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 by educating them in a state-of-the-art- infrastructure, by retaining the best practices, faculties and inspire them to imbibe real-time problem-solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals".

DEPARTMENT VISION

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

DEPARTMENT MISSION

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

PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

1. *Pursue a successful career in various domains of Civil Engineering Profession by acquiring knowledge in mathematical, scientific and engineering fundamentals.*

2. *Analyze and design Civil Engineering systems with social awareness and responsibility.*

3. *Exhibit professionalism, ethical approach, communication skills & teamwork in their profession and adapt to modern trends by engaging in lifelong learning.*

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

PROGRAM OUTCOMES (PO's):

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 analyse 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 modelling 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.*

PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO1: Inculcating in students practical knowledge and experimental skills to tackle Civil Engineering problems using technical and management skills, exhibiting professional ethics to meet the societal needs.

PSO2: Provide solutions related to Civil Engineering built environment through a multidisciplinary approach.

Department of Civil Engineering

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	**2022-23 (Odd)**
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CONTENTS

Department of Civil Engineering

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
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1.0 Student Help Desk

Sl. No.	Purpose	Contact Person	
		Faculty	**Instructor**
01	HOD, Academics, Attestations, Exam forms signature	Prof. S.M.Chandrakanth	Mr.M. S. Badiger
02	Research Center Co-Ordinator,	Prof. S.M.Chandrakanth	Mr.M. S. Badiger
03	Industry-Institute-Interaction, Technical Magazine Coordinator (MoU, Ind. Visit etc.)	Prof. Shreedevi S B	Mr.M. S. Badiger
04	EMS / ED Cell coordinator, TP Cell officer	Prof. Preethi. R.Patil	Mr.M. S. Badiger
05	Project Coordinator, KSCST, IEEE coordinator, Smart India Hackathon, Scholarship, LIC	Prof. Preethi. R.Patil	Mr.M. S. Badiger
06	FACE / Website Coordinator	Prof. Sudarshan V Jore	Mr.M. S. Badiger
07	Civil/ IT Maintenance, Feedback / Publicity, Department News Letter, NSS, Student Welfare	Prof. Vishwanath I Patil	Mr.M. S. Badiger
08	GATE Coaching Coordinator	Prof. Sudarshan V Jore	Mr.M. S. Badiger
09	ISTE / E-Shikshana / E-learning / Internship	Prof. Vishwanath I Patil	Mr.M. S. Badiger
10	Women Empower cell, Conference, FDP, Workshop	Prof. Shreedevi S B	Mr.M. S. Badiger
11	IA Coordinator / Alumni coordinator	Prof. Shreedevi S B	Mr.M. S. Badiger

Institute Level			
		Faculty	**Contact**
12	Student Welfare Convener	Sri. M. G. Huddar	8217056798
13	TP Cell Coordinator	Sri. N. M. Patel	9739619661
14	Anti-Ragging Committee Member	Sri. K.M.Akkoli	9739114856
15	Anti Raging Squad Convener	Sri. K.M.Akkoli	9739114856
16	Internal Complaint Committee Convener	Smt. S. S. Kamte	9008696825
17	Grievance redressal Convener	Sri. S. S. Tabhaj	9901398134
18	Sports and Cultural / Extra-Curricular Activities Convener	Sri. S.B. Sarawadi	9739109383

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	**2022-23 (Odd)**
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	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

2.0 Departmental Resources

*Department of Civil Engineering was established in the year 2020 and is housed in a total area of **785 Sq. Mtrs.***

2.1 Faculty Position

Sl.No.	Category	No. in Position	Average experience (in years)
01.	Teaching faculty	05	12
02.	Technical Supporting Staff	01	05
03.	Helper staff	02	20

2.2 Major Laboratories

Sl.No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. in Lakhs)
01.	Computer Aided Building Planning & Drawing	66	14.37
02.	Building Materials Testing Laboratory	149	11.02
03.	Geology Laboratory	76	0.75
04.	Fluid Mechanics & Hydraulic Machines Laboratory	72	7.76
05	Surveying Practice	76	New Setup Under Process
06	Concrete and Highway Materials Laboratory	72	New Setup Under Process

Total Investment in the Department   **Rs. 33.90 Lakhs**

3.0 Teaching Faculty Details

Sl. No.	Name	Designation	Qualification	Specializ -ation	Professional Membership	Teaching Exp (In yrs.)	Phone No.
01	Prof. S.M.Chandrakanth	Asst. Prof./HOD	M. Tech. (PhD)	Highway Engineering	IAENG 220815	11	8867814854
02	Prof. Preethi R. Patil	Asst. Prof.	M. Tech.	Structures	--	05	9606557280
03	Prof. Vishwanath I Patil	Asst. Prof.	M. Tech	Structures	--	03	9975499979
04	Prof. Sudarshan V Jore	Asst. Prof.	M. Tech.	CT & M	--	02	9535459918
05	Prof. Shreedevi S B	Asst. Prof.	M. Tech.	CT & M	--	02	7760429556

4.0	**Institute Academic Calendar**

	S J P N Trust's **Hirasugar Institute of Technology, Nidasoshi.** *Inculcating Values, Promoting Prosperity* 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
		2022-23 (Odd)
		Rev: 00

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2022-23 (Odd)

Date	Events
19-09-2022	Commencement of Classes for VII Semester
24-09-2022	NSS Foundation Day
02-10-2022	Gandhi Jayanthi
10-10-2022	Commencement of Classes for V Semester
24-10-2022 to 30-10-2022	Traffic Week
27-10-2022 to 29-10-2022	First Internal Assessment for VII Semester
31-10-2022	Feedback -I on Teaching-Learning for VII Semester
31-10-2022	National Integration Day
31-10-2022	Commencement of Classes for III Semester
01-11-2022	Kannad Rajyothsava
03-11-2022	Display of 1st Internal Assessment Marks and submission of Feedback-I of VII Semester to office
09-11-2022 to 18-11-2022	Environment Awareness Month
22-11-2022	World's Aids Day
26-11-2022	First Assignment Submission of III Semester (PCC + IPCC)
28-11-2022 to 30-11-2022	Second Internal Assessment for VII Semester & First Internal Assessment for III (PCC + IPCC) /V Semester
01-12-2022	Feedback –II on Teaching-Learning for VII Semester & Feedback – I on Teaching-Learning for III/V Semester
06-12-2022	Display of 2nd Internal Assessment Marks and submission of Feedback-II of VII Semester & Display of 1st Internal Assessment Marks and submission of Feedback-I of III/V Semester to office
10-12-2022	Human Rights Day
10-12-2022	Sports Day
23-12-2022 & 24-12-2022	First Lab Internal Assessment for III Semester (PCC+AEC)
26-12-2022 & 27-12-2022	Lab Internal Assessment for VII Semester
29-12-2022 to 31-12-2022	Third Internal Assessment for VII Semester & Second Internal Assessment for III (PCC + IPCC) /V Semester
31-12-2022	Last working day for VII Semester
02-01-2023	Feedback –II on Teaching-Learning for III/V Semester
05-01-2023	Display of Final IA Marks of VII Semester
05-01-2023	Display of 2nd Internal Assessment Marks and submission of Feedback-II of III/V Semester to office
07-01-2023	Second Assignment Submission of III Semester (PCC + IPCC)
12-01-2023	National Youth Day
15-01-2023	NSS Day
20-01-2023 & 21-01-2023	Lab Internal Assessment for V Semester
23-01-2023 to 25-01-2023	Third Internal Assessment for V Semester
26-01-2023	Republic Day
27-01-2023	Last working day for V Semester
30-01-2023 to 01-02-2023	Second Lab Internal Assessment for III Semester (PCC+IPCC+AEC)
31-01-2023	Display of Final IA Marks of V Semester
06-02-2023 to 08-02-2023	Third Internal Assessment for III Semester (PCC)
11-02-2023	Last working day for III Semester
14-02-2023	Display of Final IA Marks of III Semester

September-2022

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

October-2022

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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

04- Mahanavami, Ayudhapooja 05- Vijayadashami
24- Naraka Chaturdashi, 26- Balipadyami Deepavalli

Novemner-2022

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

01- Kannada Rajyothsava, 11- Kanakadasa Jayanti

December-2022

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

January-2023

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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

14-Makara Sankranti, 26- Republic Day

February-2023

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

18- Mahashivaratri

Dr. B. V. Madiggond
Dean (Academics)

Dr. S. C. Kamate
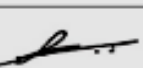**Principal**

5.0 Department Academic Calendar

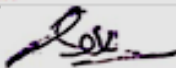| | S J P N Trust's
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Academic Calendar
2021-22 (Odd)
Rev: 00 |

DEPARTMENT OF CIVIL ENGINEERING
CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2022-23 (ODD Sem)

Date	Events
19-09-2022	Commencement of Classes for VII Semester
24-09-2022	NSS Foundation Day
02-10-2022	Gandhi Jayanthi
10-10-2022	Commencement of Classes for V Semester
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10-12-2022	Sports Day
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11-02-2023	Last working day for III Semester
14-02-2023	Display of Final IA Marks of III Semester

September-2022

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

October-2022

S	M	T	W	T	F	S
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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					

04- Mahanavami, Ayudhapooja 05- Vijayadashami
24- Naraka Chaturdashi, 26- Balipadyami Deepavalli

Novemner-2022

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

01- Kannada Rajyothsava, 11- Kanakadasa Jayanti

December-2022

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

22-Visit to Hot Mix Plant

January-2023

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

06-Technical Tour, 13- Road Safety Campaign & Club Activity, 16- Seminar on Waste Water Management Systems
14-Makara Sankranti, 26- Republic Day

February-2023

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

03-Webinar on Trends in Civil Engineerg.
18- Mahashivaratri

Prof. Sudarshan V. Jore **FACE Coordinator**	Prof. S.M.Chandrakanth **HOD**	Dr. S. C. Kamate **Principal**

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	**2022-23 (Odd)**
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6.0   Scheme of Teaching & Examination

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

V SEM   B.E: Civil Engineering

Programme: CIVIL ENGINEERING

V SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	HSMC	18CV51	Construction Management & Entrepreneurship	Civil Engg.	2	2	--	03	40	60	100	3
2	PCC	18CV52	Analysis of Indeterminate Structures	Civil Engg.	3	2	--	03	40	60	100	4
3	PCC	18CV53	Design of RC Structural Elements	Civil Engg.	3	2	--	03	40	60	100	4
4	PCC	18CV54	Basic Geotechnical Engineering	Civil Engg.	3	--	--	03	40	60	100	3
5	PCC	18CV55	Municipal Wastewater Engineering	Civil Engg.	3	--	--	03	40	60	100	3
6	PCC	18CV56	Highway Engineering	Civil Engg.	3	--	--	03	40	60	100	3
7	PCC	18CVL57	Surveying Practice	Civil Engg.	--	2	2	03	40	60	100	2
8	PCC	18CVL58	Concrete and Highway Materials Laboratory	Civil Engg.	--	2	2	03	40	60	100	2
9	HSMC	18CIV59	Environmental Studies	Civil/Environmental [Paper setting Board: Civil Engineering]	1	--	--	02	40	60	100	1
			TOTAL		18	10	04	26	360	540	900	25

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

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

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Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

Subject Title	CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP		
Subject Code	18CV51	CIE Marks	40
Number of Lecture Hrs / Week	(2:2:0)	SEE Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:

Name: Prof. V.I.Patil	**Designation:** Asst. Professor	**Experience: 04** Years
No. of times course taught: Nil	**Specialization:** Structural Engineer	

1.0	Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	III	Building Material and Construction

2.0	Course Objectives

1. Understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.
2. Inculcate Human values to grow as responsible human beings with proper personality.
3. Keep up ethical conduct and discharge professional duties.

3.0	Course Outcomes

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

Sl.No	Course Outcome	RBT Level	POs
C501.1	Prepare a project plan based on requirements and prepare schedule of a project by understanding the activities and their sequence.	L1,L2,L3,L4	1,2,3,5,6,8,12
C502.2	Understand labor output, equipment efficiency to allocate resources required for an activity / project to achieve desired quality and safety.	L1,L2,L3,L4	1,2,3,5,6,8,12
C502.3	Analyze the economics of alternatives and evaluate benefits and profits of a construction activity based on monetary value and time value.	L1,L2,L3,L4	1,2,3,5,6,8,12
C502.4	Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies.	L1,L2,L3,L4	1,2,3,5,6,8,12
	Total Hours of instruction		**40**

		Civil Engg. Dept
	S J P N Trust's	
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
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4.0   **Course Content**

Module-1

Management: Characteristics of management, functions of management, importance and purpose of planning process, types of plans.

Construction Project Formulation: Introduction to construction management, project organization, management functions, management styles.

Construction Planning and Scheduling: Introduction, types of project plans, work breakdown structure, Grant Chart, preparation of network diagram- event and activity based and its critical path-critical path method, PERT method, concept of activity on arrow and activity on node.

Module-2

Resource Management: Basic concepts of resource management, class of lab our, Wages & statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity.

Construction Equipments: classification of construction equipment, estimation of productivity for: excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance

Materials: material management functions, inventory management.

Module-3

Construction Quality , safety and Human Values: Construction quality process, inspection, quality control and quality assurance, cost of quality, ISO standards. Introduction to concept of Total Quality Management

HSE: Introduction to concepts of HSE as applicable to Construction. Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation. Storage of materials. Safety through legislation, safety campaign. Insurances.

Ethics : Morals, values and ethics, integrity, trustworthiness , work ethics, need of engineering ethics, Professional Duties, Professional and Individual Rights, Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.

Module-4

Introduction to engineering economy: Principles of engineering economics, concept on Micro and macro analysis, problem solving and decision making.

Interest and time value of money: concept of simple and compound interest, interest formula for: single payment, equal payment and uniform gradient series. Nominal and effective interest rates, deferred annuities, capitalized cost.

Comparison of alternatives: Present worth, annual equivalent, capitalized and rate of return methods, Minimum Cost analysis and break even analysis.

Module-5

Entrepreneurship: Evolution of the concept, functions of an entrepreneur, concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur, central and state level financial institutions. Micro, Small & Medium Enterprises (MSME): definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC.

Business Planning Process: Business planning process, marketing plan, financial plan, project report and feasibility study, guidelines for preparation of model project report for starting a new venture.

Introduction to international entrepreneurship opportunities, entry into international business, exporting, direct foreign investment, venture capital.

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	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
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5.0   Relevance to future subjects

Sl No	Semester	Subject	Topics
1.	V	Extensive Survey Project	Construction Project

6.0   Relevance to Real World

Sl No	Real World Mapping
01	Mega Construction Project Planning and Scheduling

7.0   Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Tenders	Topic: Government and Private process

8.0   Books Used and Recommended to Students

Text Books
1. P C Tripathi and P N Reddy, "Principles of Management", Tata McGraw-Hill Education
2. Chitkara, K.K, "Construction Project Management: Planning Scheduling and Control", Tata McGraw- Hill Publishing Company, New Delhi.
3. Poornima M. Charantimath , "Entrepreneurship Development and Small Business Enterprise", Dorling Kindersley (India) Pvt. Ltd., Licensees of PearsonEducation
4. Dr. U.K. Shrivastava "Construction Planning and Management", Galgotia publications Pvt. Ltd. New Delhi.
5. Bureau of Indian standards – IS 7272 (Part-1)- 1974 : Recommendations for labour output constant for building works:
Reference Books
1. Robert L Peurifoy, Clifford J. Schexnayder, AviadShapira, Robert Schmitt, "Construction Planning, Equipment, and Methods (Civil Engineering), McGraw-HillEducation
2. Harold Koontz, Heinz Weihrich, "Essentials of Management: An International, Innovation, and Leadership perspective", T.M.H. Edition, NewDelhi
3. Frank Harris, Ronald McCaffer with Francis Edum-Fotwe, " Modern Construction Management", Wiley-Blackwell
4. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw-HillEducation
5. Chris Hendrickson and Tung Au, "Project Management for Construction - Fundamentals Concepts for Owners, Engineers, Architects and Builders", Prentice Hall,Pitsburgh
6. James L.Riggs, David D. Bedworth , Sabah U. Randhawa " Engineerng Economics" 4
Additional Study material & e-Books
Class notes and vtu notes

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

Website and Internet Contents References
https://en.m.wikipedia.org

10.0   Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal	www.constuctionmanagement.com

11.0   Examination Note

Scheme of Evaluation for CIE (40 Marks)
➢   **Internal Assessment: 30 Marks**

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	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
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Total of Three Internal Assessment tests will be conducted for 30 Marks each. Average of three tests is scaled downed to 30 Marks.

➢ **Assignment: 10 Marks**

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.
The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

12.0   Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Management: Characteristics of management	20
	2	Functions of management, importance and purpose of planning process, types of plans.	
	3	Construction Project Formulation: Introduction to construction management	
	4	Project organization, management functions, management styles.	
	5	Construction Planning and Scheduling: Introduction	
	6	Types of project plans, work breakdown structure, Grant Chart.	
	7	Preparation of network diagram- event and activity based and its critical path critical path method	
	8	PERT method, concept of activity on arrow and activity on node.	
Module 2	9	**Resource Management:** Basic concepts of resource management.	20
	10	Class of lab our, Wages & statutory requirement.	
	11	Labour Production rate or Productivity.	
	12	Factors affecting labour output or productivity.	
	13	**Construction Equipments:** classification of construction equipment.	
	14	Estimation of productivity for: excavator, dozer, compactors, graders and dumpers.	
	15	Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance.	
	16	**Materials:** material management functions, inventory management.	
Module 3	17	Construction quality process, inspection, quality control and quality assurance, cost of quality.	20
	18	ISO standards. Introduction to concept of Total Quality Management.	
	19	**HSE: Introduction** to concepts of HSE as applicable to Construction.	
	20	Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation.	
	21	Storage of materials. Safety through legislation, safety campaign. Insurances.	
	22	**Ethics:** Morals, values and ethics, integrity, trustworthiness, work ethics, need of engineering ethics.	
	23	Professional Duties, Professional and Individual Rights.	

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	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

	24	Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.	
Module 4	25	**Introduction to engineering economy**	20
	26	Principles of engineering economics, concept on Micro and macro analysis.	
	27	Problem solving and decision making.	
	28	**Interest and time value of money:**	
	29	Concept of simple and compound interest, interest formula for: single payment, equal payment and uniform gradient series.	
	30	Nominal and effective interest rates, deferred annuities, capitalized cost.	
	31	**Comparison of alternatives:** Present worth, annual equivalent, capitalized and rate of return methods.	
	32	Minimum Cost analysis and break even analysis.	
Module 5	33	**Entrepreneurship:**	20
	34	Evolution of the concept, functions of an entrepreneur.	
	35	Concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur. central and state level financial institutions.	
	36	Micro, Small & Medium Enterprises (MSME): definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC.	
	37	**Business Planning Process:** Business planning process.	
	38	Marketing plan, financial plan, project report and feasibility study.	
	39	Guidelines for preparation of model project report for starting a new venture.	
	40	Introduction to international entrepreneurship opportunities, entry into international business, exporting, direct foreign investment, venture capital.	

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: Questions on module 1	Students study basics Management: Construction Project Formulation: Construction Planning and Scheduling.	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Students study the Resource Management: Construction Equipments	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 2
3	Assignment 3: Questions on module 3	Students study Construction Quality safety and Human Values: HSE: Introduction Ethics	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 2
4	Assignment 4: Questions on module 4	Student study the Introduction to engineering economy Interest and time value of money: Comparison of alternatives.	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 2
5	Assignment 5: Questions on module 5	Students Study Entrepreneurship: Business Planning Process.	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 3

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	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

14.0   **QUESTION BANK**

MODULE 1

1. Discuss the ideal charcteristics that a Management?
2. What is Work break down structure?
3. Briefly explain the key steps involved in Construction planning?
4. Discuss suitability advantages and disadvantages of Autocratic and Democratic style of management?
5. Discuss on autocratic and democratic management style

MODULE 2

1. What are the fundamental resource management is real time visibility
2. What are the types of earth work equipments
3. Why firms have implemented materials management system
4. What does the construction worker do ? Explain some of the main duties of a general construction worker
5. What are successful resource management requires

MODULE 3

1. Explain quality assurance
2. Explain seven quality management principle
3. Explain management commitment and leadership
4. Explain HSE and safety in construction
5. Explain safety construction problems.

MODULE 4

1. Define engineering mechanics
2. Explain the principle of engineering economy
3. Difference between micro economics macro economics
4. Explain interest formulas
5. Define simple interest and compound interest

MODULE 5

1. Explain concept of Entrepreneur
2. Explain Characteristics of of Entrepreneur
3. Difference between Entrepreneur and Manager.
4. Explain functions of entrepreneur.
5. Explain types of entrepreneurs.

Prepared by	Checked by		
Prof; V.I.Patil	**Prof: Sudarshan V.Jore**	**HOD**	**Principal**

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Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept

Academic Course Plan

2022-23 (Odd)

Rev: 00

Subject Title	Analysis of Indeterminate structure (Core Course)		
Subject Code	18CV52	CIE Marks	40
Number of Lecture Hrs / Week	(3:2:0)	SEE Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:

Name: Prof. Sudarshan V Jore	**Designation:** Asst. Professor	**Experience:** 02
No. of times course taught: 01	**Specialization:** Construction Technology and Management	

1.0   **Prerequisite Subjects:**

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Elements of Civil Engineering.
02	Civil Engineering	III	Strength of Materials
03	Civil Engineering	IV	Analysis of determinate structures

2.0   **Course Objectives**

1. Apply the knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using various engineering methods.

3.0   **Course Outcomes**

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

Sl.No	Course Outcome	RBT Level	POs
C502.1	Understand the analysis of structures using slope deflection method.	L3,L4	1,2,3,5,6,8,12
C502.2	Analyze the structure using Moment distribution method	L3,L4	1,2,3,5,6,8,12
C502.3	Exhibit the knowledge to analyze the structure using Kani's Method	L3,L4	1,2,3,5,6,8,12
C502.4	Understand the analysis of structures using flexibility matrix method	L3,L4	1,2,3,5,6,8,12
C502.5	Analyze the structure using stiffness matrix method	L3,L4	1,2,3,5,6,8,12
	Total Hours of instruction		**50**

4.0   **Course Content**

Module-1

Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy≤3.

Module-2

Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤3.

Module-3

Kani's Method: Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway.

Module-4

Matrix Method of Analysis (Flexibility Method) : Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy ≤ 3.

Module-5

Matrix Method of Analysis (Stiffness Method): Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy ≤3.

5.0   **Relevance to future subjects**

Sl No	Semester	Subject	Topics
1.	VII	Matrix method of Structural analysis	Flexibility and stiffness matrices to solve beams, frames and trusses.

6.0   **Relevance to Real World**

Sl No	Real World Mapping
01	Analyze various structures and Design

7.0   **Gap Analysis and Mitigation**

Sl No	Delivery Type	Details
01	Tutorial	Solving problems of GATE, Other University and previous year QP's
02	NPTEL	Introduction to Determinate / Indeterminate structures

8.0   **Books Used and Recommended to Students**

Text Books
1. Hibbeler R C, " Structural Analysis", Pearson Publication
2. L S Negi and R S Jangid, "Structural Analysis", Tata McGraw-Hill Publishing Company Ltd.
3. D S PrakashRao, "Structural Analysis: A Unified Approach" , Universities Press
4. K.U. Muthu, H. Narendraetal, "Indeterminate Structural Analysis", IK International Publishing Pvt. Ltd.

Reference Books
1. Reddy C S, "Basic Structural Analysis",Tata McGraw-Hill Publishing Company Ltd.
2. Gupta S P,G S Pundit and R Gupta,"Theory of Structures", Vol II,Tata McGraw Hill Publications company Ltd.
3. V N Vazirani and M MRatwani, "Analysis Of Structures ", Vol. 2, Khanna Publishers
4. 4. Wang C K, "Intermediate Structural Analysis", McGraw Hill, International Students Edition.
5. S.Rajasekaran and G. Sankarasubramanian, "Computational Structural Mechanics", PHI Learning Pvt.Ltd

Additional Study Material & e-Books
1. NPTEL notes and Videos   2. VTU online notes.

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	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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

Website and Internet Contents References
https://en.m.wikipedia.org

10.0   Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal of MAT	www.matjournals.com

11.0   Examination Note

Scheme of Evaluation for CIE (40 Marks)
➢ **Internal Assessment: 30 Marks**
Total of Three Internal Assessment tests will be conducted for 50 Marks each. Average of three tests is scaled downed to 30 Marks.
➢ **Assignment: 10 Marks**

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.
The question paper will have ten questions.
• Each full question is for 20 marks.
• There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
• Each full question with sub questions will cover the contents under a module.
• Students will have to answer 5 full questions, selecting one full question from each module.

12.0   Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Introduction to Topic, slope deflection method and Sign conventions involved	20
	2	Derivation of slope deflection equation	
	3	Expressions for fixed end moments due to various loading condition	
	4	Analysis of simply supported continuous beam using slope deflection method.	
	5	Analysis of continuous beam fixed at one end and pinned at other using SD method.	
	6	Analysis of continuous beam fixed at both ends using slope deflection method.	
	7	Analysis of overhanging continuous beam using slope deflection method.	
	8	Analysis of continuous beam which is subjected to settlement using slope deflection method.	
	9	Analysis of continuous T frame using slope deflection method.	
	10	Analysis of portal frame undergoing sway using slope deflection method.	
Module 2	11	Introduction to Moment distribution method.	20
	12	Sign conventions and important terms used in the method.	
	13	Analysis of continuous beam fixed at both ends by Moment distribution method.	
	14	Numerical problems on different loading conditions.	
	15	Analysis of continuous beam simply supported at both ends by Moment distribution method.	
	16	Numerical problems on different loading conditions.	

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		Academic Course Plan
		2022-23 (Odd)
		Rev: 00

	17	Analysis of overhanging continuous beam using Moment distribution method.	
	18	Analysis of T frame using Moment distribution method	
	19	Numerical problems on different loading conditions.	
	20	Analysis of Portal frame undergoing sway using Moment distribution method.	
Module 3	21	Introduction to Kani's method of structural analysis	20
	22	Concepts and important terms used in Kanis method.	
	23	Relationships between bending moment and deformations	
	24	Sign conventions used in the analysis	
	25	Analysis of continuous beam fixed at both ends using Kanis method	
	26	Analysis of continuous beams without settlement	
	27	Analysis of continuous beams with settlement	
	28	Analysis of frames without sway	
	29	Analysis of frames with sway	
	30	Numerical problems	
Module 4	31	Introduction to Matrix method of structural analysis	20
	32	Study of Axes and coordinates used in the analysis	
	33	Study of flexibility matrix and analysis using the matrix.	
	34	Sign conventions used in the analysis.	
	35	Numerical problems using various loading conditions	
	36	Analysis of continuous beams and plane trusses using system approach	
	37	Numerical problems using various loading conditions	
	38	Analysis of simple orthogonal rigid frames using system approach	
	39	Numerical problems using various loading conditions	
	40	Numerical problems using various loading conditions	
Module 5	41	Introduction to Stiffness matrix method of structural analysis	20
	42	Study of stiffness matrix and analysis using the matrix.	
	43	Sign conventions used in the analysis.	
	44	Analysis of continuous beams and plane trusses using system approach	
	45	Numerical problems using various loading conditions	
	46	Numerical problems using various loading conditions	
	47	Numerical problems using various loading conditions	
	48	Analysis of simple orthogonal rigid frames using system approach	
	49	Numerical problems using various loading conditions	
	50	Numerical problems using various loading conditions	

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| Civil Engg. Dept |
| --- |
| Academic Course Plan |
| 2022-23 (Odd) |
| Rev: 00 |

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: Questions on module 1	Analyze the continuous structures with different supports and carrying various loading condition using slope deflection method	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Analyze the continuous structures with different supports and carrying various loading condition using moment distribution method.	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 3
3	Assignment 3: Questions on module 3	Analyze the continuous structures with different supports and carrying various loading condition using Kani's method	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 3
4	Assignment 4: Questions on module 4	Analyze the continuous structures with different supports and carrying various loading condition using Flexibility matrix method	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 3
5	Assignment 5: Questions on module 5	Analyze the continuous structures with different supports and carrying various loading condition using Stiffness Matrix method	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 2

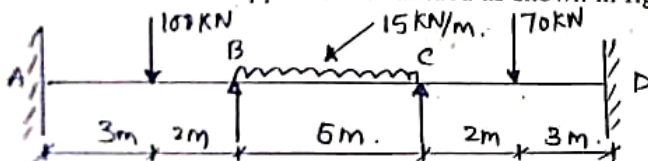**14.0**   **QUESTION BANK**

MODULE 1

1. Derive slope deflection equation
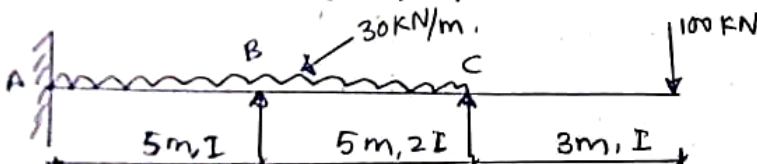2. Analyze the continuous beam shown in fig by slope deflection method. Draw BMD and SFD
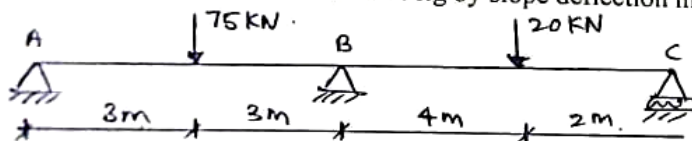
3. Analyze the frame shown in figure by slope deflection method. Draw BMD
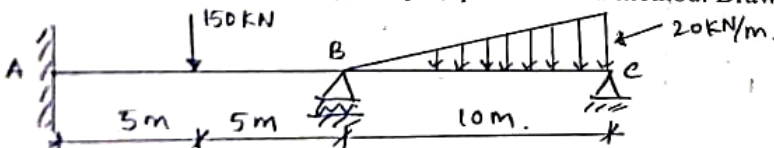
4. A continuous beam is supported and loaded as shown in figure. Analyze the beam and draw BMD and SFD.
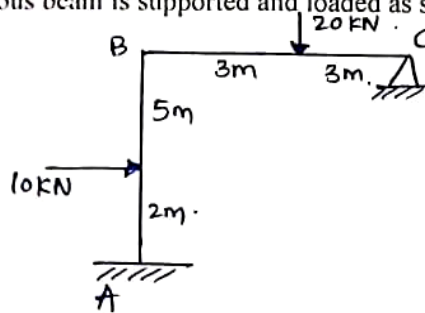

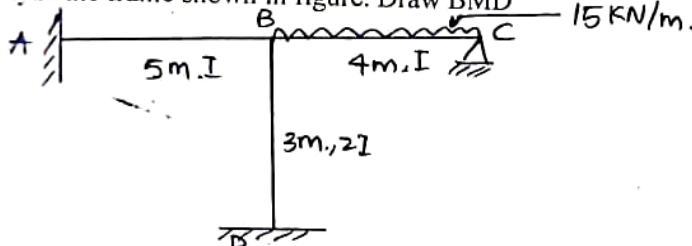5. Analyze the frame shown in figure by slope deflection method. Draw BMD

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	Inculcating Values, Promoting Prosperity	
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	Recognized under 2(f) & 12B of UGC Act, 1956	
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MODULE 2

1. A continuous beam is supported and loaded as shown in figure. Analyze the beam and draw BMD and SFD.

2. Analyze the frame shown in figure. Draw BMD

3. Analyze the frame shown in figure. Draw SFD and BMD
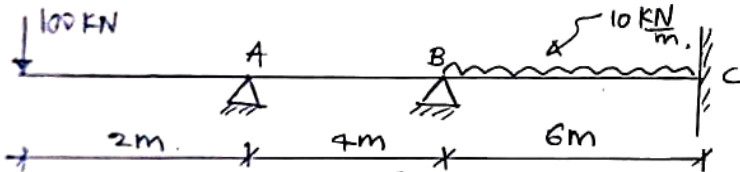
4. Analyze the frame shown in figure. Draw SFD and BMD

5. Analyze the frame shown in figure. Draw SFD and BMD

MODULE 3

1. A continous beam ABCD is simply supported at its ends and is propped at the same level at B and C. If support B sinks by 10mm , Analyse the beam by kani's method Take E=2.1x105 N/mm² and I= 85x105mm⁴

2. Analyze the frame shown in figure. Draw SFD and BMD

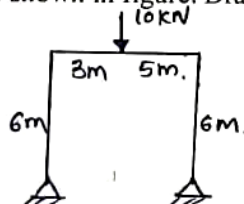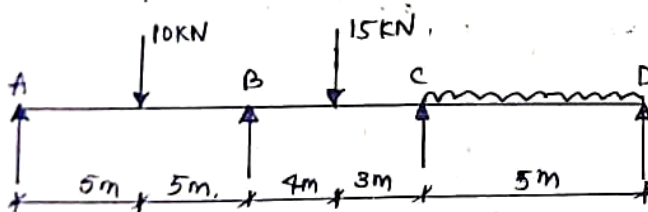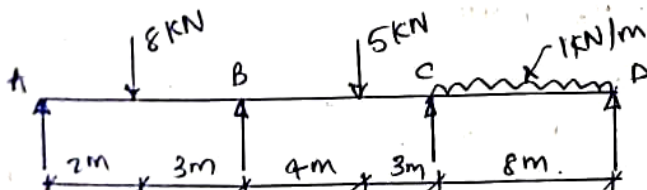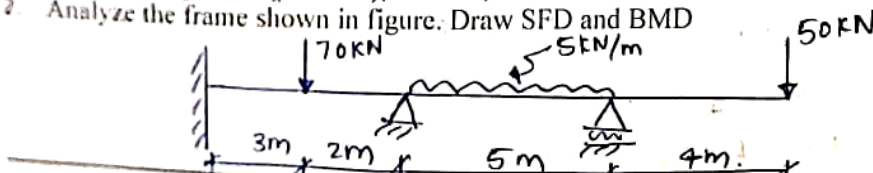|	S J P N Trust's	Civil Engg. Dept
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3. Analyze the frame shown in figure. Draw SFD and BMD

4. Analyze the frame shown in figure. Draw SFD and BMD

5. Analyze the frame shown in figure. Draw SFD and BMD

MODULE 4

1. Analyze the frame shown in figure by flexibility matrix method. Draw SFD and BMD
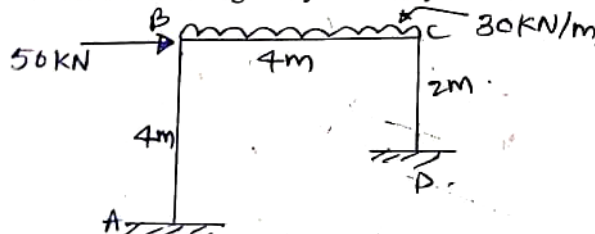
2. Analyze the frame shown in figure by flexibility matrix method. Draw SFD and BMD
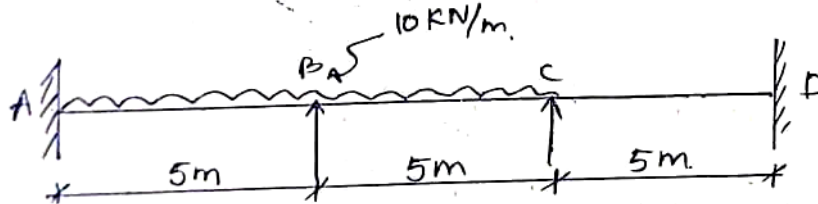
3. Analyze the frame shown in figure by flexibility matrix method. Draw SFD and BMD
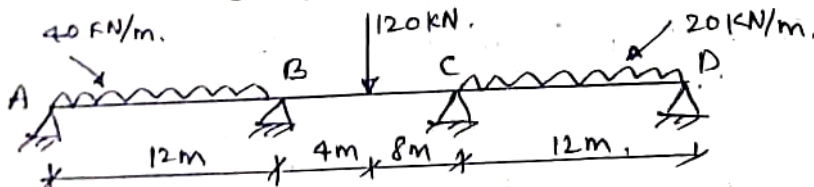
4. Analyze the frame shown in figure by flexibility matrix method. Draw SFD and BMD

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	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	
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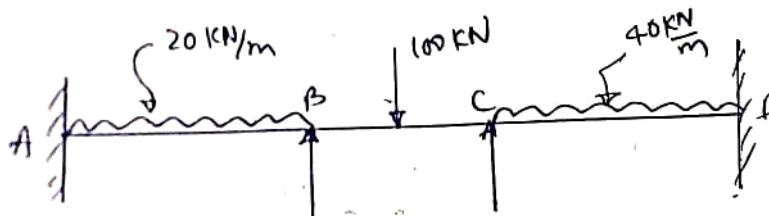
5. Analyze the frame shown in figure by flexibility matrix method. Draw SFD and BMD
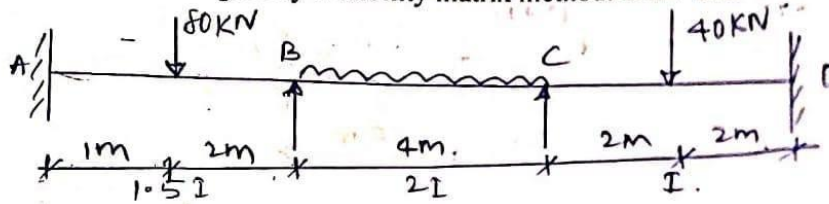
MODULE 5

1. Analyze the continuous beam shown in figure by Stiffness Matrix Method. Draw BMD and SFD.
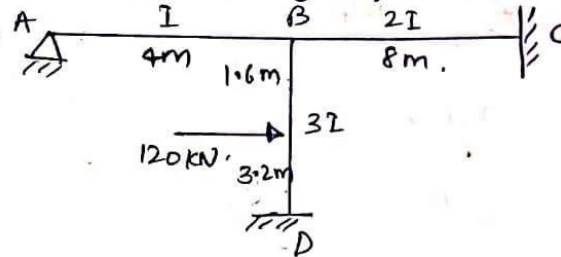
2. Analyze the continuous beam shown in figure by Stiffness Matrix Method. Draw BMD and SFD.
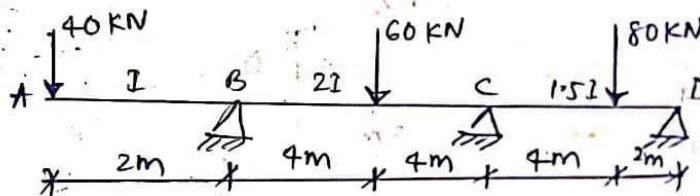
3. Analyze the continuous beam shown in figure by Stiffness Matrix Method. Draw BMD and SFD.
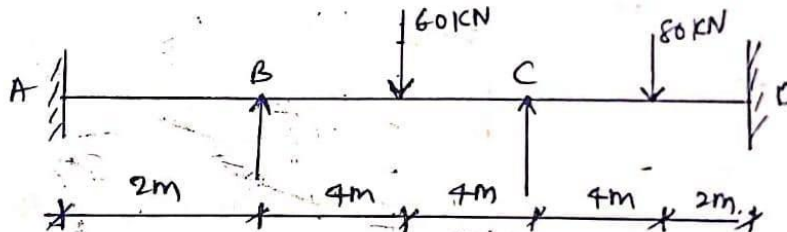
4. Analyze the continuous beam shown in figure by Stiffness Matrix Method. Draw BMD and SFD.

5. Analyze the continuous beam shown in figure by Stiffness Matrix Method. Draw BMD and SFD.
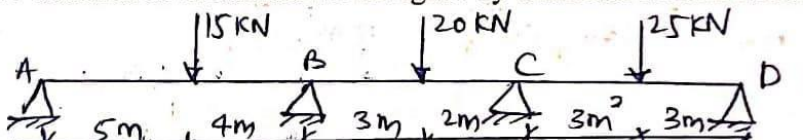
Prepared by	Checked by		
Prof. Sudarshan V Jore	Prof. Preethi R Patil	H O D	Principal

Department of Civil Engineering 14

S J P N Trust's
Hirasugar Institute of Technology, Nidasoshi.
Inculcating Values, Promoting Prosperity
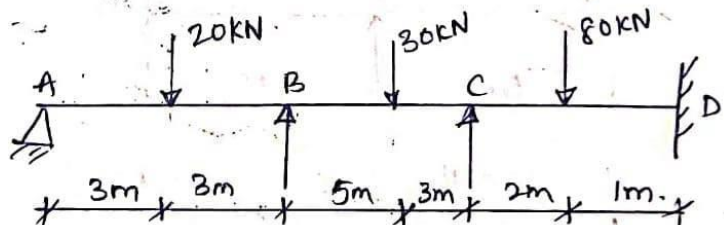Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi
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Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

Subject Title	DESIGN OF RC STRUCTURAL ELEMENTS		
Subject Code	18CV53	CIE Marks	40
Number of Lecture Hrs / Week	(3:2:0)	SEE Marks	60
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

FACULTY DETAILS:

Name: Prof. Preethi R. Patil	**Designation:** Asst. Professor	**Experience:** 4 Years
No. of times course taught: 02	**Specialization:** Structural Engineer	

1.0	Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Elements of civil engineering
02	Civil Engineering	III	Strength of Materials

2.0	Course Objectives

1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading

2. Follow a procedural knowledge in designing various structural RC elements.

3.0	Course Outcomes

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

Sl.No	Course Outcome	RBT Level	POs
C503.1	Understand the design philosophy and principles.	L1,L2,L3,L4	1,2,3,5,6,8,12
C503.2	Solve engineering problems of RC elements subjected to flexure, shear and torsion	L1,L2,L3,L4	1,2,3,5,6,8,12
C503.3	Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings.	L1,L2,L3,L4	1,2,3,5,6,8,12
C503.4	Understand the Design of cantilever, simply supported and one way continuous slab.	L1,L2,L3,L4	1,2,3,5,6,8,12
C503.5	Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments	L1,L2,L3,L4	1,2,3,5,6,8,12
	Total Hours of instruction		**50**

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

4.0   Course Content

Module-1

Introduction to working stress and limit State Design: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety and evaluation of design constants for working stress method. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

Module-2

Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced & flanged beams for flexure & shear

Module-3

Limit State Design of Beams: Design of singly and doubly reinforced beams, Design of flanged beams, design for combined bending, shear and torsion as per IS-456.

Module-4

Limit State Design of Slabs and Stairs: Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

Module-5

Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment.

5.0   Relevance to future subjects

Sl No	Semester	Subject	Topics
1.	V	Analysis of indeterminate structure	Structural analysis
2.	V	Design of reinforced concrete	Analysis of Beams
3.	VI	Design of steel structure	Analysis of Beams

6.0   Relevance to Real World

Sl No	Real World Mapping
01	Load distribution on structure , deflection of beams

7.0   Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Tutorial	Topic: Analysis of plane trusses

8.0   Books Used and Recommended to Students

Text Books
1.Unnikrishnan Pillai and Devdas Menon, " **Reinforced Concrete Design"** , McGraw Hill, New DelhI
2. Subramanian, " **Design of Concrete Structures"** , Oxford university Press
3. H J Shah, **"Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)"** , Charotar Publishing House Pvt. Ltd.

Reference Books
1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi.
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers.
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications.
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

Additional Study material & e-Books
Class notes and vtu notes

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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

Website and Internet Contents References
https://en.m.wikipedia.org

10.0   Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal of MAT	www.matjournals.com

11.0   Examination Note

Scheme of Evaluation for CIE (40 Marks)
➢   **Internal Assessment: 30 Marks**
Total of Three Internal Assessment tests will be conducted for 50 Marks each. Average of three tests is scaled downed to 30 Marks.
➢   **Assignment: 10 Marks**

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

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

12.0   Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Introduction to working stress method	20
	2	Difference between Working stress and Limit State Method of design	
	3	Modular Ratio and Factor of Safety and evaluation of design constants for working stress method.	
	4	Philosophy and principle of limit state design with assumptions	
	5	Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.	
	6	concept of balanced section, under reinforced and over reinforced section.	
	7	Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only	
	8	Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam.	
	9	Side face reinforcement, slender limits of beams for stability	
	10	Numerical problems	
Module 2	11	Analysis of singly reinforced,	20
	12	Analysis of doubly reinforced	
	13	Numerical problems	
	14	Analysis of flanged beams	
	15	Numerical problems Analysis of flexure	
	16	Analysis of flexure	
	17	Numerical problems	
	18	Analysis of shear	
	19	Numerical problems	
	20	Numerical problems	

Department of Civil Engineering   17

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

	21	Design of singly reinforced beams	
	22	Design of doubly reinforced beams	
	23	Numerical problems	
	24	Design of flanged beams	
Module 3	25	Numerical problems	20
	26	design for combined bending	
	27	Numerical problems	
	28	Design for shear as per IS-456	
	29	Design for torsion as per IS-456	
	30	Numerical problems	
	31	Introduction to one way and two way slabs	
	32	Design of cantilever	
	33	simply supported and one way continuous slab.	
	34	Design of two way slabs for different boundary conditions.	
Module 4	35	Design of dog legged	20
	36	Design of open well staircases	
	37	Importance of bond	
	38	anchorage length.	
	39	lap length	
	40	Numerical problems	
	41	Analysis and design of short axially loaded RC column.	
	42	Design of columns with uniaxia	
	43	Design of columns with biaxial moments	
	44	Design concepts of the footings	
Module 5	45	Design of Rectangular column footing	20
	46	Design of square column footing	
	47	axial load & moment	
	48	Numerical problems	
	49	Numerical problems	
	50	Numerical problems	

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: Questions on module 1	Understand the design philosophy and principles	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Solve engineering problems of RC elements subjected to flexure, shear and torsion	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 3
3	Assignment 3: Questions on module 3	Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 3
4	Assignment 4: Questions on module 4	Understand the Design of cantilever, simply supported and one way continuous slab	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 3
5	Assignment 5: Questions on module 5	. Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 2

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	2022-23 (Odd)
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Rev: 00

14.0   QUESTION BANK

MODULE 1

1. Explain the following a) Working stress method b) ultimate load method c) limit state method d) Modular ratio

2. Distinguish between a) working stress method & limit state method

b) under reinforced & over reinforced method

3. Derive the expressions for stress block parameters for compressive force Cu, Tensile force Tu, And Locate its depth y =0.42Xu from top.

4. A Singly reinforced rectangular beam 360mm x 580mm in section, is simply supported on a effective span of 5.25m. The steel reinforcement consists of 6-20dia, the beam supports a UDL of 25 KN/M. assume M20 concrete and Fe 415 steel. Check the design for short- and long-term deflections. Take Ultimate strain in concrete due to shrinkage as 0.0003 and coefficient of creep is unity. Effective cover may be taken as 40mm.

5. Obtain an expression for limiting percentage of steel for a rectangular RCC section with M15 concrete & Fe – 250 steels

MODULE 2

1. Difference between a) Analysis and design of an RCC structure b) Singly reinforced and doubly reinforced beams

2.   Give steps for determining

a) Moment of resistance of a rectangular and T-beam

b) Shear reinforcement for rectangular beam

3. Determine the safe UDL the beam can carry for the simply supported beam of span 6m. The tension reinforcement consists of 4-20mm diameter, Size of beam is 250 x 600mm. Take fck – 25 N/mm^2 and fy=415 N/mm^2 and d' = 50mm

4. Calculate depth and area of steel at mid span of a simply supported beam over a clear span 5m. The beam is carrying all inclusive load 20KN/m. Assume 300mm bearings. Use M20 and Fe-500 Assume b = 1/2d

5. Determine the ultimate flexural strength of T-Beam having following sectional dimensions bf= 2500mm, bw=300mm, Df=125mm, d=800mm,D= 850mm, Area of tensions steel = 6-25mm dia bars ,Fck= 25N/mm^2 fy= 500 N/mm^2.

MODULE 3

1. Design a singly reinforced concrete beam to support a service live load of 5 KN/m over a Clear span of 5m. Adopt M25 Grade concrete and Fe 500 HYSD Bars. Assume Suitable data, if required.

2. A Beam of rectangular cross section of size 230 x 550 mm of effective span of 6.5m. Take live load as 4 KN/m, fck= 20N/mm^2, fy=415 N/mm^2, Design a beam for flexure and shear

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	**2022-23 (Odd)**
	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	**Rev: 00**

3. A T-Beam slab floor of reinforced concrete has a slab 120mm thick spanning between the beams which are spaced 3.5m apart. The beams have a clear span of 6m and the width of support will be 350mm. The live load on floor is 3.5 KN/m². Adopt M25 grade concrete and Fe-415 steel. Design one of the intermediate T-Beam and sketch the reinforcement details.

4. A cantilever beam of 3m clear carries a load of 35KN/m. The width of the beam is 300mm. Design the beam for flexure and shear. Sketch the reinforcement details. Assume suitable data, if required.

5. Design a rectangular RC beam section to carry a unfactored bending moment of 150 kN-m unfactored shear force of 75 KN and a unfactored torsional moment of 50 KN.m use M-25 grade concrete and Fe 415 grade steel.

MODULE 4

1. Difference between one way and two way slab

2. Under what conditions a slab is designed as a two way slab

3. Will the two way slab be thinner than one way slab for the same loading and dimension

4. Explain the structural action of one way and two way slabs with the help of sketches

5. Differential between Dog- legged and open well stair case

6. What is the importance of bond, anchorage length and lap length

7. Column of multi storied building is reinforced with 20mm diameter Fe- 415 bars. Calculate the lap length required .Use M20 grade concrete.

MODULE 5

1. Differentiate between short column and long column

2. Differentiate between uniaxial bending and biaxial bending

3. What are the assumptions made for limit state of collapse in compression

4. What is IS code guidelines for longitudinal and lateral reinforcement in column

5. Why does code require all columns to be able to resist a minimum eccentricity of loading

6. Explain the design steps for a) Axially loaded short column b) Axial load and uniaxial bending moment

7. Design the isolated rectangular footing of uniform depth for the column size 300 x 500 mm subjected to a dead load and live load. The column has an unsupported length of 3.5 m and effectively held in position and restrained against rotation at both ends. Use M25 grade concrete and Fe -415 steel.

Prepared by	Checked by		
Prof. Preethi.R.Patil	**Prof. V.I .Patil**	**HOD**	**Principal**

S J P N Trust's
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Inculcating Values, Promoting Prosperity
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Recognized under 2(f) & 12B of UGC Act, 1956
Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

Subject Title	Basic Geotechnical Engineering		
Subject Code	18CV54	**CIE Marks**	40
Number of Lecture Hrs / Week	(3:0:0)	**SEE Marks**	60
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:

Name: Prof. Sudarshan V Jore	**Designation:** Asst. Professor	**Experience: 02**
No. of times course taught: 01	**Specialization:** Construction Technology and Management	

1.0	Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	III	Engineering Geology

2.0	Course Objectives

1. Become familiar with geotechnical engineering problems.

2. Assess the improvement in mechanical behaviour by densification of soil.

3.0	Course Outcomes

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

Sl.No	Course Outcome	RBT Level	POs
C504.1	Ability to plan and execute geotechnical site investigation program for different civil engineering project	L2,L3	1,2,3,5,6,8,12
C504.2	Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils	L2,L3	1,2,3,5,6,8,12
C504.3	Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures	L2,L3	1,2,3,5,6,8,12
C504.4	Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure.	L2,L3	1,2,3,5,6,8,12
C504.5	Capable of estimating load carrying capacity of single and group of piles	L2,L3	1,2,3,5,6,8,12
	Total Hours of instruction		40

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

4.0   **Course Content**

Module-1

Introduction: Origin and formation of soil, Regional soil deposits in India, Phase Diagram, phase relationships, definitions and their interrelationships. Determination of Index properties: Specific gravity, water content, in-situ density, relative density, particle size analysis(sieve and Hydrometer analysis) Atterberg's Limits, consistency indices. Activity of clay, Field identification tests, Plasticity chart, BIS soil classification (IS: 1498-1970).

Module-2

Soil Structure and Clay Mineralogy Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering

Compaction of Soils: Definition, Principle of compaction, Standard & Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-comp active effort & method of compaction, lift thickness & number of passes, Proctor's needle, Compacting equipment's & their suitability

Module-3

Flow through soils: Darcy's law-assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena.

Seepage Analysis: Laplace equation, assumptions, limitation sand its derivation. Flow nets, characteristics and applications. Flow nets for sheet piles and below the dam section. Unconfined flow, phreatic line (Casagrande's method–with and without toe filter), flow through dams, design of dam filters.

Effective Stress Analysis: Geostatic stresses, Effective stress concept-total stress, effective stress and Neutral stress and impact of the effective stress in construction of structures, quick sand phenomena.

Module-4

Shear Strength of Soil: Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotropy and sensitivity, Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions.

Module-5

Consolidation of Soil: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidationtheory-assumptionsandlimitations.GoverningdifferentialEquation and solution (No derivation). Consolidation characteristics of soil (Cc, av, mv and Cv). Laboratory one dimensional consolidation test, characteristics of e-log (σ') curve, Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils.

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	2022-23 (Odd)
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	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Rev: 00

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VI	Ground Improvement Techniques	Compaction

6.0 Relevance to Real World

Sl No	Real World Mapping
01	Analysis of soil prior to any construction and methods to improve bearing capacity of soil

7.0 Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Tutorial	Solving problems of GATE, Other University and previous year QP's
02	NPTEL	Introduction to Soil Mechanics

8.0 Books Used and Recommended to Students

Text Books
1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India.

Reference Books
1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons.
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi.
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-. , Tata McGraw Hill Publications.
4. Debashis Moitra, "Geotechnical Engineering", Universities Press.,
5. Malcolm D Bolton, "A Guide to soil mechanics", Universities Press.,
6. Bowles J E , Foundation analysis and design, McGraw- Hill Publications.

Additional Study material & e-Books
Class notes and vtu notes

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

Website and Internet Contents References
https://en.m.wikipedia.org

10.0 Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal of MAT	www.matjournals.com

11.0 Examination Note

Scheme of Evaluation for CIE (40 Marks)
➢ **Internal Assessment: 30 Marks**
Total of Three Internal Assessment tests will be conducted for 50 Marks each. Average of three tests is scaled downed to 30 Marks.
➢ **Assignment: 10 Marks**

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.
The question paper will have ten questions.

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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

12.0   Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Origin and formation of soil	20
	2	Regional soil deposits in India	
	3	Phase Diagram, phase relationships, definitions and their interrelationships	
	4	Numerical Problems	
	5	Determination of Index properties	
	6	Sieve analysis and Hydrometer analysis	
	7	Activity of clay, Field identification tests, Plasticity chart	
	8	Atterberg's Limits, consistency indices., BIS soil classification (IS: 1498-1970)	
Module 2	9	Soil Structure and Clay Mineralogy	20
	10	Valence bonds, Soil-Water system, Electrical diffuse double layer,	
	11	Adsorbed water, base-exchange capacity, Isomorphous substitution.	
	12	Compaction of Soils: Definition, Principle of compaction	
	13	Standard and Modified proctor's compaction tests	
	14	Factors affecting compaction, effect of compaction on soil properties	
	15	Proctor's needle, Compacting equipments and their suitability	
	16	Field compaction control-compactive effort & method of compaction	
Module 3	17	Flow through Soil, Darcy's law-assumption and validity	20
	18	Coefficient of permeability and its determination (laboratory and field)	
	19	Factors affecting permeability, permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena.	
	20	Seepage Analysis, Laplace equation, assumptions, limitation sand its derivation. Flow nets, characteristics and applications	
	21	Flow nets for sheet piles and below the dam section	
	22	Unconfined flow, Phreaticline (Casagrande's method–with and without toe filter), flow through dams, design of dam filters	
	23	Effective Stress Analysis: Geostatic stresses, Effective stress concept-total stress, effective stress and Neutral stress	
	24	Impact of the effective stress in construction of structures, quick sand phenomena.	
Module 4	25	Shear Strength of Soil,Concept of shear strength	20
	26	Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion	
	27	Total and effective shear strength parameters	
	28	Factors affecting shear strength of soils. Thixotrophy and sensitivity	
	29	Measurement of shear strength parameters - Direct shear test, unconfined compression test	
	30	Triaxial compression test under different drainage conditions.	
	31	Field Vane shear test under different drainage conditions.	
	32	Numerical problems	
Module 5	33	Consolidation of Soil, Definition, Mass-spring analogy.	20
	34	Terzaghi's one dimensional consolidation theory-assumptions and limitations	
	35	Governing differential Equation and solution	
	36	Consolidation characteristics of soil (Cc, av, mv and Cv)	
	37	Laboratory one dimensional consolidation test	
	38	Characteristics of e-log (σ') curve	
	39	Pre-consolidation pressure and its determination by Casagrande's method	
	40	Over consolidation ratio, normally, under and over consolidated soils.	

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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: Questions on module 1	Ability to plan and execute geotechnical site investigation program for different civil engineering projects	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Understanding compaction methods, factors affecting compaction, Effects of compaction on soil.	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 3
3	Assignment 3: Questions on module 3	Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 3
4	Assignment 4: Questions on module 4	Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 3
5	Assignment 5: Questions on module 5	Capable of estimating load carrying capacity of single and group of piles	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 2

14.0   QUESTION BANK

MODULE 1

1. With the help of three phase diagram, explain
    Void ratio   Porosity
    Water content   Degree of saturation
2. With usual notation prove the relation between e , w, G, Sr
3. Determine dry density, void ratio, porosity and degree of saturation.
   Given bulk density- 26KN/m3, G 2.67 and w-16%
4. Define liquid limit, plastic limit and shrinkage limit.
5. Explain the Indian Standard Soil classification system.
6. A Fine-grained soil has a liquid limit 54% and a plastic 30%, Classify the soil as per IS classification.

MODULE 2

1. Explain common clay minerals.
2. Following are the results of compaction test.

Weight of the soil with the mould (N)	29.25	30.95	31.50	31.25	30.70
Water content (%)	10	12	14.3	16.1	18.2

   Plot the compaction curve showing MDD and OMC, Given G = 2.70,
   Volume of mould = 1000cm^3, Weight of mould = 10N
3. Explain Electrical Diffuse double layer
4. Distinguish between Standard and modified compactor tests.
5. For constructing an embankment, the soil is transported from borrow area using truck which can carry 6m^3 of soil at a time. Determine the number of truck loads of soil required to obtain 100m^3 of compacted earth fill and the volume of borrow pit. Use the following details.

Property	Borrow area	Truck loose	Field compacted	Soil type
Bulk density (KN/m^3)	16.6	11.5	18.2	Well graded
Water Content (%)	8	6	14	

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

MODULE 3

1. What is a flow net? What are the uses and characteristics of flow nets?
2. The porosity of certain sample of sand was 50% in the loose state and 34% in the dense state. The specific gravity is 2.70. Estimate the critical hydraulic gradient in loose and dense states.
3. Compute the quantity of water seeping under a weir per day for which the flow net has been satisfactily constructed. The coefficient of permeability is 2×10^{-2} mm/s
   N_f= 5 and N_d= 18. The difference in water level between upstream and downstream is 3.0 m. The length of the weir is 60m.
4. With the help of neat sketches, derive an equation to determine permeability by the following laboratory method and also state their suitability.
   i. Constant head permeability test
   ii. Falling head permeability method
5. What are the factors affecting permeability test.

MODULE 4

1. Explain with neat sketch, the mass spring analogy
2. Explain normally consolidated soil and over consolidated soil.
3. Explain with neat sketch, determination of Pre consolidation pressure by Casagrande's method.
4. Explain square root of time fitting method.
5. A 20mm thick isotropic clay stratum overlies an impervious rock. The coefficient of consolidation of soil is 5×10^{-2} mm^2. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for 50% and 90% consolidations respectively.

MODULE 5

1. Explain Mohr Coloumb failure theory of soil.
2. What are the factors affecting the shear strength of the soil?
3. In a shear test conducted on river sand, the following results were obtained.

Normal Force (N)	80	160	240	320	400	480
Shear force (N)	50	101	149	201	248	302

   Determine 'e' and 'φ'

4. With the neat sketches, derive an equation to determine shear strength by vane shear test.
5. In a triaxial test on two identical soil samples the following data was obtained.

Test No	Cell pressure (KN/m2)	Maximum deviation stress (KN/m2)	Maximum principal stress (KN/m2)
01	50	120	
02	100		332

Prepared by	**Checked by**		
Prof. Sudarshan V Jore	**Prof. S.M.Chandrakanth**	**H O D**	**Principal**

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

Subject Title	**MUNICIPAL WASTEWATER ENGINEERING**		
Subject Code	18CV55	**CIE Marks**	40
Number of Lecture Hrs / Week	(3:0:0)	**SEE Marks**	60
Total Number of Lecture Hrs	40	**Exam Hours**	03
CREDITS – 03			

FACULTY DETAILS:

Name: Prof. S.S. Beesanakoppa	Designation: Asst. Professor	Experience: 1 Years
No. of times course taught: Nil	Specialization: Wastewater management	

1.0	**Prerequisite Subjects:**

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Element of Civil Engineering.

2.0	**Course Objectives**

1. Understand the various water demands and population forecasting methods.

2. Understand and design different unit operations and unit process in involved in wastewater treatment process

3. Understand the concept and design of various physicochemical treatment units

4. Understand the concept and design of various biological treatment units

5. Understand the concept of various advance waste water and low-cost treatment processes for rural areas.

3.0	**Course Outcomes**

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

Sl.No	Course Outcome	RBT Level	POs
C505.1	Select the appropriate sewer appurtenances and materials in sewer network.	L1,L2,L3,L4	1,2,3,5,6,8,12
C505.2	Design the sewers network and understand the self purification process in flowing water.	L1,L2,L3,L4	1,2,3,5,6,8,12
C505.3	Design the varies physic- chemical treatment units	L1,L2,L3,L4	1,2,3,5,6,8,12
C505.4	Design the various biological treatment units	L1,L2,L3,L4	1,2,3,5,6,8,12
C505.5	Design various AOPs and low cost treatment units.	L1,L2,L3,L4	1,2,3,5,6,8,12
	Total Hours of instruction		**40**

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

Module-1

Introduction: Need for sanitation, methods of sewage disposal, types of sewerage systems, dry weather flow, wet weather flow, factors effecting dry and wet weather flow on design of sewerage system, estimation of storm water flow, time of concentration flow, numerical.

Sewer appurtenances: Manholes, catch basins, oil and grease traps. P, Q and S traps. Material of sewers, shape of sewers, laying and testing of sewers, ventilation of sewers basic principles of house drainage.

Module-2

Design of sewers: Hydraulic formula to determine velocity and discharge. Self cleansing and non scouring velocity. Design of hydraulic elements for circular sewers for full flow and half flow conditions.

Waste water characteristics: sampling, significance and techniques, physical, chemical and biological characteristics, flow diagram for municipal waste water Treatment unit operations and process. Estimation of BOD. Reaction kinetics (zero order, 1st order and 2nd order).

Module-3

Treatment of municipal waste water: Screens: types, disposal. Grit chamber, oil and grease removal. primary and secondary settling tanks.

Disposal of effluents: Dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, numerical problems on disposal of effluents. Streeter-Phelps equation.

Module-4

Biological Treatment Process: Suspended growth system - conventional activated sludge process and its modifications. Attached growth system – trickling filter, bio-towers and rotating biological contactors. Principle of stabilization ponds, oxidation ditch, Sludge digesters(aerobic and anaerobic), Equalization., thickeners and drying beds**.**

Module-5

Advanced Wastewater Treatment: Need and technologies used. Nitrification and Denitrification Processes, Phosphorous removal. Advance oxidation processes (AOPs), Electro coagulation.

Rural sanitation: Low cost treatment process: Working principal and design of septic tanks for small community in rural and urban areas, two-pit latrines, eco-toilet and soak pits.

5.0 **Relevance to future subjects**

Sl No	Semester	Subject	Topics
1.	V	Extensive Survey Project	Construction Project

6.0 **Relevance to Real World**

Sl No	Real World Mapping
01	Mega Construction Project Planning and Scheduling

7.0 **Gap Analysis and Mitigation**

Sl No	Delivery Type	Details
01	Tenders	Topic: Government and Private process

8.0 **Books Used and Recommended to Students**

Text Books
1. Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraw Hill, New York, Indian Edition, 2013
2. B C Punmia, "Environmental Engineering vol-II", Laxmi Publications 2nd, 2016
3. Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India

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Inculcating Values, Promoting Prosperity
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

Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

Pvt. Ltd., New Delhi. 3rd, Edition, 2017
4. S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 28th edition and 2017

Reference Books

1. CPHEEO manual on sewage treatment, Ministry of Urban Development, Government of India, New Delhi,1999
2. Mark.J Hammer, "Water & Waste Water Technology" John Wiley & Sons Inc., New York, 2008
3. Benefield R.D., and Randal C.W, "Biological Process Design for Wastewater Treatment", Prentice Hall, Englewood Chiffs, New Jersey 2012
 4. Metcalf and Eddy Inc, "Wastewater Engineering - Treatment and Reuse", Publishing Co. Ltd., New Delhi, 4th Edition, 2009.

Additional Study material & e-Books

Class notes and vtu notes

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

Website and Internet Contents References
https://en.m.wikipedia.org

10.0	Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal	www.constuctionmanagement.com

11.0	Examination Note

Scheme of Evaluation for CIE (40 Marks)
➢ **Internal Assessment: 30 Marks**
Total of Three Internal Assessment tests will be conducted for 30 Marks each. Average of three tests is scaled downed to 30 Marks.
➢ **Assignment: 10 Marks**

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.
The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

12.0	Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	**Introduction:** Need for sanitation, methods of sewage disposal,	20
	2	Types of sewerage systems, dry weather flow, wet weather flow,	
	3	Factors effecting dry and wet weather flow on design of sewerage system	
	4	Estimation of storm water flow,	
	5	Time of concentration flow, numerical.	
	6	Sewer appurtenances: Manholes, catch basins, oil and grease traps. P, Q and S traps. Material of sewers.	
	7	Shape of sewers, Laying and testing of sewers, ventilation of sewers	
	8	Basic principles of house drainage	
Module 2	9	**Design of sewers:** Hydraulic formula to determine velocity and discharge	20
	10	Self cleansing and non scouring velocity.	
	11	Design of hydraulic elements for circular sewers for full flow and half flow conditions.	

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

	12	Waste water characteristics: sampling, significance and techniques,	
	13	Physical, chemical and biological characteristics,	
	14	Flow diagram for municipal waste water Treatment	
	15	Unit operations and process. .	
	16	Estimation of BOD. Reaction kinetics (zero order, 1st order and 2nd order).	
Module 3	17	**Treatment of municipal waste water:** Screens: types, disposal.	20
	18	Grit chamber, oil and grease removal.	
	19	primary and secondary settling tanks	
	20	Disposal of effluents: Dilution, self-purification phenomenon,	
	21	Oxygen sag curve	
	22	Zones of purification, sewage farming, sewage sickness,	
	23	Numerical problems on disposal of effluents.	
	24	Streeter-Phelps equation	
Module 4	25	**Biological Treatment Process:** Suspended growth system	20
	26	Conventional activated sludge process,	
	27	Activated sludge process and its modifications	
	28	Attached growth system – trickling filter	
	29	Bio-towers and rotating biological contactors.	
	30	Principle of stabilization ponds, oxidation ditch	
	31	Sludge digesters(aerobic and anaerobic)	
	32	Equalization., thickeners and drying beds	
Module 5	33	**Advanced Wastewater Treatment:** Need and technologies used.	20
	34	Nitrification and Denitrification Processes, Phosphorous removal.	
	35	Advance oxidation processes (AOPs),	
	36	Electro coagulation.	
	37	Rural sanitation: Low cost treatment process	
	38	Working principal and design of septic tanks	
	39	Small community in rural and urban areas	
	40	Two-pit latrines, eco-toilet and soak pits.	

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: Questions on module 1	Students study basics Management: Construction Project Formulation: Construction Planning and Scheduling.	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Students study the Resource Management: Construction Equipments	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 2
3	Assignment 3: Questions on module 3	Students study Construction Quality safety and Human Values: HSE: Introduction Ethics	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 2
4	Assignment 4: Questions on module 4	Student study the Introduction to engineering economy Interest and time value of money: Comparison of alternatives.	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 2
5	Assignment 5: Questions on module 5	Students Study Entrepreneurship: Business Planning Process.	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 3

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

14.0   QUESTION BANK

MODULE 1

1. Explain the factors affecting dry weather flow and the effects of flow variations on the design of sewerage system.
2. Explain the need for sanitation along with different sewerage systems 3.Define sewer appurtenances. With neat sketch explain the construction and working of manhole and catch basin.
4. Explain the process of laying and testing of sewers.
5. Explain the factors to be considered while selecting the sewer material. What are the commonly used sewer materials?
6. Design a sewer to serve a population of 38,000, the daily per capita water supply allowance being 130 litres,of which 80%, find its way into the sewer. The slope available for the sewer to be laid is 1 in 600 and the sewer should be designed to carry four times the dry weather flow, when running full. What would be the velocity of flow in the sewer when running full?

MODULE 2

1. Draw a neat flow diagram employed in Municipal wastewater treatment plant.
2. The 5 day BOD at 30o C of a sewage sample is 120mg/L. Calculate 5 days BOD at 20oC. Assume deoxygenation constant at 20oC, K = 0.1/day.
3. Explain: a) Self cleansing velocity and b) Non scouring velocity.

MODULE 3

1. Explain the importance of screens and types of screens in the sewage treatment process.
2. Write short notes on: a) Sewage sickness and b) Sewage farming.
3. Discuss in detail the process of Deoxygenation and Reoxygenation with respect to selfpurification of Natural water with a neat sketch.
4. A stream, saturated with D O, has a flow of 1.2 m3 /sec, BOD of 4 mg/L and rate constant of 0.3 per day. It receives an effluent discharge of 0.25m3 /sec having BOD of 20 mg/L, D O 5 mg/L and rate constant 0.13 per day. The average velocity of flow of the stream is 0.18m/sec. Calculate the D O deficit at point 20 kms and 40kms downstream. Assume the temperature as 20oC, throughout the BOD is measured at 5 days. Take saturation D O at 20oC as 9.17 mg/L

MODULE 4

1. Explain the working of conventional activated sludge process (ASP) with flow diagram.
2. Design a primary sedimentation tank of circular cross-section, for a sewage of 10 MLD, detention period of 2 hours and assume the surface loading rate to be 30 m3 /m2 /d.
3. Explain briefly the different stages of sludge digestion process in a "Digestor". With a neat sketch, explain the constructional details of sludge digestion tank.
4. Determine the size of the High rate trickling filters for the following data: i) sewage flow = 4.5 MLD ii) Recirculation ratio = 1.5 iii) BOD of Raw sewage = 250 mg/L iv) BOD removal in primary tank = 30% v) Final effluent BOD desired = 30 mg/L

MODULE 5

1. What do you understand by advanced wastewater treatment? How is it different from the conventional treatment? Give, in a tabular form, important AWT processes.
2. Draw a neat sketch of septic tank with soak pit, Write the design criteria required for septic tank.
3. Discuss in brief the biological and chemical methods of removal of phosphorous from wastewater.
4. Write a short note on: a) eco toilet. b) two pit latrines.

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Prepared by	Checked by		
Prof: Shreedevi S B	**Prof: Sudarshan V.Jore**	**HOD**	**Principal**

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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

| Civil Engg. Dept |
| Academic Course Plan |
| 2022-23 (Odd) |
| Rev: 00 |

Subject Title	**HIGHWAY ENGINEERING**		
Subject Code	18CV56	**IA Marks**	40
Number of Lecture Hrs / Week	3:0:0	**Exam Marks**	60
Total Number of Lecture Hrs	40	**Exam Hours**	03
		Credits: 3	

FACULTY DETAILS:

Name: Prof. S.M.Chandrakanth	**Designation:** Asst. Prof. / HOD	**Experience:** 12 Years
No. of times course taught: 06		**Specialization:** Highway Engineering

1.0 **Prerequisite Subjects:**

Sl.No	Branch	Semester	Subject
01	General Science/Mathematics	I/II	Knowledge of Geometry, Engineering Mathematics and trigonometry.
02	Civil Engineering	I/II	Elements of Civil Engineering and Mechanics
03	Civil Engineering	III	Basic Surveying
04	Civil Engineering	IV	Advance Surveying

2.0 **Course Objectives**

This course will enable students to;

1. Gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
2. Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).
3. Get insight to different aspects of geometric elements & train them to design geometric elements of a highway network.
4. Understand pavement and its components, pavement construction activities and its requirements.
5. Gain the skills of evaluating the highway economics by B/C, NPV, IRR methods and also introduce the students to highway financing concepts.

3.0 **Course Outcomes**

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

CO	Course Outcome	Cognitive Level	POs
C506.1	Explain the principles of transportation including the present scenario of road development in India. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.	L1, L2, L3, L4	1,2,3,4,6,8,12
C506.2	Design of Geometrics of the road as per IRC recommendations.	L1, L2, L3, L4	1,2,3,4,6,8,12
C506.3	Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.	L1,L2,L3,L4,L5	1,2,3,4,6,8,12
C506.4	Design road geometrics, structural components of pavement, drainage and techniques of construction for various types of pavements.	L1,L2,L3,L4,L5	1,2,3,4,5,6,8,12
C506.5	Evaluate and design a suitable drainage system and the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.	L1,L2,L3,L4,L5	1,2,3,4,5,6,8,12
Total Hours of Instruction		**40**	

	S J P N Trust's	Civil Engg. Dept
Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	2022-23 (Odd)
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	
	Recognized under 2(f) & 12B of UGC Act, 1956	Rev: 00
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	

4.0	**Course Content**

Module-1

Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.

Highway Development and Planning: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4thtwenty year road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.

Highway Alignment and Surveys: Ideal Alignment, Factors affecting the alignment, Engineering surveys-
Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects.

Module-2

Highway Geometric Design of horizontal alignment elements: Cross sectional elements–width, surface, camber, Sight distances–SSD, OSD, ISD, HSD, Radius of curve, Transition curve, Design of horizontal and vertical alignment–curves, super-elevation, widening, gradients, summit and valley curves.

Module-3

Pavement Materials: Sub grade soil - desirable properties-HRB soil classification-determination of CBR and modulus of sub grade reaction with Problems Aggregates- Desirable properties and tests, Bituminous materials-Explanation on Tar, bitumen, cutback and emulsion-tests on bituminous material Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.

Module-4

Pavement Construction: Design of soil aggregate mixes by Rothfuch's method. Uses and properties of bituminous mixes and cement concrete in pavement construction. Earthwork; cutting and Filling, Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base iii) WMM base,iv) Bituminous Macadam v) Dense Bituminous Macadam vi) Bituminous Concrete,vii) Dry Lean Concrete sub base and PQC viii) concrete roads.

Module-5

Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location.

Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts.

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	V	Highway Engineering	Highway Development and Planning, Highway Alignment and Surveys, Highway Geometric Design of horizontal alignment elements
02	V	Surveying Practice Lab.	Apply the basic principles of engineering surveying and measurements practices
03	VI	Remote Sensing & GIS	Basic concept of Remote sensing, Remote Sensing Platforms and Sensors, Geographic Information System, Data Models, Integrated Applications of Remote sensing and GIS.
04	VI	Extensive Survey Project	Practical applications of Surveying.

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	To Involve in the design, construction and maintenance of highway systems.
02	To understand the principles & techniques of Highway Engineering.
03	To learn & implement the Standards of highway engineering
04	To analyse and design the highway cross section and alignment elements.
05	To prepare the highway geometric design
06	Students are able to understand future traffic flows, design of highway intersections/interchanges
07	In highway construction, highway pavement materials and design.
08	Understand the structural design of pavement thickness and pavement maintenance.
09	To learn the development of nations which have extensive highway networks
10	To investigate the highway drainage and Highway economics

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Demonstration to Theodolite & tachometer in Survey laboratory
02	NPTEL	Introduction to Surveying & Mapping, Advance and Higher Surveying

8.0 Books Used and Recommended to Students

Text Books

1 . S K Khanna and C E G Justo, "Highway Engineering", Nem Chand Bros, Roorkee.

2. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.

3. R Srinivasa Kumar, "Highway Engineering", University Press.

4. K. P.Subramanium, "Transportation Engineering", SciTech Publications, Chennai.

Reference Books

1. Relevant IRC Codes.

2. Specifications for Roads and Bridges-MoR T&H, IRC, New Delhi.

3. C. JotinKhisty, B. Kentlal, "Transportation Engineering", PHI Learning Pvt. Ltd. New Delhi.

Additional Study Material & e-Books

1.   NPTEL notes and Videos

2.   VTU online notes.

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	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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

Website and Internet Contents References

01) https://nptel.ac.in/courses/105105107

02) https://archive.nptel.ac.in/courses/105/107/105107123/

03) https://onlinecourses.nptel.ac.in/noc22_ce94/preview

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

Sl. No	Magazines/Journals	Website
01	Transportation Geotechnics	https://www.sciencedirect.com/journal/transportation-geotechnics
02	Transportation Planning and Technology	https://www.tandfonline.com/journals/gtpt20
03	Transport	https://www.tandfonline.com/journals/tran20
04	Journal of Transportation Engineering, Part B: Pavements	https://ascelibrary.org/journal/jpeodx

11.0 **Examination Note**

Scheme of Evaluation for CIE (40 Marks)

Internal Assessment: 30 Marks

Total of Three Internal Assessment tests will be conducted for 50 Marks each.

Average of three tests is scaled downed to 30 Marks.

Assignment: 10 Marks

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

The question paper will have ten questions.

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

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

12.0	Course Delivery Plan

Module	Lecture No.	Content of Lecture	% of portion
1	1	**Principles of Transportation Engineering:** Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation	20%
	2	Central Road Fund, Indian Roads Congress, Central Road Research Institute.	
	3	**Highway Development and Planning:** Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing	
	4	Road development in India, problems on best alignment among alternate proposals	
	5	Salient Features of 3rd and 4thtwenty year road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.	
	6	**Highway Alignment and Surveys:** Ideal Alignment, Factors affecting the alignment,	
	7	Engineering surveys- Map study, Reconnaissance, Preliminary surveys.	
	8	Final location & detailed survey, Reports and drawings for new and re-aligned projects.	
2	9	**Highway Geometric Design of horizontal alignment elements:** Cross sectional elements–width, surface, camber.	20%
	10	Sight distances–SSD	
	11	OSD, ISD, HSD	
	12	Design of horizontal curves.	
	13	Design of vertical alignment.	
	14	Problems on HC and VC	
	15	Super-elevation, Widening, Gradients.	
	16	Summit and valley curves	
3	17	**Pavement Materials:** Subgrade soil - desirable properties.	20%
	18	HRB soil classification.	
	19	Determination of CBR and modulus of subgrade reaction with Problems.	
	20	Aggregates- Desirable properties and tests.	
	21	Bituminous materials- Explanation on Tar, bitumen, cutback and emulsion.	
	22	Tests on bituminons material.	
	23	Pavement types, Component parts of flexible and rigid pavements and their functions	
	24	ESWL and its determination, (Graphical method only)- Examples	
4	25	**Pavement Construction:** Design of soil aggregate mixes by Rothfuch's method.	20%
	26	Uses and properties of bituminous mixes and cement concrete in pavement Construction.	
	27	Earthwork; cutting and Filling.	
	28	Preparation of subgrade.	
	29	Specification and construction of i) Granular Sub base, ii) WBM Base,	
	30	iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam,	
	31	vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC,	
	32	viii) Concrete roads.	
5	33	**Highway Drainage:** Significance and requirements.	20%
	34	Surface drainage system and design-Examples.	
	35	Sub surface drainage system. Design of filter materials	
	36	Types of cross drainage structures, their choice and location	
	37	**Highway Economics:** Highway user benefits. VOC using charts only-Examples.	
	38	Economic analysis - annual cost method.	
	39	Benefit Cost Ratio method-NPV-IRR methods- Examples.	
	40	Highway financing-BOT-BOOT concepts.	

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	**Rev: 00**
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	

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: Questions on module 1	Students study the Topics and write the Answers. Get practice to solve numerical of university question papers.	Module 1 of the syllabus	3	Individual Activity. Printed solution expected.	Book 1, 2 & 1, 2, 3, 4 & 5 of the reference list.
2	Assignment 2: Questions on module 2	Students study the Topics and write the Answers. Get practice to solve numerical of university question papers.	Module 2 of the syllabus	5	Individual Activity. Printed solution expected.	Book 1, 2 & 1, 2, 3, 4 & 5 of the reference list.
3	Assignment 3: Questions on module 3	Students study the Topics and write the Answers. Get practice to solve numerical of university question papers.	Module 3 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 & 1, 2, 3, 4 & 5 of the reference list.
4	Assignment 4: Questions on module 4	Students study the Topics and write the Answers. Get practice to solve numerical of university question papers.	Module 4 of the syllabus	10	Individual Activity. Printed solution expected.	Book 1, 2 & 1, 2, 3, 4 & 5 of the reference list.
5	Assignment 5: Questions on module 5	Students study the Topics and write the Answers. Get practice to solve numerical of university question papers.	Module 5 of the syllabus	12	Individual Activity. Printed solution expected.	Book 1, 2 & 1, 2, 3, 4 & 5 of the reference list.

14.0 **QUESTION BANK**

MODULE – 1

1. Discuss the role of transportation in national development?
2. Explain various characteristics of road transport?
3. What are the different modes of transportation? Mention their advantages?
4. List & explain briefly the recommendations of Jayakar committee.
5. Discuss briefly the role of transportation in economic, social, political development of country?
6. Explain a) I R C b) C R F c) C R R I.
7. Explain the classification of roads as per Third 20-year road development plan.
8. What are the important policies mentioned in vision: 2021 document.
9. Define i) Master Plan ii) Saturation System
10. With a neat sketch explain: i) Rectangular or Block Pattern ii) Star & Grid Patter
11. List the salient features of i) PMGSY ii) KSHIP Projects.
12. With a neat sketch explain different road patterns.
13. What is saturation of road planning? How is it used to decide best proposal among several alternative proposals?
14. The area of certain backward district in India is 18400km2 & there are 15 towns as per 1981 census. Determine the length of different categories of road by third road development plan.
15. Explain the various types of survey to be carried out before planning a highway system for a given area.
16. What is the ideal requirement of highway alignment list & explain briefly?
17. Explain briefly the various factors governing the highway alignment?
18. Three new road links A, B & C are to be constructed during a five-year plan period. Suggest the order of priority for phasing road construction programme Used on maximum utility approach. Assume utility units of

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	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

0.5, 1.0 & 2.0 for three-year population ranges & 1 per 1000 tons of Agricultural & industrial Products respectively.

Road link	Length, km	No. of villages served with population Range			Productivity served, in 1000 tons	
		<500	501-1000	1001-2000	Agricultural	Industrial
A	500	100	150	40	250	20
B	600	200	250	68	320	25
C	700	270	350	82	500	35

19. Four new roads A, B, C & D are to be constructed in a district during a five-year plan period. Suggest the order of priority for phasing the development programme based on maximum utility approach. Assume utility units 0.5, 1.0, 2.0 & 4.0 for population ranges & 10.0 for 1000 T of agricultural & industrial products.

Road link	Length, km	No. of villages served with population Range				Productivity in tons	
		<500	500-1000	1000-2000	>2000	Agricultural	Industrial
A	65	40	12	14	14	5000	1000
B	55	22	9	6	6	8000	1200
C	45	32	8	9	9	6000	800
D	72	36	6	3	3	9000	2000

MODULE – 2

1. What are objects of highway geometric design? List various geometric elements to be considered in highway?
2. Enumerate the factors governing the width of carriageway. State the IRC Specification for width of carriageway for various classes of roads?
3. In a region with light rainfall a two-lane bituminous road is to be designed. Determine the height of the crown of parabolic camber. Draw the neat sketch?
4. Define right of way. Explain the factors affecting right of way?
5. Draw typical cross section of NH/SH in rural section in embankment & in cutting with dimensions?
6. Discuss importance of camber, skid resistance, unevenness of pavement surface?
7. In Mangalore district of Karnataka state, a VR of thin bituminous pavement 3.75m wide & a NH of bituminous concrete pavement 7m wide are to construct. What should be the height of crown with

respect to edge in these two cases?

8. What is Camber? What are the objectives of providing camber to the pavement surface? Specify the values of camber recommended by the IRC for different types of road surfaces?
9. What are the steps to be followed while re -aligning an existing highway with poor alignment?
10. Explain briefly the various surveys to be conducted for the alignment of highway?
11. Define super elevation. Explain maximum & minimum super elevation. Enumerate the steps for practical design of super-elevation.
12. On a highway there is a horizontal curve of radius 400m & length 200m. Compute the setback distance required so as to provide stopping sight distance, for the design speed of 65kmph. The distance between the center line of the road & the center line of inner lane is 1.9m.
13. List the objects of providing extra widening of pavement at horizontal curves & super elevation.
14. Why vertical curves are required? Explain different types of vertical curve.

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Inculcating Values, Promoting Prosperity
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

Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

15. Two cars are approaching from opposite directions of a road with a gradient of two percent, with velocities of 90kmph & 75kmph respectively. Calculate the minimum sight distance required to avoid a head on collision of both the cars. Reaction time of the driver is 2.5sec & the coefficient of friction is 0.35.

16. Define SSD. Explain any one factor that restricts the SSD.

17. The speeds of overtaking & overtaken vehicles are 96kmph & 80kmph. Assuming an acceleration of 2.5 kmph/sec & Driver's reaction time of 2sec, find the OSD & draw a neat sketch of overtaking zone.

18. Explain with the help of a sketch the effect of centrifugal force on a vehicle negotiating a horizontal curve.

19. Explain briefly the attainment of designed super elevation in practice.

20. A summit curve is formed when an ascending gradient of 1 in 25 meets another ascending gradient of 1 in 100. Find the length or summit curve to provide the required SSD for a design speed of 80kmph.

21. List the factors Affecting SSD & OSD.

22. The design speed of overtaking vehicle is 60kmph. The rate of acceleration of the above vehicle is 3.6kmph/sec. The difference in speed between overtaking & overtaken vehicle is 20kmph. Calculate OSD as per IRC guidelines for a lane with two-way traffic.

23. Calculate the length of transition curve for a plain & rolling terrain for the following data: Design speed=80kmph, radius of curve=250m, road width=7.0m, maximum allowable rate of super elevation 1 in 150, super elevation maximum restricted to 0.07. Assume pavement is rotated with respect to center line.

24. Explain with neat sketch the 'PIEV' theory.

25. What is super elevation? Explain the steps for practical design of super elevation.

26. A valley curve is formed y a descending gradient of 1 in 25 meeting an ascending gradient of 1in30. Design the total length of valley curve, if the design speed is 100kmph so as to fulfil comfort conditions & head light sight distance for night driving assuming suitable details.

MODULE – 3

1. What are the desirable properties of soil as a highway material?
2. What are the desirable properties of aggregates? List the various tests on rod aggregates.
3. Differentiate between Bitumen and Tar. List the various tests on Bitumen.
4. Explain the following i) Bitumen emulsion ii) Cutback bitumen.
5. Explain HRB soil classification system.
6. Differentiate between Flexible and Rigid Pavement.
7. Explain CBR test procedure with neat sketch.
8. Compare Tar and Bitumen.
9. Define modulus of subgrade reaction. With the sketch explain the principal test for determining the K- value. How correction for K- value is made for different plate sizes.
10. Explain ESWL. How it is determined for dual wheel load assembly and what are its applications?
11. The properties of subgrade soil are given below:
Passing 0.074mm sieve=55%   Liquid Limit= 50%   Plastic Limit= 41%
a) classify the soil by revised PRA/HRB system.
b) discuss the suitability of the soil as a subgrade material.
12. The properties of subgrade soil are given below:
Passing 0.074mm sieve=32%   Liquid Limit= 42.5 %   Plastic Limit= 26.7 %
classify the soil by revised PRA/HRB system.
13. Calculate the GI of a sample of soil with the following data:
Passing 0.074mm sieve= 60%   Liquid Limit= 30 %   Plasticity index = 12
14. Explain procedure to find K –value (modulus of subgrade reaction)

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

15. A plate load test was conducted on a soaked subgrade during monsoon season using a plate diameter of 30cm. the load values corresponding to the mean settlement dial reading are given below. Determine the modulus of subgrade reaction for the standard plate.

Mean settlement value, mm	Load values, kg
0	0
0.24	460
0.52	900
0.76	1180
1.02	1360
1.23	1480
1.53	1590
1.76	1640

16. A plate load test was conducted in the field & the following are te readings obtained after the test. Determine the modulus of subgrade reaction if the radius of contact plate is 150mm.

Mean settlement value, mm	Load values, KN
0	0
0.05	1
0.2	5
0.6	10
0.8	15
1.05	20
1.15	25
1.30	30
1.40	35
1.50	40

17. The load penetration values of CBR tests conducted on two specimens of the soil samples are given below. Determine the CBR value of soil if 100 division of the load dial represents 190 kg of load in the Calibration chart of the proving ring.

Penetration of plunger,mm	Load dial readings, divisions	
	Specimen No. 1	Specimen No. 2
0	0	0
0.5	8	0.5
1.0	15	.5
1.5	23	2.5
2.0	29	6.0
2.5	34	13
3.0	37	20
4.0	43	30

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Hirasugar Institute of Technology, Nidasoshi.
Inculcating Values, Promoting Prosperity
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

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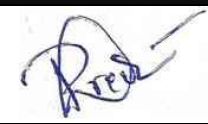**Academic Course Plan**
2022-23 (Odd)
Rev: 00

5.0	48	38
7.5	57	50
10.0	63	58
12.5	67	63

MODULE - 4

1. Write down the construction steps for WMM base course.
2. Explain the construction steps for Dry lean concrete sub base.
3. Explain the construction steps for CC Roads.
4. What do you understand by Wet Mix Macadam? What are the materials used and its requirements?
5. Explain the construction procedure for bituminous road.
6. Write the construction steps for: a) Water bound macadam. b) CC pavement.

MODULE -5

1. Explain the significance of highway drainage.
2. Indicate the different methods of subsurface drainage, with neat sketches.
3. With the help of a neat sketch, explain how the surface drainage system is provided to lower the
4. ground water table.
5. What are the quantifiable and non- quantifiable road user benefits due to construction of new highway or improvement of existing highway?
6. Briefly explain the three methods of economic evaluation of highway projects.
7. Briefly explain the various factors affecting the VOC.
8. Explain the concept of BOT and BOOT, in financing highway projects.
9. Explain the various benefits that a road user gets by the improvement of road.
10. Compare the annual cost of two types of pavement structures:
 i) WBM with thin bituminous surface at total cost of Rs. 2.2 lakhs per km, life of 5 years, interest at 10%, salvage value of Rs. 0.9 lakhs after 5 years, annual average maintenance cost of Rs. 0.35 lakhs per km and ii) BM base and BC surface, total cost of Rs. 4.2 lakhs per km, life of 15 years, interest at 8%, salvage value of Rs. 2.0 lakhs at the end of 15 years, annual average maintenance cost of Rs. 0.25 lakhs per km.
11. Write a short note on: a) Annual cost method. b) Benefit cost ratio method. c) Alligator Cracking. d) Mud pumping.

Prepared by	Checked by		
Prof. S.M.Chandrakanth	Prof. Preethi R Patil	H O D	Principal

	S J P N Trust's	Civil Engg. Dept
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	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

Subject Title	**SURVEY PRACTICE LABORATORY**		
Subject Code	18CVL57	**CIE Marks**	40
TeachingHours/Week(L.T.P)	0:2:2	**Exam Marks**	60
Credits	02	**Exam Hours**	03

FACULTYDETAILS:

Name: Prof. Shreedevi. S.Beesanakoppa	**Designation:** Asst. Professor	**Experience:** 01Years
No. of times course taught: 01	**Specialization:** Waste water & management Engineering	

1.0   **Prerequisite Subjects:**

Sl.No	Branch	Semester	Subject
01	Civil Engineering	III	Basic surveying
02	Civil Engineering	IV	Advanced surveying

2.0   **Course Objectives**

1. Apply the basic principles of engineering surveying and measurements

2. Followeffectivelyfieldproceduresrequiredforaprofessionalsurveyor

3. Use techniques, skills and conventional surveying instruments necessary for engineering practice

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.3.0   **Course Outcomes**

The student, after successful completion of the course, will be able to

CO	Course Outcomes	RBT Level	Pos
CO1	Apply the basic principles of engineering surveying and for linear and angular measurements.	L1, L2, L3	1,2,3,4,6,9,11,12
CO2	Comprehend effectively field procedure required for a professional surveyor.	L1, L2, L3	1,2,3,4,6,9,11,12
CO3	Use techniques, skills and conventional surveying instruments necessary f o r engineering Practice	L1, L2, L3	1,2,3,4,6,9,11,12
	Total Hours of instruction		**52**

4.0   **Course Content**

1 Measurements of distances using tape along with horizontal planes and slopes, direct ranging.

b) Setting out perpendiculars. Use of cross staff, optical square.

2. Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass.

3. Determination of distance between two inaccessible points using compass and 4. Determination of reduced levels of points using dumpy level/auto level (simple

5. Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling).

6. To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error.

7. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in

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	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	2022-23 (Odd)
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Rev: 00

excel. Block contour on graph paper to scale.

8. Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite.

9. Determination of horizontal distance and vertical height to a base in accessible object using theodolite by single plane and double plane method.

10. To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight.

11. Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule and Bowditch rule.

12. To locate the points using Radiation and Intersection method of Plane table surveying.

13. To solve three-point problem in plane table using Bessel's graphical solution

14. Demonstration of Minor instruments like Clinometer, Ceylon Ghattracer, Boxsextant, Hand level, Planimeter, nautical extant and Penta graph.

5.0	Relevance to future subjects

SL.No	Semester	Subject	Topics /Relevance
01	V	Extensive survey lab	Al l the experiment
02	VIII	Project work	Al l the experiment

6.0	Relevance to Real World

SL.No	Real World Mapping
02	Measurement of all the kinds of field

7.0	Books Used and Recommended to Students

Text Books
1. B.C.Punmia,"SurveyingVol.1",LaxmiPublicationspvt.Ltd.,NewDelhi– 2009.
2. Kanetkar T P and S V Kulkarni, Surveying & Levelling Part I, Pune Vidyarthi Griha Prakashan, 1988**.**
Reference Books
1. S. K. Duggal, "SurveyingVol.1",Tata Mc Graw Hill Publishing Co. Ltd. New Delhi. 2009.
2. 2. K.R.Arora, "SurveyingVol.1" Standard Book House, New Delhi.–2010.
Additional Study material &e-Books
S. K. Duggal, "SurveyingVol.1",Tata Mc Graw Hill Publishing Co. Ltd. New Delhi. 2009

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

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

Website and Internet Contents References
http://www.nptel.ac.in
Materials Science-Qualify Gate Exam
qualifygate.com/download/s%20k%20mondal/**Material**%20**Science**%20IISc.**pd**

9.0	**Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	Website
1	Materials Today-Journal-Elsevier	https://www.journals.elsevier.com/**materials**-**today**/

10.0	**Examination Note**

CIE marks:

Theoretical aspects as well as relevant circuits should be drawn neatly for questions asked in Internal Assessment.

Scheme of Evaluation for CIE (40 Marks)

(a) Continuous Assessment: **24 marks**

(b) Internal Assessment test in the same pattern as that of the main examination: **16 marks.**

Write up- 4 marks

Conduction and Result- 10 marks

Viva Voce- 2 marks

Conduct of Practical SEE:

1. Students can pick one experiment from the questions lot prepared by the examiners.

2. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

11.0	**Course Delivery Plan**

Expt No	Hour	Name of the Experiment
1	3	a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging. b) Setting out perpendiculars. Use of cross staff, optical square.

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Civil Engg. Dept
Academic Course Plan
2022-23 (Odd)
Rev: 00

2	3	Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass
3	3	Determination of distance between two inaccessible points using compass
4	3	Determination of reduced levels of points using dumpy level/auto level
5	3	Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling).
6	3	To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error
7	3	To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale.
8	3	Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite.
9	3	Determination of horizontal distance and vertical height to a base in accessible object using theodolite by single plane and double plane method.
10	3	To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight
11	3	Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule and Bowditch rule.
12	3	To locate the points using Radiation and Intersection method of Plane table surveying
13	3	To solve three point problem in plane table using Bessel's graphical solution
14	3	Demonstration of Minor instruments like Clinometer, Ceylon Ghattracer, Boxsextant, Hand level, Plan meter, nautical extant and Pantograph.

12.0   QUESTIONBANK

1] What is transit & non transit theodolite?

2] what is repetition & reiteration method? what are the errors eliminated by these

methods?

3] Define the fundamental axes of theodolite.

4] Distinguish between:

    a] Horizontal & vertical axis

    b] face left & face right observations

    c] Swing left & swing right

    d] Tangent screw & clip screw

    e] line of collimation   & axis of telescope

5] Explain various methods of prolonging a straight line when instrument is in

good condition & in bad condition.

6] What is trigonometric survey? what is the purpose for which it is used

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
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	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

7] What is single plane & Double plane method?

8] List the desired relationships between the fundamental lines of theodolite

9] Explain the relative importance of each permanent adjustment.

10] What are temporary & permanent adjustments?

11] List the different types of curves used in roads and railway lines.

12] Give the various elements of the simple circular curve and write the formulae.

13] Define compound curve & reverse curve

14] Give the reason why the reverse curve is not provided on major highways

15] What is super elevation? What is the necessity of providing super elevation?

16] What are transition curves? Give   the object of introducing the transition curve

17] what are the conditions to be fulfilled by the transition curve when introduced between the circular curve & straight?

18] why the cubic spiral is more superior than the cubic parabola?

19] What is shift of curve? What are the characteristics of shift?

20] What is autogenously curve?

21] What is Tachometer? What are the characteristics of Tachometer?

22] What is the difference between the Tachometer and stadia theodolite?

23] How do you determine the stadia constant of the instrument in the field?

24] What is analectic lens?

25] What is meant by reduction of stadia notes? What are the different methods?

Prepared by	Checked by		
Prof. Shreedevi S B	**Prof. Preethi R Patil**	**H O D**	**Principal**

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

Subject Title	**CONCRETE & HIGHWAY MATERIAL LABORATORY**		
Subject Code	18CVL38	**CIE Marks**	40
Teaching Hours/Week (L.T.P)	0:2:2	**Exam Marks**	60
Credits	02	**Exam Hours**	03

FACULTYDETAILS:

Name: Prof. V I Patil	**Designation:** Asst. Professor	**Experience:** 04Years
No. of times course taught: 01	**Specialization:** Structural Engineering	

1.0	**Pre requisite Subjects:**

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Elements of Civil Engineering and Mechanics
02	Civil Engineering	III	Strength of materials

2.0	**Course Objectives**

1. To learn the concept of the preparation of samples to perform characterization such as microstructure, volume fraction of phase sand grain size.
2. To understand mechanical behavior of various engineering materials by conducting standard tests.
3. To learn material failure modes and the different loads causing failure.
4. To learn the concepts of improving the mechanical properties of materials by different methods like heat treatment, surface treatment etc.

3.0	**Course Outcomes**

The student after successful completion of the course will be able to

CO	Course Outcome	RBT Level	POs
01	Able to interpret the experimental results of concrete and highway materials based on laboratory tests.	L1,L2,L3	1,2,3,4,6,
02	Determine the quality and suitability of cement.	L1,L2,L3	1,2,3,4,6,9
03	Design appropriate concrete mix Using Professional codes.	L1,L2,L3	1,2,3,4,6,9
04	Determine strength and quality of concrete.	L1,L2,L3	1,2,3,4,6,9
05	Evaluate the strength of structural elements using NDT techniques.	L1,L2,L3	1,2,3,4,6,9
06	Test the soil for its suitability as sub grade soil for pavements.	L1,L2,L3	1,2,3,4,6,9

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	**Academic Course Plan**
	Inculcating Values, Promoting Prosperity	
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	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

4.0   **Course Content**

PART A: Concrete lab

1. Tests on cement -Normal Consistency, Setting time, Compressive strength, Fineness by air permeability test, specific gravity.

2. Tests on Concrete-Design of concrete mix as perIS-10262, Tests on fresh concrete-slump, compaction factor and Vee Bee test, Tests on hardened concrete-compressive strength test, split tensile strength test, flexural strength test, NDT tests by re bound hammer and pulse velocity test.

3. Tests on Self Compacting Concrete-Design of self-compacting concrete, slump flow test, V-funnel test, J-Ring test, U Box test and L Box test

PART B: Highway Material Lab

1. Tests on Aggregates-Aggregate Crushing value, Los Angeles abrasion test, Aggregate impact test, Aggregate shape tests (combined index and angularity number)

2. Tests on Bituminous Materials-Penetration test, Ductility test , Softening point test, Specific gravity test, Viscosity test by tarvisco meter, Bituminous Mix Design by Marshal Method (Demonstration only)

3. Tests on Soil-Wet sieve analysis, CBR test

5.0   **Relevance to future subjects**

SL.No	Semester	Subject	Topics /Relevance
01	VI	Concrete and Highway Materials Laboratory	Analysis &Design of materials
02	VIII	Project work	Generation of components for project

6.0   **RelevancetoRealWorld**

SL.No	Real World Mapping
01	Testing of Materials by using various equipment.
02	Heat treatment procedure

Department of Civil Engineering   48

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
	Inculcating Values, Promoting Prosperity	
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi	**2022-23 (Odd)**
	Recognized under 2(f) & 12B of UGC Act, 1956	
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	**Rev: 00**

7.0	**Books Used and Recommended to Students**

Text Books
1. Smith, Foundations of Materials Science and Engineering, 4thEdition, McGrawHill,2009.
2. William D. Callister, Material science and Engineering and Introduction, Wiley, 2006.
Reference Books
1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual",
7. Nem Chand Bros, Roorkee.
8. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi. ASM Handbooks, American Society of Metals.
Additional Study material & e-Books
A text book of Materials Science and Engineering by William Callister

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

Website and Internet Contents References
http://www.nptel.ac.in
Materials Science-Qualify Gate Exam
qualifygate.com/download/s%20k%20mondal/**Material**%20**Science**%20IISc.**pd**

9.0	**Magazines/Journals Used and Recommended to Students**

Sl.No	Magazines/Journals	Website
1	Materials Today-Journal-Elsevier	https://www.journals.elsevier.com/**materials**-**today**/
2	Journal of Materials Engineering and Performance-Springer	www.springer.com › Home › Materials › Characterization & Evaluation of Materials

10.0	**Examination Note**

CIE marks:

Theoretical aspects as well as relevant circuits should be drawn neatly for questions asked in Internal Assessment.

Scheme of Evaluation for CIE (40 Marks)

(a) Continuous Assessment: **24 marks**

(b) Internal Assessment test in the same pattern as that of the main examination: **16 marks.**

        Write up- 4 marks

        Conduction and Result- 10 marks

        Viva Voce- 2 marks

Conduct of Practical SEE:

1. Students can pick one experiment from the questions lot prepared by the examiners.
2. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

	S J P N Trust's	Civil Engg. Dept
	Hirasugar Institute of Technology, Nidasoshi.	Academic Course Plan
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11.0   Course delivery plan

Exp No	Hour	Name of the Experiment
1	3	Tests on cement -Normal Consistency, Setting time
2	3	Tests on cement - Fineness by air permeability test, specific gravity.
3	3	Tests on Concrete-Design of concrete mix as per IS-10262
4	3	Tests on fresh concrete-slump, compaction factor and Vee Bee test
5	3	Tests on hardened concrete-compressive strength test
6	3	Tests on hardened concrete split tensile strength test, flexural strength test
7	3	NDT tests by re bound hammer and pulse velocity test
8	3	Tests on Self Compacting Concrete-Design of self-compacting concrete
9	3	Tests on Aggregates- Aggregate Crushing value, Los Angeles abrasion test, Aggregate impact test,
10		Aggregate shape tests (combined index and angularity number)
11	3	Tests on Bituminous Materials-Penetration test, Ductility test, Softening point test, Specific gravity test
12	3	Viscosity test by tarvisco meter, Bituminous Mix Design by Marshal Method (Demonstration only)
13	3	Tests on Soil-Wet sieve analysis, CBR test

12.0   QUESTIONBANK

01. Explain the procedure of Normal consistency of cement.
02. Explain initial setting time and final setting time of cement.
03. Define slump.
04. Define specific gravity.
05. Perform mix design of the concrete using IS 10262.
06. Explain the tests on bituminous materials.
07. Explain the tests on soils.
08. Explain various tests on aggregates.
09. Explain nondestructive tests on concrete.
10. Explain parameters of concrete.
11.

Prepared by	Checked by		
Prof. Vishwanath I. Patil	Prof. Preethi R Patil	H O D	Principal