. Schemes and Programmes**	08	L1,L2,L3

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VI	Research work	Paper writing concept
02	VIII	Project Work	Project

6.0 Relevance to Real World

SL.No	Real World Mapping
01	The students can gain knowledge of research work
02	The students can gain knowledge of to patent or not patent an application.
03	The students can get knowledge of documents required for GI Registration.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	NPTEL	Introduction to Research
02	Tutorial	Paper Writing Concept

8.0 Books Used and Recommended to Students

Text Books
1. Dr. Santosh M Nejakar.Dr. Harish Bendigeri " Research Methodology and Intellectual Property Rights" ,ISBN 978-93-5987-928-4
Reference Books
1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488- 4 2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

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

Website and Internet Contents References
https://onlinecourses.nptel.ac.in/noc23_ge36/preview https://onlinecourses.nptel.ac.in/noc22_hs59/preview

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	International Journal of Methodology-AIJR Journals	https://ipindexing.com/journal-details/International-Journal-of-Science-and-Research-Methodology/520
2	Journal of Intellectual Property Rights(JIPR)	http://op.niscair.res.in/index.php/JIPR

11.0 Examination Note

Assessment Details (both CIE and SEE)

Marks scored by the students will be proportionally scaled down to 50 marks

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). Astudent 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 5 th week of the semester
2. Second test at the end of the 10 th week of the semester
3. Third test at the end of the 15 th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of 4 th week of the semester
5. Second assignment at the end of 9 th 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 be set for 100 marks. Marks scored shall be proportionally reduced to 50 marks
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions is under a module (with a maximum of 2 sub-questions).
4. The students have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecture	Teaching Method	% Of Portion
1	1	Meaning of Research, Objectives of Engineering Research	Chalk and talk	20
	2	Motivation in Engineering Research, Types of Engineering Research	Chalk and talk	
	3	Finding and Solving a Worthwhile Problem.	Chalk and talk	
	4	Ethics in Engineering Research, Ethics in Engineering Research Practice	Chalk and talk	
	5	Types of Research Misconduct, Ethical Issues Related to Authorship	Chalk and talk	
2	6	New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases,Web of Science,Google and Google Scholar	Chalk and talk	20
	7	Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Researc,Critical and Creative Reading	Chalk and talk	
	8	Taking Notes While Reading,Reading Mathematics and Algorithms,Reading Mathematics and Algorithms, Reading a Datasheet	Chalk and talk	
	9	Giving Credit wherever Due,Citations: Functions and Attributes,Impact of Title and Keywords on Citations. Knowledge Flow through Citation,Citing Datasets,Styles for Citations	Chalk and talk	
	10	Acknowledgemens and Attributions,What should be Acknowledged, Acknowledgments in, Books ,Dissertations, Dedication or Acknowledgments.	Chalk and talk	
3	11`	Role of IP in the Economic and Cultural Development of the Society,IP Governance, IP as a Global Indicator of Innovation,Origin of IP History in India,Major Amendements in IP Laws and Acts in India.	Chalk and talk & NPTEL Video	20
	12	Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention,Rights Associated with Patents Enforcement of Patent Rights	Chalk and talk PPT	
	13	Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting,Process of Patenting,Prior Art Search ,Choice of Application to be Filed Patent Application Forms	Chalk and talk PPT	
	14	Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection.	Chalk and talk	

	15	Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models	PPT	
4	16	**Copyrights and Related Rights**: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright.Copyrights of the Author, Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence.	PPT	20
	17	Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights	Chalk and talk	
	18	Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish', Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board , Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases	PPT	
	19	Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark,	Chalk and talk	
	20	. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.	Chalk and talk	
5	21	**Industrial Designs:** Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term, Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration	Chalk and talk	20
	22	Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co.	Chalk and talk	
	23	Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI,	Chalk and talk	
	24	Non-Registerable GI. Protection of GI. Collective or Certification Marks, Enforcement of GI Rights,Procedure for GI registration Documents Required for GI Registration,GI Ecosystem in India.	Chalk and talk	
	25	Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. ,IP Organizations In India. Schemes and Programmes	Chalk and talk YouTube Videos	

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	Students study the Topics and will prepare for Final Exam.	Module-1,2 of the syllabus	3	Individual Activity	Text Book 1
2	Assignment 2: University Questions	Students study the Topics and will prepare for Final Exam.	Module-3,4,5 of the syllabus	6	Individual Activity.	Text Book 4

14.0 University Result

Examination	Total Students	FCD	FC	SC	FAIL	% of passing
Aug 2023	66	49	12	3	3	95.52

15.0 QUESTION BANK

Module 1

Q1.What is the meaning of Research.
Q2.What are the objectives of Engineering Research.
Q3.List and explain the types of Engineering Research.
Q4.Explain Ethics in Engineering Research.
Q5.Explain types of Research Misconduct.
Q6.Explain Ethical Issues related to Authorship.

Module 2

Q1.ExplainSynthesis & Synthesis of Prior Art Bibliographic Databases.
Q2.Explain Web of Science and Google Scholar.
Q3.Explain Effective Research.
Q4.Explain Critical and Creative Reading.
Q5.Explain Reading Mathematics and Algorithms.
Q6.Explain styles for Citiations.
Q7.Desribe Dedication or Acknowledgements.

Module 3

Q1.Explain Role of IP in the economic & Cultural Development of Society.IP Governance.
Q2.Describe Major Amendments in IP Laws and Acts in India.
Q3.Write about Conditions for obtaining a patent protection.
Q4.Describe about how to avoid public disclosure of an Invention before patenting.

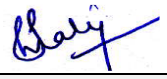
Q5.Explain validity of patent protection.
Q6.Explain post-grant opposition.
Q7.Describe types of patent applications.
Q8.Explain Choice of application to be filed.
Q9.Explain Utility models.
Q10.Describe types of patent applications.

Module 4

Q1.Explain Classes of Copy-Rights.
Q2.Explain Copyright Infringements.
Q3.Explain Fee structure.
Q4.Describe Copyright Profile in .India.
Q5.Explain International copyright agreements.
Q6.Who can apply for a trademark. Explain.
Q7.Explain process for trademarks registration.
Q8. Describe Types of Trademark Registered in India. Trademark Registry

Module 5

Q1.Explain Acts and Laws to govern Industrial Designs.
Q2.Describe procedure for registration of Industrial Designs.
Q3.Explain Importance of Design Registration.
Q4. Explain Classification of Industrial Designs.
Q5. Describe Collective or Certification Marks.
Q6. Explain GI Ecosystem in India.
Q7. Explain Case study of Neem Patent.

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

Subject Title	**ENVIRONMENTAL STUDIES**		
Subject Code	BESK508	**IA Marks**	50
Number of Lecture Hrs /	02	**SE Exam Marks**	50
Total Number of Lecture	30	**Exam Hours**	01
CREDITS – 01			

FACULTY DETAILS:		
Name: Dr. Shashikant Walki	Designation: Assoc. Professor	Experience: 08.0
No. of times course taught:05	**Specialization:** Organic Chemistry	

1.0 Prerequisite Subjects:

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

2.0 Course Learning Objectives

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

3.0 Course Outcomes

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

Course Code	**Course Outcome**	**RBT level**	**POs**
	To understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.	L1,L2	1,2,3,6,7, 9,10,12
	To Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment as legislation.	L1, L2	1,2,3,6,7,9, 10,12
	Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues	L1, L2	1,2,3,6,7,9, 10,12
Total Hours of instruction		**30**	

4.0 Course Content

Module-1: ECOSYSTEM AND SUSTAINABILITY

Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake.

Sustainability: 17 SDGs- History, targets, implementation, Capacity Development

Teaching-Learning Process: Chalk and talk, PowerPoint presentation and animation tools

Module 2: NATURAL RESOURCE MANAGEMENT

Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.

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

Teaching-Learning Process: Chalk and talk, PowerPoint presentation and animation tools

Module 3: ENVIRONMENTAL POLLUTION & WASTE MANAGEMENT

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.

Waste Management: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

Teaching-Learning Process: Chalk and talk, PowerPoint presentation and animation tools

Module 4: GLOBAL ENVIRONMENTAL ISSUES

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

Teaching-Learning Process: Chalk and talk, PowerPoint presentation and animation tools

Module 5: ENVIRONMENTAL LEGISLATION

Environmental Legislation : Water Act 1974, Air Act 1981, Environmental Protection Act 1984, Solid Waste Management Rules-2016, E- Waste management Rule - 2022, Biomedical Waste management- 2016.

Teaching-Learning Process: Chalk and talk, PowerPoint presentation and animation tools

5.0 Relevance to future subjects

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

6.0 Relevance to Real World

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

7.0 Gap Analysis and Mitigation

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

8.0 Books Used and Recommended to Students

Text Books
1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited. 2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi. 3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005, 4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.
Reference Books
1. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005 2. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006 3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007 4. Erach Bharucha, "Text Book of Environmental Studies", for UGC, University press, 2005 5. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004 6. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006 7. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

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

Website and Internet Contents References
Web links and Video Lectures: https://archive.nptel.ac.in/courses/109/105/109105190/ https://nptel.ac.in/courses/120/108/120108005/ https://nptel.ac.in/courses/120/108/120108002/ https://nptel.ac.in/courses/120/108/120108004/ https://nptel.ac.in/courses/105/102/105102089/ https://www.my-mooc.com/en/categorie/environmental-science https://academicearth.org/environmental-studies/ https://sdgs.un.org/goals

10.0 Magazines/Journals Used and Recommended to Students

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

11.0 Examination Note

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% (40marks 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 01 hours)

Question paper pattern:

1. The Question paper will have 50 objective questions

2. Each question will be for 01 marks

3. Students will have to answer all the questions on an OMR Sheet.

4. The Duration of the Exam will be 01 hour

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecturer	% of Portion
1	1.	**Module-1: ECOSYSTEM AND SUSTAINABILITY Ecosystems** (Structure and Function): Forest and Desert	**20**
	2.	**Ecosystems** (Structure and Function):Wetlands and River	
	3.	**Ecosystems** (Structure and Function): Oceanic and Lake.	
	4.	**Sustainability**: 17 SDGs- History	
	5.	**Sustainability**: 17 SDGs- targets	
	6.	**Sustainability**: 17 SDGs- implementation, Capacity Development	
2	7.	**Module 2: NATURAL RESOURCE MANAGEMENT Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): Hydrogen and Solar	**20**
	8.	**Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): OTEC	
	9.	**Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): Tidal and Wind.	
	10.	**Natural Resource Management** (Concept and case-studies): Disaster Management	
	11.	**Natural Resource Management** (Concept and case-studies): Sustainable Mining - case studies	
	12.	**Natural Resource Management** (Concept and case-studies): Carbon Trading.	
3	13.	**Module 3: ENVIRONMENTAL POLLUTION & WASTE MANAGEMENT: Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution.	**20**
	14.	**Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Noise pollution	
	15.	**Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Soil Pollution and Air Pollution.	
	16.	**Waste Management:** Bio-medical Wastes	
	17.	**Waste Management:** Solid waste; Hazardous wastes; E-wastes	
	18.	**Waste Management:** Industrial and Municipal Sludge.	
4	19.	**Module 4: GLOBAL ENVIRONMENTAL ISSUES** **Global Environmental Concerns (**Concept, policies and case-studies): Ground water depletion/recharging	**20**
	20.	**Global Environmental Concerns (**Concept, policies and case-studies Climate Change; Acid Rain.	
	21.	**Global Environmental Concerns (**Concept, policies and case-studies): Ozone Depletion	
	22.	**Global Environmental Concerns (**Concept, policies and case-studies Radon and Fluoride problem in drinking water	
	23.	**Global Environmental Concerns (**Concept, policies and case-studies): Environmental Toxicology.	
	24.	**Global Environmental Concerns (**Concept, policies and case-studies): Resettlement and rehabilitation of people	

5	25.	**Module 5: ENVIRONMENTAL LEGISLATION**	**20**
	26.	**Environmental Legislation :** Water Act 1974,	
	27.	**Environmental Legislation :** Air Act 1981	
	28.	**Environmental Legislation :** Environmental Protection Act 1984,	
	29.	**Environmental Legislation :** Solid Waste Management Rules-2016,	
	30.	**Environmental Legislation :** E- Waste management Rule - 2022, Biomedical Waste management- 2016.	

13.0 Assignments

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 of the syllabus	2	Individual Activity.	Book 1, of the reference list. Website of the Reference list
2	Assignment 1: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 2 of the syllabus	4	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
3	Assignment 1: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3 of the syllabus	6	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 2: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 4 of the syllabus	8	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
5	Assignment 2: University Questions/ Write up	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 5 of the syllabus	10	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list

14.0 QUESTION BANK

Module-1

Q1. What is the main source of energy in a forest ecosystem?

a) Soil nutrients

b) Sunlight

c) Water

d) Organic matter

Answer: b) Sunlight

Q2. Which of the following adaptations helps plants survive in desert ecosystems?

a) Broad leaves for capturing sunlight

b) Shallow roots for surface water

c) Deep roots to access underground water

d) Large leaves to increase transpiration

Answer: c) Deep roots to access underground water

Q3. Wetlands are often referred to as "nature's kidneys" because:

a) They store excess nutrients

b) They filter pollutants and purify water

c) They provide oxygen for aquatic life

d) They store solar energy

Answer: b) They filter pollutants and purify water

Q4. What is the term used to describe the area where a river meets the ocean?

a) Delta

b) Tributary

c) Estuary

d) Watershed

Answer: c) Estuary

Q5. Which of the following is the most productive zone in the ocean, supporting the greatest biodiversity?

a) Abyssal zone

b) Bathyal zone

c) Photic zone

d) Hadal zone

Answer: c) Photic zone

Q6. In a lake ecosystem, which zone is near the shore and rich in biodiversity?

a) Profundal zone

b) Limnetic zone

c) Littoral zone

d) Benthic zone

Answer: c) Littoral zone

Q7. The process of converting sunlight into chemical energy by plants is called:

a) Respiration

b) Photosynthesis

c) Decomposition

d) Nitrogen fixation

Answer: b) Photosynthesis

Q8. Which of the following organisms would be considered a primary consumer in a forest ecosystem?

a) Rabbit

b) Wolf

c) Oak tree

d) Mushroom

Answer: a) Rabbit

Q9. Which of the following is a typical characteristic of desert ecosystems?

a) High rainfall

b) Low evaporation rate

c) Sparse vegetation

d) High population density of organisms

Answer: c) Sparse vegetation

Q10. What is the main reason why phytoplankton are important to marine ecosystems?

a) They decompose organic matter

b) They provide shelter for fish

c) They are the primary producers and form the base of the food web

d) They consume large predators

Answer: c) They are the primary producers and form the base of the food web

11. When were the United Nations' 17 Sustainable Development Goals (SDGs) adopted?

a) 2000

b) 2010

c) 2015

d) 2020

Answer: c) 2015

12. Which of the following is NOT one of the 17 SDGs?

a) Gender equality

b) Zero hunger

c) Global disarmament

d) Climate action

Answer: c) Global disarmament

13. The SDGs aim to be achieved by which year?

a) 2025

b) 2030

c) 2050

d) 2040

Answer: b) 2030

14. Which of the following SDGs focuses on providing clean water and sanitation?

a) SDG 6

b) SDG 10

c) SDG 13

d) SDG 7

Answer: a) SDG 6

15. The principle of “Leave No One Behind” is central to the SDGs. What does this principle emphasize?

a) Focusing on wealthier nations

b) Achieving economic growth only

c) Prioritizing the most vulnerable and marginalized groups

d) Expanding urban infrastructure

Answer: c) Prioritizing the most vulnerable and marginalized groups

16. Which of the following targets falls under SDG 1 (No Poverty)?

a) End hunger and ensure food security

b) Ensure affordable and clean energy

c) Eradicate extreme poverty for all people everywhere

d) Promote economic growth and decent work

Answer: c) Eradicate extreme poverty for all people everywhere

17. Capacity development for achieving the SDGs involves:

a) Focusing solely on government-led efforts

b) Strengthening the skills and knowledge of individuals, organizations, and societies

c) Increasing private-sector profits

d) Reducing foreign aid

Answer: b) Strengthening the skills and knowledge of individuals, organizations, and societies

18. Which of the following SDGs is most closely linked to addressing climate change?

a) SDG 7 - Affordable and Clean Energy

b) SDG 13 - Climate Action

c) SDG 15 - Life on Land

d) SDG 9 - Industry, Innovation, and Infrastructure

Answer: b) SDG 13 - Climate Action

19. The 2030 Agenda for Sustainable Development was built upon which earlier initiative?

a) The Paris Agreement

b) The Millennium Development Goals (MDGs)

c) The Kyoto Protocol

d) The Bali Roadmap

Answer: b) The Millennium Development Goals (MDGs)

20. Implementation of the SDGs requires participation from which of the following groups?

a) Only national governments

b) Private sector and corporations

c) Civil society, governments, the private sector, and international organizations

d) Only non-governmental organizations (NGOs)

Answer: c) Civil society, governments, the private sector, and international organizations

Module-2

1. Which of the following is a primary advantage of hydrogen as a fuel?

a) High greenhouse gas emissions

b) Zero-emission when burned

c) Low energy density

d) Difficult storage

Answer: b) Zero-emission when burned

2. Which country is the global leader in installed solar photovoltaic (PV) capacity?

a) United States

b) Germany

c) China

d) India

Answer: c) China

3. A major limitation of wind energy is:

a) High operational cost

b) Noise pollution and visual impact

c) Lack of renewable potential

d) High greenhouse gas emissions

Answer: b) Noise pollution and visual impact

4. What is one of the biggest challenges of using hydrogen as an energy source?

a) Its low abundance

b) Difficulty in producing it efficiently without fossil fuels

c) Low energy density compared to gasoline

d) High toxicity

Answer: b) Difficulty in producing it efficiently without fossil fuels

5. Ocean Thermal Energy Conversion (OTEC) uses the temperature difference between:

a) Deep and surface ocean water

b) Ocean and land temperature

c) Tropical and polar ocean water

d) Ocean and air temperature

Answer: a) Deep and surface ocean water

6. Which of the following is a key benefit of solar energy?

a) Continuous energy production

b) High greenhouse gas emissions

c) Abundant and renewable

d) Requires high water consumption

Answer: c) Abundant and renewable

7. Tidal energy is considered a reliable energy source because:

a) It depends on sunlight

b) Tides are predictable and regular

c) It is easily transportable

d) It has low efficiency

Answer: b) Tides are predictable and regular

8. Which of the following is a demerit of solar power?

a) Intermittency due to weather conditions

b) High greenhouse gas emissions

c) Difficulty in land use

d) Limited lifetime of solar panels

Answer: a) Intermittency due to weather conditions

9. Which of the following countries is known for leading tidal energy projects?

a) Japan

b) South Korea

c) Australia

d) Brazil

Answer: b) South Korea

10. Wind energy has the greatest potential in which geographic region?

a) Equatorial regions

b) Desert regions

c) Coastal and open plains

d) Dense urban centers

Answer: c) Coastal and open plains

11. Which of the following is a major disadvantage of OTEC systems?

a) High operational costs and infrastructure requirements

b) Dependence on fossil fuels

c) Low energy conversion efficiency

d) Limited locations with required temperature differentials

Answer: d) Limited locations with required temperature differentials

12. Which of the following hydrogen production methods is considered most sustainable?

a) Steam methane reforming

b) Electrolysis using renewable energy

c) Gasification of coal

d) Thermo-chemical conversion

Answer: b) Electrolysis using renewable energy

13. Which of the following is a primary objective of disaster management?

a) Maximizing economic losses

b) Strengthening resilience and preparedness

c) Ignoring risk mitigation strategies

d) Relocating populations permanently

Answer: b) Strengthening resilience and preparedness

14. Which country implemented the first cap-and-trade system for carbon emissions?

a) United States

b) Germany

c) Japan

d) European Union

Answer: d) European Union

15. Sustainable mining practices are aimed at:

a) Extracting as many resources as possible in the shortest time

b) Minimizing environmental impacts and ensuring community benefits

c) Prioritizing short-term profits over ecological balance

d) Ignoring the impact on local communities

Answer: b) Minimizing environmental impacts and ensuring community benefits

16. Which of the following is an example of a sustainable mining case study?

a) The Ok Tedi Mine in Papua New Guinea

b) The Diavik Diamond Mine in Canada

c) The West Virginia coal mines in the USA

d) The Athabasca oil sands in Canada

Answer: b) The Diavik Diamond Mine in Canada

17. Which organization typically leads global carbon trading efforts?

a) World Health Organization (WHO)

b) International Monetary Fund (IMF)

c) United Nations Framework Convention on Climate Change (UNFCCC)

d) International Atomic Energy Agency (IAEA)

Answer: c) United Nations Framework Convention on Climate Change (UNFCCC)

18. Which of the following is a component of effective disaster management?

a) Early warning systems

b) Limiting access to information

c) Delaying recovery efforts

d) Ignoring environmental impact assessments

Answer: a) Early warning systems

19. Carbon trading works by:

a) Allowing countries and companies to buy and sell emissions allowances

b) Increasing global greenhouse gas emissions

c) Forcing companies to produce more emissions

d) Reducing carbon dioxide removal efforts

Answer: a) Allowing countries and companies to buy and sell emissions allowances

20. A notable disaster management case study in India is the:

a) Chernobyl disaster

b) Uttarakhand floods

c) Fukushima nuclear accident

d) Hurricane Katrina

Answer: b) Uttarakhand floods

Module-3

1. Which of the following is a major source of surface water pollution?

a) Industrial effluents

b) Solar radiation

c) Wind energy

d) Desertification

Answer: a) Industrial effluents

2. The primary cause of groundwater pollution is:

a) Overfishing

b) Leaching of chemicals from landfills

c) Noise from traffic

d) Airborne particles

Answer: b) Leaching of chemicals from landfills

3. Which of the following gases is most commonly associated with air pollution in urban areas?

a) Methane (CH_4)

b) Nitrogen dioxide (NO_2)

c) Oxygen (O_2)

d) Hydrogen (H_2)

Answer: b) Nitrogen dioxide (NO_2)

4. Noise pollution is measured in which unit?

a) Pascals

b) Decibels

c) Watts

d) Joules

Answer: b) Decibels

5. Which of the following is a primary effect of soil pollution?

a) Increased crop yields

b) Reduced soil fertility

c) Decrease in pesticide use

d) Enhanced biodiversity

Answer: b) Reduced soil fertility

6. The Clean Air Act in the United States is designed to:

a) Regulate noise levels in urban areas

b) Control emissions of harmful air pollutants

c) Monitor solid waste disposal methods

d) Manage water quality in rivers and lakes

Answer: b) Control emissions of harmful air pollutants

7. Eutrophication, a result of nutrient pollution in water bodies, primarily causes:

a) Improved fish habitats

b) Oxygen depletion and dead zones

c) Enhanced water clarity

d) Increased freshwater availability

Answer: b) Oxygen depletion and dead zones

8. One of the key preventive measures for groundwater pollution is:

a) Increased mining activities

b) Proper waste disposal and landfill management

c) Building more factories near water bodies

d) Increased pesticide application in agriculture

Answer: b) Proper waste disposal and landfill management

9. The major contributor to air pollution from vehicles is:

a) Carbon monoxide (CO)

b) Nitrous oxide (N_2O)

c) Hydrogen sulfide (H_2S)

d) Ozone (O_3)

Answer: a) Carbon monoxide (CO)

10. Which Indian law focuses on the prevention and control of water pollution?

a) The Environment Protection Act, 1986

b) The Air (Prevention and Control of Pollution) Act, 1981

c) The Water (Prevention and Control of Pollution) Act, 1974

d) The Noise Pollution (Regulation and Control) Rules, 2000

Answer: c) The Water (Prevention and Control of Pollution) Act, 1974

Waste Management: Bio-medical Wastes, Solid Waste, Hazardous Wastes, E-wastes, Industrial and Municipal Sludge

11. Which of the following is classified as hazardous waste?

a) Food scraps

b) Lead batteries

c) Organic fertilizer

d) Plastic bottles

Answer: b) Lead batteries

12. Biomedical waste should be disposed of in:

a) Compost bins

b) Open fields

c) Incinerators

d) Public parks

Answer: c) Incinerators

13. Which of the following is a key environmental issue related to e-waste?

a) Excessive use of freshwater resources

b) Heavy metal contamination in landfills

c) Increased air pollution

d) Noise from electronic devices

Answer: b) Heavy metal contamination in landfills

14. Solid waste management in urban areas is primarily aimed at:

a) Burning all waste in open spaces

b) Reducing, reusing, and recycling waste materials

c) Increasing landfill sizes indefinitely

d) Disposing waste in rivers and lakes

Answer: b) Reducing, reusing, and recycling waste materials

15. The Safe Disposal of Hazardous Waste Rule was introduced in India in:

a) 1986

b) 2000

c) 1990

d) 2008

Answer: d) 2008

16. Which of the following is the most environmentally friendly method for handling municipal solid waste?

a) Open dumping

b) Landfilling

c) Recycling and composting

d) Incineration

Answer: c) Recycling and composting

17. The Basel Convention relates to:

a) Trade regulations

b) Transboundary movement of hazardous wastes

c) Water management

d) Noise pollution control

Answer: b) Transboundary movement of hazardous wastes

18. One of the most harmful components of e-waste is:

a) Silicon chips

b) Copper wires

c) Lead and mercury

d) Plastic casings

Answer: c) Lead and mercury

19. Which of the following is a best practice for managing industrial sludge?

a) Dumping it in local water bodies

b) Treating it in wastewater treatment plants

c) Using it for construction purposes

d) Burying it in forests

Answer: b) Treating it in wastewater treatment plants

20. A major issue with biomedical waste management is the spread of:

a) Noise pollution

b) Infectious diseases

c) Soil fertility

d) Renewable energy

Answer: b) Infectious diseases

Module-4

1. Groundwater depletion is primarily caused by:

a) Reduced atmospheric pressure

b) Over-extraction for agriculture and urban use

c) Increased rainfall

d) Glacier melting

Answer: b) Over-extraction for agriculture and urban use

2. Which method is commonly used to recharge depleted groundwater resources?

a) Deforestation

b) Urbanization

c) Rainwater harvesting

d) Salination

Answer: c) Rainwater harvesting

3. Which of the following gases is a major contributor to climate change?

a) Oxygen (O_2)

b) Carbon dioxide (CO_2)

c) Nitrogen (N_2)

d) Argon (Ar)

Answer: b) Carbon dioxide (CO_2)

4. Which international agreement was designed to reduce global greenhouse gas emissions?

a) Kyoto Protocol

b) Montreal Protocol

c) Stockholm Convention

d) Basel Convention

Answer: a) Kyoto Protocol

5. Acid rain is primarily caused by:

a) Overuse of water in agriculture

b) Emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from industrial activities

c) Excess ozone in the atmosphere

d) Pesticides used in farming

Answer: b) Emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from industrial activities

6. The pH of acid rain is typically:

a) Above 7

b) Neutral

c) Below 5.6

d) Exactly 7.0

Answer: c) Below 5.6

7. Ozone depletion in the stratosphere is primarily caused by:

a) Carbon dioxide (CO_2) emissions

b) Chlorofluorocarbons (CFCs)

c) Nitrogen oxides (NOx)

d) Methane (CH_4)

Answer: b) Chlorofluorocarbons (CFCs)

8. Which of the following international agreements targets the protection of the ozone layer?

a) Paris Agreement

b) Montreal Protocol

c) Kyoto Protocol

d) Nagoya Protocol

Answer: b) Montreal Protocol

9. Radon, a naturally occurring radioactive gas, poses a risk to human health primarily by causing:

a) Skin cancer

b) Lung cancer

c) Waterborne diseases

d) Heart disease

Answer: b) Lung cancer

10. Fluoride contamination in drinking water at high levels can cause:

a) Fluorosis

b) Respiratory problems

c) Cardiovascular diseases

d) Blindness

Answer: a) Fluorosis

11. Which state in India is known for severe fluoride contamination in its groundwater?

a) Kerala

b) Rajasthan

c) Punjab

d) West Bengal

Answer: b) Rajasthan

12. Resettlement and rehabilitation are most commonly associated with:

a) Urban planning

b) Large-scale development projects like dams and mining

c) Industrial pollution

d) Deforestation

Answer: b) Large-scale development projects like dams and mining

13. Which project in India is a significant case study of resettlement and rehabilitation issues?

a) Yamuna River Project

b) Narmada Dam Project

c) Delhi Metro Expansion

d) Sunderbans Development Project

Answer: b) Narmada Dam Project

14. Environmental toxicology primarily deals with:

a) The study of economic development

b) The effects of pollutants on ecosystems and human health

c) Preservation of cultural heritage

d) Noise pollution in urban areas

Answer: b) The effects of pollutants on ecosystems and human health

15. Which of the following is considered a persistent organic pollutant (POP)?

a) Carbon dioxide

b) DDT

c) Methane

d) Nitrogen dioxide

Answer: b) DDT

16. What is the main health risk associated with long-term exposure to arsenic in drinking water?

a) Liver failure

b) Skin cancer and other cancers

c) Tuberculosis

d) Cardiovascular disease

Answer: b) Skin cancer and other cancers

17. The Bhopal Gas Tragedy, a landmark environmental disaster in India, involved the release of which toxic chemical?

a) Carbon monoxide

b) Methane

c) Methyl isocyanate

d) Lead

Answer: c) Methyl isocyanate

18. Which of the following is a potential impact of climate change on global sea levels?

a) Stabilization of sea levels

b) Significant decrease in sea levels

c) Rising sea levels due to melting polar ice caps and thermal expansion of water

d) Increased salinity in the deep ocean

Answer: c) Rising sea levels due to melting polar ice caps and thermal expansion of water

19. What is a key preventive measure for acid rain?

a) Banning the use of renewable energy

b) Reducing emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) through clean energy technologies

c) Increasing coal consumption

d) Increasing deforestation

Answer: b) Reducing emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) through clean energy technologies

20. The term "environmental refugees" refers to:

a) People displaced due to natural disasters, climate change, or environmental degradation

b) Individuals seeking better job opportunities

c) Political refugees fleeing conflict

d) Tourists stranded due to weather conditions

Answer: a) People displaced due to natural disasters, climate change, or environmental degradation

Module-5

1. The Water (Prevention and Control of Pollution) Act was enacted in which year?

a) 1981

b) 1984

c) 1974

d) 1992

Answer: c) 1974

2. The main objective of the Water Act of 1974 is to:

a) Promote air quality

b) Prevent and control water pollution

c) Increase groundwater levels

d) Promote waste recycling

Answer: b) Prevent and control water pollution

3. Which body is responsible for implementing the Water Act at the central level?

a) National Green Tribunal (NGT)

b) Central Pollution Control Board (CPCB)

c) Ministry of Environment, Forest, and Climate Change (MoEFCC)

d) Indian Meteorological Department (IMD)

Answer: b) Central Pollution Control Board (CPCB)

4. According to the Water Act, who can apply for consent to establish and operate any industry or process that discharges sewage or effluents?

a) Any government official

b) The owner or occupier of the industry

c) A resident of the locality

d) Only the central government

Answer: b) The owner or occupier of the industry

5. Violation of the Water Act can lead to which of the following penalties?

a) Fines or imprisonment

b) Community service

c) Confiscation of property

d) Increased taxes

Answer: a) Fines or imprisonment

Air Act (1981)

6. The Air (Prevention and Control of Pollution) Act was introduced in which year?

a) 1974

b) 1981

c) 1986

d) 1991

Answer: b) 1981

7. Which pollutants are regulated under the Air Act of 1981?

a) Industrial and vehicular emissions

b) Groundwater pollutants

c) Plastic waste

d) Ocean pollutants

Answer: a) Industrial and vehicular emissions

8. The Air Act aims to:

a) Encourage deforestation

b) Prevent and control air pollution

c) Reduce soil erosion

d) Promote biofuel usage

Answer: b) Prevent and control air pollution

9. Under the Air Act, the state pollution control boards have the authority to:

a) Issue licenses for timber extraction

b) Enforce emission standards and shut down polluting units

c) Monitor water levels in rivers

d) Issue guidelines for wildlife conservation

Answer: b) Enforce emission standards and shut down polluting units

10. What happens if someone fails to comply with the provisions of the Air Act?

a) They receive subsidies for renewable energy projects

b) They can be penalized with imprisonment or fines

c) They are required to plant trees

d) They are issued a warning with no legal consequences

Answer: b) They can be penalized with imprisonment or fines

Environmental Protection Act (1986)

11. The Environmental Protection Act (EPA) was enacted in the wake of which major environmental disaster?

a) Bhopal Gas Tragedy

b) Chernobyl Disaster

c) Uttarakhand Floods

d) Amazon Forest Fires

Answer: a) Bhopal Gas Tragedy

12. Which of the following is a key feature of the Environmental Protection Act (1986)?

a) It focuses solely on air pollution

b) It provides a framework for the protection of the environment as a whole

c) It only regulates water pollution

d) It encourages the use of fossil fuels

Answer: b) It provides a framework for the protection of the environment as a whole

13. Under the Environmental Protection Act, the government has the power to:

a) Regulate industrial emissions and waste disposal practices

b) Implement international trade sanctions

c) Provide subsidies to polluting industries

d) License wildlife hunting

Answer: a) Regulate industrial emissions and waste disposal practices

14. Which ministry is responsible for overseeing the implementation of the Environmental Protection Act?

a) Ministry of Agriculture

b) Ministry of Environment, Forest, and Climate Change (MoEFCC)

c) Ministry of Water Resources

d) Ministry of Petroleum and Natural Gas

Answer: b) Ministry of Environment, Forest, and Climate Change (MoEFCC)

15. Under the Environmental Protection Act, pollution from which of the following can be controlled?

a) Only industrial waste

b) Air, water, land, and noise pollution

c) Only vehicular emissions

d) Only municipal solid waste

Answer: b) Air, water, land, and noise pollution

Solid Waste Management Rules (2016)

16. Which of the following is a new category of waste included in the Solid Waste Management Rules (2016)?

a) Hazardous waste

b) Biomedical waste

c) Sanitary waste

d) Radioactive waste

Answer: c) Sanitary waste

17. According to the Solid Waste Management Rules, what is the preferred method for managing waste?

a) Incineration

b) Open dumping

c) Waste segregation at source and recycling

d) Landfilling without treatment

Answer: c) Waste segregation at source and recycling

18. The Solid Waste Management Rules (2016) are applicable to:

a) Only urban households

b) Only rural areas

c) All residential and commercial entities in urban and rural areas

d) Only industrial units

Answer: c) All residential and commercial entities in urban and rural areas

E-Waste Management Rules (2022)

19. The E-Waste Management Rules (2022) primarily focus on:

a) Promoting fossil fuel use

b) Regulating the disposal and recycling of electronic waste

c) Banning the production of electronic devices

d) Reducing air pollution

Answer: b) Regulating the disposal and recycling of electronic waste

20. Under the E-Waste Management Rules (2022), which of the following is a key responsibility of producers?

a) Dumping e-waste in landfills

b) Collecting e-waste and ensuring proper disposal under the Extended Producer Responsibility (EPR) framework

c) Only manufacturing new electronic products

d) Promoting single-use electronics

Answer: b) Collecting e-waste and ensuring proper disposal under the Extended Producer Responsibility (EPR) framework

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