



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

Civil Engg. Dept

Academic
Course Plan

2022-23 (Odd)

Rev: 00

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.*



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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.*




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Theory – Course Plans and Question Bank		
01.	Transform Calculus, Fourier Series & Numerical Techniques	21MAT31 01 - 09
02.	Geodetic Engineering	21CV32 10 - 20
03.	Strength of Materials	21CV33 21 - 28
04.	Earth Resources & Engineering	21CV34 29 - 35
Laboratory / Other – Course Plan		
05	Computer Aided Building Planning and drawing	21CVL35 36 - 42
06	Social Connect and Responsibility	21UH36 43 - 45
07	Fire Safety in Buildings (Ability Enhancement Course-III)	21CV385 46 - 50
08	Constitution of India and Professional Ethics	21CIP37 --
09	National Service Scheme / Physical Education / Yoga	21NS/PE/YO83 --
10	Additional Mathematics – I (for Lateral Entry Students)	21MATDIP31 51 - 57



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

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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	Specialization	Professional Membership	Teaching Exp (In yrs.)	Phone No.
01	Prof. S.M.Chandrankanth	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



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4.0

Institute Academic Calendar

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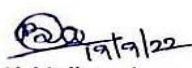
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CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2022-23 (Odd)


Date	Events	September-2022																																																																																																																																																																																																																																																																			
19-09-2022	Commencement of Classes for VII Semester	S M T W T F S 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																																																																																																																																																																																																																																																																			
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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 1 st 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 2 nd Internal Assessment Marks and submission of Feedback-II of VII Semester & Display of 1 st Internal Assessment Marks and submission of Feedback-I of III/V Semester to office																																																																																																																																																																																																																																																																				
10-12-2022	Human Rights Day																																																																																																																																																																																																																																																																				
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23-12-2022 & 24-12-2022	First Lab Internal Assessment for III Semester (PCC+AEC)																																																																																																																																																																																																																																																																				
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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																																																																																																																																																																																																																																																																				
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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																																																																																																																																																																																																																																																																				
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Dr. B. V. Madiggond
Dean (Academics)


Dr. S. C. Kamate
Principal


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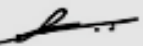
5.0 Department Academic Calendar

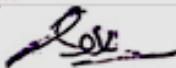
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DEPARTMENT OF CIVIL ENGINEERING CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2022-23 (ODD Sem)

Date	Events	September-2022						
19-09-2022	Commencement of Classes for VII Semester	S M T W T F S						
24-09-2022	NSS Foundation Day	4 5 6 7 8 9 10						
02-10-2022	Gandhi Jayanthi	11 12 13 14 15 16 17						
10-10-2022	Commencement of Classes for V Semester	18 19 20 21 22 23 24						
24-10-2022 to 30-10-2022	Traffic Week	25 26 27 28 29 30						
27-10-2022 to 29-10-2022	First Internal Assessment for VII Semester	October-2022						
31-10-2022	Feedback -I on Teaching-Learning for VII Semester	S M T W T F S						
31-10-2022	National Integration Day	2 3 4 5 6 7 8						
31-10-2022	Commencement of Classes for III Semester	9 10 11 12 13 14 15						
01-11-2022	Kannad Rajyothsava	16 17 18 19 20 21 22						
03-11-2022	Display of 1 st Internal Assessment Marks and submission of Feedback-I of VII Semester to office	23 24 25 26 27 28 29						
09-11-2022 to 18-11-2022	Environment Awareness Month	30 31						
22-11-2022	World's Aids Day	04- Mahanavami, Ayudhapooja 05- Vijayadashami 24- Naraka Chaturdashi, 26- Balipudyami Deepavalli						
26-11-2022	First Assignment Submission of III Semester (PCC + IPCC)	November-2022						
28-11-2022 to 30-11-2022	Second Internal Assessment for VII Semester & First Internal Assessment for III (PCC + IPCC) /V Semester	S M T W T F S						
01-12-2022	Feedback -II on Teaching-Learning for VII Semester & Feedback - I on Teaching-Learning for III/V Semester	6 7 8 9 10 11 12						
06-12-2022	Display of 2 nd Internal Assessment Marks and submission of Feedback-II of VII Semester & Display of 1 st Internal Assessment Marks and submission of Feedback-I of III/V	13 14 15 16 17 18 19						
10-12-2022	Human Rights Day	20 21 22 23 24 25 26						
10-12-2022	Sports Day	27 28 29 30						
23-12-2022 & 24-12-2022	First Lab Internal Assessment for III Semester (PCC+AEC)	01- Kannada Rajyothsava, 11- Kanakadasa Jayanti						
26-12-2022 & 27-12-2022	Lab Internal Assessment for VII Semester	December-2022						
29-12-2022 to 31-12-2022	Third Internal Assessment for VII Semester & Second Internal Assessment for III (PCC + IPCC) /V Semester	S M T W T F S						
31-12-2022	Last working day for VII Semester	4 5 6 7 8 9 10						
02-01-2023	Feedback -II on Teaching-Learning for III/V Semester	11 12 13 14 15 16 17						
05-01-2023	Display of Final IA Marks of VII Semester	18 19 20 21 22 23 24						
05-01-2023	Display of 2 nd Internal Assessment Marks and submission of Feedback-II of III/V Semester to office	25 26 27 28 29 30 31						
07-01-2023	Second Assignment Submission of III Semester (PCC + IPCC)	22-Visit to Hot Mix Plant						
12-01-2023	National Youth Day	January-2023						
15-01-2023	NSS Day	S M T W T F S						
20-01-2023 & 21-01-2023	Lab Internal Assessment for V Semester	1 2 3 4 5 6 7						
23-01-2023 to 25-01-2023	Third Internal Assessment for V Semester	8 9 10 11 12 13 14						
26-01-2023	Republic Day	15 16 17 18 19 20 21						
27-01-2023	Last working day for V Semester	22 23 24 25 26 27 28						
30-01-2023 to 01-02-2023	Second Lab Internal Assessment for III Semester (PCC+IPCC+AEC)	29 30 31						
31-01-2023	Display of Final IA Marks of V Semester	06-Technical Tour, 13- Road Safety Campaign & Club Activity, 16- Seminar on Waste Water Management Systems 14-Makara Sankranti, 26- Republic Day						
06-02-2023 to 08-02-2023	Third Internal Assessment for III Semester (PCC)	February-2023						
11-02-2023	Last working day for III Semester	S M T W T F S						
14-02-2023	Display of Final IA Marks of III Semester	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 Engineering 18- Mahashivaratri						


 Prof. Sudarshan V. Jore
 FACE Coordinator


 Prof. S.M.Chandrankanth
 HOD


 Dr. S. C. Kamate
 Principal



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6.0 Scheme of Teaching & Examination

III SEM

B.E: Civil Engineering

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI B.E. in Civil Engineering Scheme of Teaching and Examinations 2021 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2021 - 22)											
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III SEMESTER												
Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination			Credits	
				Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
				L	T	P	S					
1	BSC 21MAT31	Transform Calculus, Fourier Series and Numerical Techniques (Common to all)	TD- Maths PSB- Maths	2	2	0	0	03	50	50	100	3
2	IPCC 21CV32	Geodetic Engineering	TD: Civil Engg PSB: Civil Engg	2	2	2	0	03	50	50	100	4
3	IPCC 21CV33	Strength of Materials	TD: Civil Engg PSB: Civil Engg	2	2	2	0	03	50	50	100	4
4	PCC 21CV34	Earth Resources and Engineering	TD: Geology PSB: Geology	3	0	0	0	03	50	50	100	3
5	PCC 21CVL35	Computer Aided Building Planning and Drawing	TD: Civil Engg PSB: Civil Engg	0	0	2	0	03	50	50	100	1
6	UHV 21UH30	Social Connect and Responsibility	Any Department	0	0	2	0	01	50	50	100	1
7	HSMC 21KSK37/47	Samskrutika Kannada	TD and PSB HSMC	0	2	0	0	01	50	50	100	1
	HSMC 21KBK37/47	Balake Kannada										
	OR											
	HSMC 21CIP37/47	Constitution of India and Professional Ethics										
8	AEC 21CV38X	Ability Enhancement Course - III	TD: Concerned department PSB: Concerned Board	If offered as Theory Course				01	50	50	100	1
				0	2	0						
				if offered as lab. course				02				
				0	0	2						
Total									400	400	800	18

9	Scheduled activities for III to VIII semesters	NCMC 21NSB3	National Service Scheme (NSS)	NSS	All students have to register for any one of the courses namely National Service Scheme, Physical Education (PE)(Sports and Athletics), and Yoga with the concerned coordinator of the course during the first week of III semester. The activities shall be carried out between III semester to VIII semester (for 5 semesters). SEE in the above courses shall be conducted during VIII semester examinations and the accumulated CIE marks shall be added to the SEE marks. Successful completion of the registered course is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities.							
		NCMC 21PEB3	Physical Education (PE)(Sports and Athletics)	PE								
		NCMC 21YOB3	Yoga	Yoga								

Course prescribed to lateral entry Diploma holders admitted to III semester B.E./B.Tech programs

1	NCMC 21MATDIP31	Additional Mathematics - I	Maths	02	02	--	--	---	100	---	100	0
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Note: BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, INT – Internship, HSMC: Humanity and Social Science & Management Courses, AEC – Ability Enhancement Courses. UHV: Universal Human Value Course.

L – Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination. TD- Teaching Department, PSB: Paper Setting department

21KSK37/47 Samskrutika Kannada is for students who speak, read and write Kannada and **21KBK37/47** Balake Kannada is for non-Kannada speaking, reading, and writing students.

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching-Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the



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21INT49 Inter/Intra Institutional Internship: All the students admitted to engineering programs under the lateral entry category shall have to undergo a mandatory 21INT49 Inter/Intra Institutional Internship of 03 weeks during the intervening period of III and IV semesters. The Internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the IV semester grade card. The Internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the Internship shall be declared fail and shall have to complete during subsequently after satisfying the Internship requirements. The faculty coordinator or mentor shall monitor the students' Internship progress and interact with them for the successful completion of the Internship.

Non-credit mandatory courses (NCMC):**(A) Additional Mathematics I and II:**

(1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and have no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory.

(B) National Service Scheme/Physical Education (Sport and Athletics)/ Yoga:

(1) Securing 40 % or more in CIE, 35 % or more marks in SEE, and 40 % or more in the sum total of CIE + SEE leads to successful completion of the registered course.

(2) In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University.


(3) In case, any student fails to register for NSS, PE or Yoga/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks.

(4) Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.

(5) These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

Ability Enhancement Course - III

21CV381	Problem Solving using Python	21CV384	Infrastructure Finance
21CV382	Microsoft Excel and Visual Basic for Application	21CV385	Fire Safety in Buildings
21CV383	Personality Development and Soft Skills		

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Subject Title	Transform Calculus, Fourier Series and Numerical Techniques		
Subject Code	21MAT31	IA Marks	50
Number of Lecture Hrs /	04	Exam Marks	50
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. S. A. Patil	Designation: Asst. Professor	Experience: 12
No. of times course taught: 01		Specialization: Mathematics

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Electronics and Communication Engineering	II	Advanced Calculus & Numerical Methods

2.0 Course Objectives


Course Learning Objectives:

- To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z- Transforms.
- To develop the proficiency in variation calculus and solving ODE's arising in engineering applications, using numerical methods.

3.0 Course Outcomes

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

Course Code	Course Outcome	RBTL	POs
C201.1	Use Laplace transform and inverse Laplace transform in solving differential/integral equation arising in network analysis, control systems and other fields of engineering	L1,L2	1,2,3,12
C201.2	Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field	L1, L2	1,2,3,12
C201.3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations	L1, L2	1,2,3,12
C201.4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations	L1, L2	1,2,3,12
C201.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibration analysis.	L1,L2,L3	1,2,3,12
Total Hours of instruction		40	

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Course Content

Module-1: Laplace Transform:

Definition and Laplace transforms of elementary functions (statements only). Problems on Laplace's Transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$. Laplace transforms of Periodic functions (statement only) and unit-step function – problems.

Inverse Laplace Transform: Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Laplace transforms of derivatives, solution of differential equations.

Self-study: Solution of simultaneous first-order differential equations. **(8 Hours)**

Module -2: Fourier Series:

Introduction to infinite series, convergence and divergence. Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.

Self-study: Convergence of series by D'Alembert's Ratio test and, Cauchy's root test. **(8 Hours)**

Module -3: Infinite Fourier Transforms and Z-Transforms

Infinite Fourier transforms definition, Fourier sine and cosine transforms. Inverse Fourier transforms, Inverse Fourier cosine and sine transforms. Problems. Difference equations, z-transform-definition, Standard z-transforms, Damping and shifting rules, Problems. Inverse z-transform and applications to solve difference equations.

Self Study: Initial value and final value theorems, problems.

Module -4: Numerical Solution of Partial Differential Equations


Classifications of second-order partial differential equations, finite difference approximations to derivatives, Solution of Laplace's equation using standard five-point formula. Solution of heat equation by Schmidt explicit formula and Crank- Nicholson method, Solution of the Wave equation. Problems. **(8 Hours)**

Self Study: Solution of Poisson equations using standard five-point formula.

Module -5: Numerical Solution of Second-Order ODEs and Calculus of Variations

Second-order differential equations - Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae). Calculus of Variations: Functionals, Euler's equation, Problems on extremals of functional. Geodesics on a plane, Variational problems. **(8 Hours)**

Self Study: Hanging chain problem

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5.0 Relevance to future subjects

Sl. No.	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Signal and Analysis, Field Theory, Thermodynamics, Fluid Dynamics etc

6.0 Relevance to Real World


Sl. No	Real World Mapping
01	Numerical methods are used to solve engineering problems. For examples will be drawn from a variety of engineering problems, including heat transfer, vibrations, dynamics, fluid mechanics, etc.
02	Laplace transform are used in various areas of physics, electrical engineering, control engineering, optics, mathematics and signal processing. Laplace Transform is widely used by electronic engineers to solve quickly differential equations occurring in the analysis of electronic circuits
03	Fourier series is that very little information is lost from the signal during the transformation. The Fourier transform maintains information on amplitude, harmonics, and phase and uses all parts of the waveform to translate the signal into the frequency domain.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Calculus of Variations

8.0 Books Used and Recommended to Students

Text Books
1. B.S. Grewal, Higher Engineering Mathematics, 44 th Edition 2018, Khanna Publishers. 2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2016. 3. Srimanta Pal et al Engineering Mathematics, 3rd Edition, 2016, Oxford University Press.
Reference Books
1. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11 th Ed. 2. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press, 3 rd Reprint, 2016. 3. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition. 4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co. New York, Latest ed. 5. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", McGraw Hill Education (India) Pvt. Ltd 2015. 6. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication (2014). 7. James Stewart: "Calculus" Cengage publications, 7 th edition, 4 th Reprint 2019.

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

Website and Internet Contents References

Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>
4. VTU Edusat Programme
5. VTU e-Shikshana Program
6. <http://www.bookstreet.in>.

10.0

Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	+ Plus Magazine	https://plus.maths.org/issue44 .
2	Mathematics Magazine	www.mathematicsmagazine.com

11.0

Examination Note

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Three Unit Tests each of 20 Marks (duration 01 hour)
2. First test at the end of 5th week of the semester
3. Second test at the end of the 10th week of the semester
4. Third test at the end of the 15th week of the semester.

Two assignments each of 10 Marks

5. First assignment at the end of 4th week of the semester
6. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**
7. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks** (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

Semester End Examination:

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

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



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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

Mathematics. Dept


**Academic
Course Plan**

2022-23 (Odd)

Rev: 00

12.0 Course Delivery Plan

Module No.	Lecture No.	Content of Lecturer	% of Portion
1	1	Definition, transforms of elementary functions & Properties	20
	2	Problems	
	3	Periodic function	
	4	Unit step function & Problems	
	5	Inverse Laplace Transforms	
	6	Convolution theorem	
	7	Solution of linear differential equations using Laplace Transforms	
	8	Problems	
2	9	Introduction to infinite series	20
	10	convergence and divergence	
	11	Introduction, Periodic functions, Dirichlet's conditions	
	12	Fourier series of periodic functions of period 2π & Problems	
	13	Fourier series of periodic functions of arbitrary period $2l$ & Problems	
	14	Fourier series of even & odd functions	
	15	Half range Fourier series & Problems	
	16	Practical harmonic analysis	
3	17	Introduction, Infinite Fourier transform	20
	18	Fourier sine transforms & Problems	
	19	Fourier cosine transforms & Problems	
	20	Inverse Fourier transforms & Problems	
	21	z-transform-definition & Standard z-transforms	
	22	Initial value and final value theorems (without proof) and problems	
	23	Inverse z-transform & Problems	
	24	Applications of z-transforms to solve difference equations	
4	25	Classifications of second-order partial differential equations	20
	26	Finite difference approximations to derivatives	
	27	Solution of Laplace's equation using standard five-point formula.	
	28	Problems.	
	29	Solution of heat equation by Schmidt explicit formula	
	30	Solution of heat equation by Crank- Nicholson method	
	31	Solution of the Wave equation	
	32	Problems.	
5	33	Numerical solution of second order ordinary differential equations	20
	34	Runge -Kutta method & Problems.	
	35	Milne's method & Problems.	
	36	Problems.	
	37	Calculus of Variations: Variation of function & Functional, variation problems	
	38	Euler's equation	
	39	Problems	
	40	Geodesics and problems	

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13.0 Assignments

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

14.0 QUESTION BANK

Module-1: Laplace Transform

- Find the Laplace Transform of $\sin 2t \sin 3t$. & $\sin^3 2t$.
- Find $L(e^3 t \sin 2t)$ & $L(e^{4t} \sin 2t \cos t)$.
- Find $L\left(\frac{1-e^t}{t}\right)$ & $L\left[\frac{\cos at - \cos bt}{t}\right]$
- Using unit step function find LT of $f(t) = \begin{cases} \sin t, & 0 < t < \pi \\ \sin 2t, & \pi < t < 2\pi \\ \sin 3t, & t > 2\pi \end{cases}$
- Express $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \cos 2t, & \pi < t < 2\pi \\ \cos 3t, & t > 2\pi \end{cases}$ in terms unit step function & hence find LT
- Evaluate $L[t^2 u(t-3)]$.
- Find the inverse transform $\frac{s+2}{s^2-4s+13}$.
- Find $L^{-1}\left(\frac{4s+5}{(s-1)^2(x+2)}\right)$
- Find $L^{-1}\left(\frac{s}{s^4+4a^4}\right)$.
- Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$.
- Find $L^{-1}\left[\log \frac{(s+1)}{(s-1)}\right]$



12. Find $L^{-1} \left[\frac{s}{(2s-1)(3s-1)} \right]$
13. Using the Convolution THM obtain the $L^{-1} \left[\frac{s}{(s^2+a^2)^2} \right]$.
14. Solve the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3t}$ with $y(0) = 0 = y'(0)$, using LT
15. Solve the differential equation $y'' + 4y' + 3y = e^{-t}$, $y(0) = 1 = y'(0)$. Using LT

Module-2: Fourier series

- Obtain a Fourier series to represent e^{-ax} from $(-\pi, x)$
- Expand $f(x) = x \sin x$, $0 < x < 2$, in a Fourier series.
- For a function $f(x)$ defined by $f(x) = |x|$, $-\pi < x < \pi$, obtain a Fourier series. Deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} = \frac{\pi^2}{8}$$

- Find the Fourier series for the function $f(x) = \frac{\pi-x}{2}$ in $(0, 2\pi)$.

Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots$

- Find the Fourier series to represent $f(x) = x + x^2$ from $x = -\pi$ to $x = \pi$ and deduce that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} = \frac{\pi^2}{12}$$

- Expand $f(x) = e^{-x}$ as a Fourier series in the interval $(-l, l)$

- Obtain Fourier series for the function

$$f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2-x), & 1 \leq x \leq 2 \end{cases} \quad \text{and deduce that } \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$$

- Develop $f(x)$ in Fourier series in the interval $(-2, 2)$ if $f(x) = \begin{cases} 0, & -2 < x < 0 \\ 1, & 0 < x < 2 \end{cases}$

- Find the half range cosine series for the function $f(x) = x^2$ in the range $0 \leq x \leq 1$

- Find the complex form of the Fourier series of the periodic function $f(x) = \cos ax$, in $-\pi < x < \pi$.

- The following table gives the variation of periodic current over a period

t sec	0	T/6	T/3	T/2	2T/3	5T/6	T
A amp	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of the first harmonic.

- Obtain the Fourier expansion of $f(x) = 2x - x^2$ in $0 \leq x \leq 2$
- Obtain the constant term and the coefficient of the first sine and cosine terms in the Fourier expansion of y as given below.

x	0	1	2	3	4	5
y	9	18	24	28	26	20


Module-3: Infinite Fourier Transforms and Z-Transforms

- Find the Fourier transform of

$$f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases} \quad \text{Hence evaluate } \int_0^{\infty} \frac{\sin x}{x} dx$$

- Find the Fourier transform of the function


$$f(x) = \begin{cases} x, & |x| \leq \alpha \\ 0, & |x| > \alpha \end{cases} \quad \text{Where } \alpha \text{ is a positive constant?}$$

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3. Find the Fourier transform of $\cos ax^2$
 4. Find the Fourier sine transform of $e^{-ax/x}$
 5. Find the Fourier sine and cosine transform of $f(x) = \begin{cases} 1, & 0 \leq x < a \\ 0, & x \geq a \end{cases}$
 6. Find the finite Fourier sine and cosine transform of $f(x) = 2x, 0 < x < 4$.
 7. Find the cosine transform of $f(x) = \frac{1}{1+x^2}$
 8. Find the Fourier sine transform of $e^{-|x|}$
 9. Find the Fourier transform of $f(x) = \begin{cases} a^2-x^2, & |x| < a \\ 0, & |x| > a \end{cases}$ and Evaluate $\int_0^\infty \frac{\sin x - x \cos x}{x^3} dx$.
 10. Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}, a > 0$.
 11. Find the Fourier cosine transform of $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$.
 12. Find the Fourier transform of $f(x) = e^{-|x|}$ and Evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$.
 13. Find the Fourier transform of $f(x) = e^{-|x|}$ and Evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$.
- P.T. $z_T(n^2) = \frac{z^2+z}{(z-1)^3}$
14. P.T. $z_T(n^3) = \frac{z^3+4z^2+2}{(z-1)^4}$
 15. P.T. $z_T(\cos \theta) = \frac{z(z-\cos \theta)}{z^2-2z \cos \theta+1}$
 16. P.T. $z_T(\sin \theta) = \frac{(z \sin \theta)}{z^2-2z \cos \theta+1}$
 17. P.T. $z_T(a^n \cos n \theta) = \frac{z(z-a \cos \theta)}{z^2-2az \cos \theta+a^2}$
 18. Find the Z-transform of $\cos hn \theta$ & $\sin hn \theta$.
 19. Find the Z-transform of $(n+1)^2$
 20. Using the inversion integral method find the inverse Z-transform of $\frac{3z}{(z-1)(z-2)}$
 21. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using Z-transform
 22. Solve the difference equation $y_{n+2} + 2y_{n+1} + y_n = n$ with $y_0 = y_1 = 0$ using Z-Transform.
 23. Obtain the z-transform of $\cos n \theta$ and $\sin n \theta$
 24. Find the Inverse z-transform of $\frac{2z^2+3z}{(z+2)(z-4)}$.
 25. If $\bar{u}(z) = \frac{2z^2+3z+12}{(z-1)^4}$, find the value of u_0, u_1, u_2, u_3 .
 26. Solve the difference equation $u_{n+2} + 6u_{n+1} + 9u_n = 2^n, u_0 = u_1 = 0$.

Module -4: Numerical Solution of Partial Differential Equations

1. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5, t \geq 0$ given that $u(x, 0) = 20, u(0, t) = 0, u(5, t) = 100$. Compute u for the time step with $h = 1$ by Crank Nicholson method.
2. Find the solution of the parabolic equation $u_{xx} = 2u_t$ when $u(0, t) = 0 = u(4, t) = 0$ and $u(x, 0) = x(4-x)$, taking $h = 1$. Find the values up to $t = 5$.
3. Solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ with the conditions $u(0, t) = 0, u(x, 0) = x(1-x)$ and $u(1, t) = 0$. Assume $h = 0.1$. Tabulate u for $t = k, 2k$ and $3k$ choosing an appropriate value of k .
4. Solve the boundary value problem $u_{tt} = u_{xx}$ with the conditions $u(0, t) = u(1, t) = 0, u(x, 0) =$

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$\frac{1}{2}x(1-x)$ and $u_t(x, 0) = 0$, taking $h = k = 0.1$ for $0 \leq t \leq 0.4$. Compare your solution with the exact solution at $x = 0.5$ and $t = 0.3$.

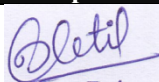
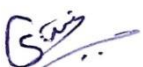


5. Solve $y_{tt} = y_{xx}$ upto $t = 0.5$ with a spacing of 0.1 subject to $y(0, t) = 0, y(1, t) = 0, y_t(x, 0) = 0$ and $y(x, 0) = 10 + x(1-x)$. Solve the equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in Fig. Iterate until the maximum difference between the successive values at any point is less than 0.001.


Module -5: Numerical Methods and Calculus of Variation

- Use R- K method to solve $y = xy'^2 - y^2$ for $x = 0.2$ correct to 4 decimal places. $y(0) = 1$ & $y'(0) = 0$
- Evaluate $y(0.2)$ by RK method given that $y'' - x(y')^2 + y^2 = 0, y(0) = 1, y'(0) = 0$
- Given $y'' - xy' - y = 0$ with the initial conditions $y(0)=1, y'(0)=0$. Compute $y(0.2)$ and $y'(0.2)$ by taking $h=0.2$ and using fourth order Runge Kutta method.
- Obtain the solution of the equation $2 \frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}$ at the point $x = 1.4$ by applying Milne's method given that $y(1) = 2, y(1.1) = 2.2156, y(1.2) = 2.4649, y(1.3) = 2.7514, y'(1) = 2, y'(1.1) = 2.3178, y'(1.2) = 2.6725$ and $y'(1.3) = 3.0657$.
- Using R-K method of order four, solve $y'' = y + xy', y(0) = 1, y'(0)$ to find $y(0.2)$ & $y'(0.2)$.
- Show that the Geodesics on a plane are straight line.
- Find the Geodesics on a right circular cylinder of radius a.
- Find the extremals of the functional $\int_{x_0}^{x_1} \frac{(y')^2}{x^3} dx$
- Show that the shortest distance between any two points in a plane is a straight line.
- Prove that Catenaries' is the curve which when rotated about a line generates a surface of minimum area.
- Find the extremely of the functional $\int_0^\pi (y'^2 - y^2 + 4y \cos x) dx; y(0) = 0 = y(\pi)$
- Solve the variation problem $\delta \int_1^2 (x^2(y')^2 + 2y(x+y)) dx = 0$, given $y(1) = y(2) = 0$
- Find the path on which a particle in the absence of friction will slide from one point to another in a shortest time under the action of gravity.
- Find the curve passing through the point (x_1, y_1) and (x_2, y_2) which when rotated about the x axis gives the minimum surface area.
- Find the curve on which the functional $\int_0^1 (y'^2 + 12xy) dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremised.

16.0 University Result

Examination	FCD (S+, S, A)	FC (B)	SC (C, D, E)	% Passing
Jan 2019	08	10	19	86.05
Jan 2018	09	04	20	89.18

Prepared by	Checked by		
			
Prof. S. A. Patil	Dr. S. L. Patil	HOD	Principal

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Subject Title	GEODETIC ENGINEERING		
Subject Code	21CV32	IA Marks	50
Number of Lecture Hrs / Week	2:2:2:0	Exam Marks	50
Total Number of Lecture Hrs	50	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

2.0 Course Objectives


This course will enable students to;

1. Understand the concept of surveying, fundamentals and application of Surveying in Civil Engineering.
2. Provide basic knowledge about principles of surveying for location, design and construction of engineering projects.
3. Develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass.
4. Make students to familiar with cooperative efforts required in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works.
5. Provide information about new technologies that are used to abstracting the information of Earth surface.

3.0 Course Outcomes

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

CO	Course Outcome	Cognitive Level	POs
C302.1	Understand Basics, Principles of Surveying & measuring units (linear and angular), conventional surveying data capturing techniques and process the data for computations.	L1, L2, L3, L4	1,2,3,4,6,8,12
C302.2	Measurement of vertical and horizontal plane, linear measurements with use of levels to arrive at solutions to basic surveying problems. Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours.	L1, L2, L3, L4	1,2,3,4,6,8,12
C302.3	Theodolite Surveying, measure horizontal and vertical angles by theodolite, determining elevations by trigonometric leveling. Understand tacheometry, apply principles for distances and elevation measurements. Explain Geodetic survey & principle of triangulation. Compute linear and angular methods required for setting out curves.	L1, L2, L3, L4, L5	1,2,3,4,6,8,12
C302.4	Compute linear and angular methods required for setting out curves and Design proper types of curves for deviating type of alignments.	L1, L2, L3, L4, L5	1,2,3,4,5,6,8,12
C302.5	Apply the concept of aerial photogrammetry (vertical and tilted photographs) to determine topographical coordinates. Explain the concepts of advanced data capturing methods, Modern Surveying Instruments, Remote sensing & GIS concepts for Surveying.	L1, L2, L3, L4, L5	1,2,3,4,5,6,8,12
Total Hours of Instruction		50	

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4.0 Course Content

Module-1

Introduction to Surveying: Importance of surveying in Civil Engineering, Concepts of plane and geodetic Surveying Principles of surveying – Plans and maps – Surveying equipment's, Meridians, Bearings, Dip, Declination, Local attraction, Calculation of bearings and included angles. Compass surveying and Plane Table Surveying.

Compass surveying: Prismatic and surveyor's compasses, temporary adjustments.

Plane Table Surveying: plane table and accessories, advantages and disadvantages of plane table survey, method of plotting-radiation, intersection, traversing, resection, two point and three-point method.

Module-2

Levelling – Principles and basic definitions – Types of Levels – Types of adjustments and objectives – Types of levelling – Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning – Booking of levels – Rise & fall and H. I methods (Numerical)

Areas and volumes: Measurement of area – by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpsons one third rule, area from co-ordinates, introduction to planimeter, digital planimeter. Measurement of volumes-trapezoidal and prismatic formula.

Module-3

Theodolite Surveying: Theodolite and types, fundamental axes and parts of theodolite, temporary adjustments of transit theodolite, Horizontal and Vertical angle measurements by repetition and reiteration.

Trigonometric levelling: Single and Double plane for finding elevation of objects Computation of distances and elevations using Tacheometric method.

Module-4

Curve Surveying: Curves – Necessity – Types, Simple curves, Elements, Designation of curves, setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (numerical problems).

Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems).

Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius).

Transition curves Characteristics, numerical problems on Length of Transition curve,

Vertical curves –Types – (theory).


Module-5

Photogrammetry and aerial survey: Introduction, definitions, basics principles, methods, importance of scale, height, applications.

Remote sensing: Introduction, Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, LIDAR, visual and digital image processing and its applications.

Global Positioning System: Definition, Principles of GPS and applications. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications

Advanced instrumentation in surveying: classification, measuring principles, electronic theodolite, EDM, Total Station, Drones

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5.0 Relevance to future subjects


Sl No	Semester	Subject	Topics
01	V	Transportation Engineering	Highway Development and Planning, Road Alignment and Surveys, Highway Geometric Design of horizontal alignment elements
02	VI	Railways, Harbours, Tunnelling and Airports	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.
05	VII	Quantity Survey and Contract Management	Quantity Estimation for Buildings, Roads, Manholes, Septic tanks, Culverts and Canals etc..
06	VII	Pavement Design	Geometric design of Rigid and flexible pavements.

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	To investigate the ground nature in surveying, to get the knowledge of ground profile.
02	Principles and techniques of surveying can be applied before any constructions. Easy to measure the horizontal distances of any land.
03	Compass can be used for detailed measurement of bearings and directions on the fields. Easy to identify the directions of land by using compass.
04	Before any constructions we can apply methods of leveling. To understand the principles & techniques of theodolite surveying in capturing ground measurements
05	Theodolite survey gives the accuracy and precision of work. Easy to measure the horizontal and vertical angles, distances of land.
06	Theodolite survey gives the accuracy and precision of work, to find elevations of points. Tacheometry can be used for indirect measurement of distances on the fields.
07	Students are able to design curves and setting out various types of curves on ground.
08	With help of arithmetic equations to calculate the areas and volume of all type of land. By using contours easy to determine the storage capacity of water bodies.
09	Before any constructions we can apply methods of aerial photogrammetry for landscaping. Easy to Measure, calculations of earth and celestial coordinates for large areas.
10	By using aerial photogrammetry to conduct aerial survey. Use of advance instruments (EDM, Total Station, LiDAR & Drone Survey) & RS & GIS for surveys.

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
03	Survey Pr Lab	Field Practical's helps in understanding concepts of field measurements

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8.0 Books Used and Recommended to Students

Suggested Learning Resources: Books

1. B.C. Punmia, "Surveying Vol.1, 2 & 3", Laxmi Publications pvt. Ltd., New Delhi seventeenth edition (2016)
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part 1& 2, Pune Vidyarthi Griha Prakashan
3. GopiSatheesh, R.Sathikumar, N. Madhu, "Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Pearson 2017
3. S.K. Duggal, "Surveying Vol. I & II", Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition (2017).
4. R Subramanian, Surveying and Levelling, Second edition, Oxford University Press, New Delhi.
5. Schofield and Breach, "Engineering Surveying" 6th edition, Butterworth-Heinemann (Elsevier publication, 2007)
6. A Banister, S Raymond, R Baker, "Surveying", 7th edition, Pearson, New Delhi
7. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi.

Other Reference Books

8. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers
9. B Bhatia, Remote Sensing and GIS, Oxford University Press, New Delhi.
10. T.M Lillesand, R.W Kiefer, and J.W Chipman, Remote sensing and Image interpretation, 5th edition, John Wiley and Sons India
11. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication.
12. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill Higher Education.
13. Sateesh Gopi, Global Positioning System, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Additional Study Material & e-Books

1. NPTEL notes, videos and courses
2. VTU online notes,
3. Activity Based Learning (Suggested Activities in Class)/ Practical Based learning


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

Website and Internet Contents References

- 01) <https://nptel.ac.in/courses/105/107/105107122/> & <https://nptel.ac.in/courses/105104101>
- 02) <https://nptel.ac.in/courses/105104100> & <https://nptel.ac.in/courses/105107121>
- 03) <https://nptel.ac.in/courses/105103176> & <https://nptel.ac.in/courses/105/107/105107158/>

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	Website
01	The American Surveyor	https://amerisurv.com/
02	ISPRS International Journal of Geo-Information	https://www.mdpi.com/journal/ijgi
03	Journal of Surveying Engineering (J S - ASCE)	http://www.pubs.asce.org/journals/surveying/
04	Professional Surveyor Magazine Archives	http://archives.profsurv.com/magazine/

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11.0

Examination Note

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks).

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

Two Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of **5th week** of the semester
2. Second test at the end of the **10th week** of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of **4th week** of the semester
2. Second assignment at the end of **9th week** of the semester

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

CIE for the practical component of IPCC

1. On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
2. The **CIE marks** awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for **10 marks**. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
3. The laboratory test (**duration 02/03 hours**) at the end of the **15th week** of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 marks** and scaled down to **05 marks**.

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

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

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



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12.1 Course Delivery Plan (Theory)

Module	Lecture No.	Content of Lecture	% of portion
1	1	Introduction to Surveying: Importance of surveying in Civil Engineering,	20%
	2	Concepts of plane and geodetic surveying, Principles of surveying	
	3	Plans and maps – Surveying equipment's	
	4	Compass surveying: Prismatic and surveyor's compasses, temporary adjustments	
	5	Meridians, Bearings, Dip, Declination, Local attraction,	
	6	Calculation of bearings and included angles.	
	7	Plane Table Surveying: PT & accessories, advantages & disadvantages of plane table survey,	
	8	Method of plotting - radiation, intersection,	
	9	Method of plotting - traversing, resection,	
	10	Method of plotting - two point and three-point method	
2	11	Levelling – Principles and basic definitions	20%
	12	Types of Levels – Types of adjustments and objectives	
	13	Types of levelling – Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning	
	14	Booking of levels – Rise & fall and H. I methods (Numerical)	
	15	Areas and volumes: Measurement of area – by dividing the area into geometrical figures,	
	16	area from offsets, mid ordinate rule, trapezoidal	
	17	Simpsons one third rule, area from co-ordinates,	
	18	introduction to planimeter, digital planimeter	
	19	Measurement of volumes: trapezoidal formula.	
	20	Measurement of volumes- prismoidal formula.	
3	21	Theodolite Survey & Instrument Adjustments: Theodolite & types. Uses of theodolite.	20%
	22	Fundamental axes, Parts of Transit theodolite.	
	23	Temporary adjustments of transit theodolite.	
	24	Measurement of horizontal and vertical angles, by repetition and reiteration	
	25	Measurement of horizontal and vertical angles, by repetition and reiteration <i>Continued...</i>	
	26	Trigonometric leveling: Single and Double plane for finding elevation of objects	
	27	Problems on above	
	28	Tacheometry: Computation of distances and elevations using Tacheometric method.	
	29	Computation of distances and elevations using Tacheometric method <i>Continued...</i>	
	30	Problems on above	
4	31	Curve Surveying: Curves, Necessity, Types, Simple curves,	20%
	32	Elements, Designation of curves,	
	33	Setting out simple curves by linear methods (numerical problems on offsets from long chord and chord produced method),	
	34	Setting out curves by Rankines deflection angle method (Numerical problems).	
	35	Compound curves, Elements, Design of compound curves,	
	36	Setting out of compound curves (numerical problems).	
	37	Reverse curve between two Parallel Sstraights (problems on Equal & unequal radius).	
	38	Transition curves Characteristics, numerical problems on Length of Transition curve,	
	39	Vertical Curves (Theory).	
	40	Types of Vertical Curves – (Theory).	
5	41	Photogrammetry and aerial survey: Introduction, definitions,	20%
	42	basics principles, methods,	
	43	importance of scale, height, applications.	
	44	Remote sensing: Introduction, Principle of Remote sensing, EMR, types, resolutions,	
	45	types of satellites, type of sensors, LIDAR,	
	46	visual and digital image processing and its applications.	
	47	Global Positioning System: Definition, Principles of GPS and applications.	
	48	Geographical Information System: Introduction, principle, components & applications of GIS	
	49	Advanced instrumentation in surveying: classification, measuring principles,	
	50	Electronic theodolite, EDM, Total Station, Drones	

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12.2 Course Delivery Plan (Laboratory Experiments)

Exp. No	Content of Lecture	% of portion
1	Study of various instruments used for surveying, namely chain, tape, Compass,	8.33 %
2	Dumpy level, Auto-level, Theodolite, Tacheometer, Total station and GPS. To find distance between two points shown in field using method of pacing, chaining and taping.	8.33 %
3	To set regular geometric figures (Hexagon and Pentagon) using chain tape and accessories.	8.33 %
4	To set regular geometric figures (Hexagon and Pentagon) using prismatic compass, given the bearing of one line.	8.33 %
5	Study of use of Dumpy level and to determine the different in elevation between two points by differential levelling using Dumpy level	8.33 %
6	To find the true difference in elevation between two points situated far apart by using Reciprocal levelling.	8.33 %
7	Trigonometrical levelling: Single plane method and Double plane method	8.33 %
8	Measurement of horizontal angle using theodolite by: i) Method of Repetition and ii) Reiteration method.	8.33 %
9	Setting simple circular curve-Instrumental method,	8.33 %
10	Setting compound curve using theodolite	8.33 %
11	Plane table: Setting, orientation, radiation, intersection	8.33 %
12	Demo: Total station, GPS	8.33 %

13.0 Internal Assessments, Assignments, Group Discussion, Seminars, Quiz, Mini Project.

Sl. No.	Title	Outcome expected	Allied study	Week No.	Max Marks	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 syllabus	4	10	Individual Activity, Written solution expected.	Book 1, 2, 3 & notes, also 4-13 of reference list.
2	Internal Assessment - I	Students study the topics & write / reproduce the answers in blue books	Module 2 of syllabus	5	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.
3	Assignment 2: Questions on module 3	Students study the topics and write the Answers. Get practice to solve numerical of university question papers.	Module 3 of syllabus	9	10	Individual Activity, Written solution expected.	Book 1, 2, 3 & notes, also 4-13 of reference list.
4	Internal Assessment - II	Students study the topics & write / reproduce the answers in blue books	Module 4 of syllabus	10	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.
5	Internal Assessment - III	Students study the topics & write / reproduce the answers in blue books	Module 5 of syllabus	15	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.

**14.0****QUESTION BANK****MODULE - 1**

1. Explain the Classifications of Surveying.
2. Define Surveying. List the Objectives and Purpose of Surveying.
3. Define Errors. Explain the Types of Errors in chaining and taping.
4. Describe the method of numbering of maps by survey department of India.
5. Explain Taping on Sloping Ground. Any 3 Methods.
6. Define Meridian. Explain the types of Meridians.
7. Define Bearing. Explain the types of Bearing.
8. Convert the following WCB into RB and RB into WCB.
1) $351^{\circ} 35''$ 2) $277^{\circ} 5''$ 3) $170^{\circ} 12''$ 4) $22^{\circ} 30''$ 5) $N 29^{\circ} 45'' E$ 6) $S 60^{\circ} 59'' E$ 7) $N 58^{\circ} 18'' W$
9. A survey line ABC crosses normally a river flowing east – west point B & C being on the near and far banks respectively. A perpendicular BD 36.44m long is set out at B. The bearings of AD and DC are 399° and 309° respectively. If the distance AB is 45m, find the width of the river.
10. Find the Fore Bearing and Back Bearing of the following lines.
1) FB of PQ = $304^{\circ} 30'$ 2) FB of QR = $125^{\circ} 45'$ 3) BB of RS = $190^{\circ} 30'$ 4) BB of ST = $70^{\circ} 30'$
5) FB of PQ = $N 55^{\circ} 30' W$ 6) BB of QR = $S 15^{\circ} 15' E$ 7) FB of RS = $N 35^{\circ} 45' E$ 8) FB of ST = $S 65^{\circ} 45' W$
11. Differentiate between Prismatic Compass & Surveyor's Compass.
12. The following are the included angles of a traverse ABCDEA. $A = 105^{\circ} 30'$, $B = 98^{\circ} 25'$, $C = 125^{\circ} 10'$,
 $D = 68^{\circ} 45'$, $E = 142^{\circ} 10'$. The bearing of the line AB is $212^{\circ} 35'$. Compute the bearing of all other lines.
13. Explain Prismatic Compass with neat Sketch.
14. Define Traverse. Explain the Types of Traverses.
15. The following bearings were observed with a compass. At what stations do you suspect local attraction? What are the correct bearings? And also find the Interior Angles.

Line	Fore Bearing (FB)	Back Bearing (BB)
AB	$10^{\circ} 45'$	$190^{\circ} 45'$
BC	$266^{\circ} 30'$	$84^{\circ} 30'$
CD	$177^{\circ} 20'$	$360^{\circ} 00'$
DA	$81^{\circ} 10'$	$260^{\circ} 30'$

16. Explain the Advantages of Plane Table Surveying.
17. Explain the Orientation and its Methods.
18. Explain the two point and three-point problem.
19. Explain the Solution to three-point problem Bessel's graphical method.
20. Explain the Solution to two-point problem by graphical method.

MODULE - 2

1. Define 1. BS 2. FS 3. HI 4. IS.
2. Explain the Temporary Adjustment of Dumpy Level.
3. The following consecutive readings were taken with a levelling instrument at intervals of 20m. 2.375, 1.730, 0.615, 3.450, 2.835, 2.070, 1.835, 0.985, 0.435, 1.630, 2.255 and 3.630m. The instrument was shifted after the fourth and eighth readings. The last reading was taken on a BM of RL 110.200m. Find the RL's of all the points.
4. Determine the RL of the top of the tower from the following data:

Inst. Station	Reading on B.M	Angle of Elevation to Aerial Pole	Remarks
A	3.625	$16^{\circ} 42'$	R.L. of B.M. 1728.785m
B	2.005	$11^{\circ} 12'$	



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Station A, B & the tower are in the same vertical plane. Distance between A & B is 30m.

5. Fill the Missing Readings (X) and calculate the Reduced Levels of all points & apply arithmetic checks.

Station	BS	IS	FS	Rise	Fall	RL
1.	2.285					232.460
2.	1.650		X	0.020		
3.		2.105			X	
4.	1.625		1.960	X		
5.	2.050		1.925		0.300	
6.		X		X		232.255
7.	1.690		X	0.340		
8.	2.865		2.100		X	
9.			X	X		233.425

6. A series of offsets were taken from a chain line to a curved boundary line at intervals of 15m in the following order. 0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85m. Compute the area between the chain line, curved boundary and the end offsets by Trapezoidal and Simpson's Rule.

7. With Neat Sketches explain any 7 Characteristics of Contours.

8. The following perpendicular offsets were taken from a chain line to an irregular boundary.

Chainage (m)	0	30	60	90	120	150	180	210
Offset Length (m)	0	2.65	3.80	3.75	4.65	3.60	5.00	5.80

Calculate the area between the chain lines and irregular boundary, first and last offsets by

1. Trapezoidal Rule and 2. Simpson's Rule.

9. A railway embankment is 10m wide with side slopes of 1:1.5 (V: H). Assuming the ground to be level in a direction transverse to the centerline, calculate the volume contained in a length of 120m, the centre heights at 20m intervals being in 'm' 2.2, 3.7, 3.8, 4.0, 3.8, 2.8 and 2.5. Compute the volumes by Trapezoidal and Prismoidal Rule.

10. List the various methods to calculate the Area with their Formula.

11. A railway embankment is 30m wide at the top with side slopes of 2:1 (H: V). The ground levels at 100m intervals along a line AB are as under:

Chainage (m)	0	30	60	90	120	150	180
RL	170.30	169.10	168.50	168.10	166.50	163.50	165.60

12. The areas within the contour lines at the site of a reservoir and the face of the proposed dam are as follows.

Taking 101 as the bottom level of the reservoir and 109 as the top level. Calculate the capacity of the reservoir by using Trapezoidal Formula and Prismoidal Formula.

Contour	101	102	103	104	105	106	107	108	109
Area (m ²)	1000	12800	95200	147600	872500	1350000	1985000	2286000	2512000

MODULE - 3

1. Differentiate between

a) Transiting & Swinging b) The upper plate & Lower plate c) Face left & Face Right

2. Explain the procedure for measuring the horizontal angle by method of repetition & reiteration.

3. Mention the permanent adjustment of theodolite.

4. List the fundamental lines of the theodolite

5. Explain the interrelationship between the fundamental lines by sequence

6. Write a short note on Spire test

7. Explain the procedure for test the dumpy level for permanent adjustment.

8. A transit is set up at 75m away from a lightning conductor of a tall building. The angle of elevation to its top is



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14036'. The reading on a levelling staff held on a B.M of RL 1900.800 is 3.775m. Determine the RL of top of lightning conductor.

9. A theodolite was set up at a distance of 500m from a tower & the angle of elevation to the top was 9039' while the angle of depression to the foot of tower was 2052'. The staff reading on a BM of RL 86.600 was 2.480m. What is the height of tower & RL of its top and its foot?

10. Determine the RL of a top of tower from the following observations:

Inst. Station	Vertical angle Elevation	Reading on BM with Horizontal line of sight
A	+16042'	1.73m
B	+13038'	2.23m

Distance between A and B is 100m. RL of BM is 168.270m. A and B are not in the same plane with the top of tower. Horizontal angle at A between B and top of tower is 73044'. Horizontal angle between A and top of tower at B is 52008'.

11. Derive the standard expression for tachometry when line of sight horizontal with usual notations.

12. Derive the tachometric expression for line of sight inclined in fixed hair method.

13. Derive the expression for tangential method considering all three cases.

14. Describe briefly Tachometric constant.

15. Mention the points to be considered in the selection of triangulation station.

16. Triangulation station B was used in measuring angles and the instrument was necessary to shift to a satellite S due south of main station B at a distance of 12.2m from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30° 20' 30" and 29° 45' 6". When the station B was observed angles CAB & ACB were observed to be 59° 18' 26" and 60° 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.

17. What are the different methods employed in tacheometric survey? Describe the method most commonly used.

18. Explain how you would determine the constants of a tacheometer. What are the advantages of an anallatic lens used in a tacheometer?

19. Two distances of 50 and 80 meters were accurately measured out and the intercepts on the staff between the outer stadia webs were 0.496 at the former distance and 0.796 at the later. Calculate the tacheometric constants.

20. To determine the elevation of the first station A of a tacheometer survey, the following observations were made, the staff being held vertically. The instrument was fitted with an anallatic lens and the value of the constant was 100.

Inst. Station	Height of the Instrument	Staff Station	Vertical angle	Staff readings	Remarks
O	1.440	B M	- 5° 40'	1.332, 1.896, 2.460	RL of BM
"	1.440	C P	+ 8° 20'	0.780, 1.263, 1.746	= 158.205
A	1.380	C P	- 6° 24'	1.158, 1.617, 2.076	m

Calculate the reduced level of A.

MODULE – 4

1. Explain the following with a neat sketch.

1) Forward Tangent 2) Point of Curve 3) Deflection Angle 4) Apex Distance


2. What are the common difficulties in setting out simple curves? Describe briefly the method employed in overcoming them.

3. Two tangents intersect at a chainage of 1190m, the deflection angle 36°. Compute all the data necessary to set out a curve of radius 300m by deflection angle method. The peg interval is 30m. Tabulate the results.

4. A reverse curve is set out to connect two parallel railway line 30m apart. The distance between the tangent points is 150m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for set out the curve.

5. List the requirements of a transition curve (Any Four).

6. With a neat sketch, list any four Vertical Curves.





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7. List the different methods of setting out simple curves. Explain the Linear method of setting out simple curve by the method of offsets from long chord.
8. What is transition curve? List the function and essential requirements of an ideal Transition curve.
9. Two tangents intersect at a chainage of 1000m, the deflection angle 28° . Compute all the data necessary to set out a simple circular curve of radius 200m by Rankines method of deflection angles. The peg interval is 10m. Tabulate the results.
10. The tangents to a railway meet at an angle of 148° . Owing to the position of a building. A curve is to be chosen that will pass near a point 10 m from the point of intersection of the tangents on the bisector of the angle 148° . Calculate the suitable radius of the curve.

MODULE - 5

1. Define the following terms.

1) Exposure Station	2) Picture Plane	3) Perspective Centre	4) Air Base
5) Tilt Displacement	6) Principal point	7) Isocenter	8) isometric Plane
2. Mention the general features of Photographic images.
3. What is Tilt distortion? Prove that, in a tilted photograph, tilt distortion is radial from the isocenter.
4. Describe various steps involved in combination of vertical air photographs by principal point radial line method.
5. Define Parallax and briefly explain parallax.
6. Describe overlaps and mosaics and stereoscopes.
7. Find the number of photographers (size 250 x 250mm) required to cover over an area of 20km x 16km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is 1cm – 150m.
8. Derive an expression for relief displacement on a vertical photograph.
9. Explain the procedure for aerial survey.
10. A vertical photograph was taken at an altitude of 1200 meters above mean sea level. Determine the scale of the photograph for a terrain lying at elevations of 80meters and 300meters if the focal length of the camera is 15cm.
11. What do you understand by Electromagnetic Spectrum? State the wave length regions, along with their uses for Remote Sensing applications.
12. Explain interaction mechanism of EM radiation with earth's surface, starting with basic interaction equation.
13. Mention the advantages of total station and also discuss the working principles of the same.
14. Define remote sensing. Explain the stages of idealized remote sensing system.
15. What is GIS? Enumerate on GIS applications in civil engineering.
16. Explain the basic principles of GPS and its application in surveying.
17. Explain Digital image processing and Image interpretation techniques.
18. Explain the applications of Remote Sensing in various sectors with examples
19. Explain with a help of neat sketch, as idealised remote sensing system and describe active and passive RS.
20. Explain the application of RS and GIS in Civil Engineering.

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

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Subject Title	STRENGTH OF MATERIALS		
Subject Code	21CV33	CIE Marks	50
Number of Lecture Hrs / Week	(2:2:2:0)	SEE Marks	50
Total Number of Lecture Hrs	50	Exam Hours	03
			Credits:04

FACULTY DETAILS:		
Name: Prof. V.I.Patil	Designation: Asst. Professor	Experience: 04 Years
No. of times course taught: 1	Specialization: Structural Engineer	

1.0 Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Elements of civil Engineering & mechanics

2.0 Course Objectives


This course will enable students:

1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural elements.
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.
4. To determine slope and deflections of beams.
5. To evaluate the behaviour of torsion members, columns and struts.

3.0 Course Outcomes

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

Sl.No	Course Outcome	RBT Level	POs
C303.1	Evaluate the behavior when a solid material is subjected to various types of forces (namely Compressive, Tensile, Thermal, Shear, flexure, Torque, internal fluid pressure) and estimate stresses and corresponding strain developed.	L3	1,2,3,5,6,8,12
C303.2	Estimate the forces developed and draw schematic diagram for stresses, forces, moments for simple beams with different types of support and are subjected to various types of loads	L3	1,2,3,5,6,8,12
C303.3	Evaluate the behavior when a solid material is subjected to Torque and internal fluid pressure and estimate stresses and corresponding strain developed.	L3	1,2,3,5,6,8,12
C303.4	Distinguish the behavior of short and long column and calculate load at failure & explain the behavior of spring to estimate deflection and stiffness	L3	1,2,3,5,6,8,12
C303.5	Examine and evaluate the mechanical properties of various materials under different loading conditions	L3	1,2,3,5,6,8,12
Total Hours of Instruction			50

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4.0 Course Content

Module-1

Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants (No Numerical), Thermal stress and strains **Compound stresses:** Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses, maximum shear stresses and their planes (shear planes). Compound stress using Mohr's circle method..

Module-2

Bending moment and shear force diagrams in beams: Definition of shear force and bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram(SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL(Uniformly Distributed Load), UVL(Uniformly Varying Load) and Couple.

Module-3

Bending stress in beams: Introduction – Bending stress in beam, Pure bending, Assumptions in simple bending theory, derivation of Simple bending equation (Bernoulli's equation), modulus of rupture, section modulus, Flexural rigidity, Problems

Shear stress in beams: Derivation of Shear stress intensity equations, Derivation of Expressions of the shear stress intensity for rectangular, triangular and circular cross sections of the beams. Problems on calculation of the shear stress intensities at various critical levels of T, I and Hollow rectangular cross sections of the beam..

Module-4

Torsion: Twisting moment in shafts, simple torque theory, derivation of torsion equation, torsional rigidity, polar modulus, shear stress variation across solid circular and hollow circular sections, Problems


Thin cylinders: Introduction: Longitudinal, circumferential (hoop) stress in thin cylinders. Expressions for longitudinal and circumferential stresses. Efficiency of longitudinal and circumferential joints. Problems on estimation of change in length, diameter and volume when the thin cylinder subjected to internal fluid pressure.

Thick cylinders: Concept of Thick cylinders Lamé's equations applicable to thick cylinders with usual notations, calculation of longitudinal, circumferential and radial stresses – simple numerical examples. Sketching the variation of radial stress (pressure) and circumferential stress across the wall of thick cylinder.

Module-5

Elastic stability of columns: Introduction – Short and long columns, Euler's theory on columns, Effective length, slenderness ratio, radii of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different boundary conditions, Limitations of Euler's theory, Rankine's formula and related problems.

Deflection of determinate Beams: Introduction, Elastic curve – Derivation of differential equation of flexure, Sign convention, Slope and deflection using Macaulay's method for statically determinate beams subjected to various vertical loads, moment, couple and their combinations. Numerical problems. direct foreign investment, venture capital.

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5.0 Relevance to future subjects

SI No	Semester	Subject	Topics
1.	IV	ANALYSIS OF STRUCTURES	Moment area method, slope deflection

6.0 Relevance to Real World

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

7.0 Gap Analysis and Mitigation

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

8.0 Books Used and Recommended to Students

Text Books
1. Timoshenko and Young, "Elements of Strength of Materials", EastWest Press, 5th edition 2003 2.R. Subramanyam, "Strength of Materials", Oxford University Press, 3rd Edition -2016 3. B.C Punmia Ashok Jain, Arun Jain, "Strength of Materials", Laxmi - 2018-22 Publications, 10th Edition-2018 Web links and Video Lectures (e-Resources): 1. Strength of Materials web course by IIT Roorkee https://nptel.ac.in/courses/112107146/ 2. Strength of Materials video course by IIT Kharagpur https://nptel.ac.in/courses/105105108/ 3. Strength of Materials video course by IIT Roorkee https://nptel.ac.in/courses/112107147/18 4. All contents organized http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html
Reference Books
NILL
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

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks).

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

Two Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of **5th week** of the semester
2. Second test at the end of the **10th week** of the semester

Two assignments each of **10 Marks**

1. First assignment at the end of **4th week** of the semester
2. Second assignment at the end of **9th week** of the semester

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

CIE for the practical component of IPCC

1. On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
2. The **CIE marks** awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for **10 marks**. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
3. The laboratory test (**duration 02/03 hours**) at the end of the **15th week** of the semester /after completion of all the experiments (whichever is early) shall be conducted for **50 marks** and scaled down to **05 marks**.

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

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

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



12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Introduction, Properties of Materials	20
	2	Stress, Strain, Hook's Law, Poisson's Ratio	
	3	Stress – Strain Diagram for structural steel	
	4	Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections	
	5	Composite section, Volumetric strain, expression for volumetric strain	
	6	expression for volumetric strain, Elastic constants, relationship among elastic constants (No Numerical), Thermal stress and strains	
	7.	Introduction to Compound stresses, Stress components on inclined planes	
	8.	Principal planes and stresses, maximum shear stresses and their planes (shear planes).	
	9.	Compound stress using Mohr's circle method	
	10	Numerical Problems	
Module 2	11	Definition of shear force and bending moment,	20
	12.	Sign convention	
	13.	Relationship between loading, shear force and bending moment,	
	14	Shear force and bending moment equations	
	15.	development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD)	
	16.	salient values for cantilever	
	17.	salient values for simply supported	
	18	salient values for overhanging beams	
	19	salient values for point loads	
	20	salient values for UDL(Uniformly Distributed Load), UVL(Uniformly Varying Load) and Couple	
Module 3	21	Introduction – Bending stress in beam	20
	22	Pure bending, Assumptions in simple bending theory	
	23	derivation of Simple bending equation (Bernoulli's equation),	
	24	modulus of rupture, section modulus, Flexural rigidity, Problems	
	25	Numerical Problems	
	26	Derivation of Shear stress intensity equations	
	27	Derivation of Expressions of the shear stress intensity for rectangular,	
	28	Derivation of Expressions of the shear stress intensity for triangular	
	29	circular cross sections of the beams	
	30	Problems on calculation of the shear stress intensities at various critical levels of T, I and Hollow rectangular cross sections of the beam	
Module 4	31	Torsion, Twisting moment in shafts,	20
	32	simple torque theory, derivation of torsion equation, torsional rigidity,	
	33	polar modulus, shear stress variation across solid circular and hollow circular sections,	
	34	Numerical Problems, Thin cylinders: Introduction	
	35	Longitudinal, circumferential (hoop) stress in thin cylinders	
	36	Expressions for longitudinal and circumferential stresses. Efficiency of longitudinal and circumferential joints.	
	37	Problems on estimation of change in length, diameter and volume when the thin cylinder subjected to internal fluid pressure	
	38	Thick cylinders Concept of Thick cylinders Lamé's equations applicable to thick cylinders with usual notations	
	39	calculation of longitudinal ,circumferential and radial stresses – simple numerical examples	
	40	Sketching the variation of radial stress (pressure) and circumferential stress across the wall of thick cylinder	



Module 5	41	Elastic stability of columns Introduction – Short and long columns	20
	42	Euler's theory on columns, Effective length, slenderness ratio,	
	43	radii of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different boundary conditions,	
	44	Limitations of Euler's theory, Rankine's formula and related problems.	
	45	Deflection of determinate Beams Introduction	
	46	Elastic curve –Derivation of differential equation of flexure, Sign convention,	
	47	Slope and deflection using Macaulay's method for statically determinate beams subjected to various vertical loads	
	48	moment, couple and their combinations.	
	49	Numerical problems.	
	50	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	Evaluate the behaviour when a solid material is subjected to various types of forces (namely Compressive, Tensile, Thermal, Shear, flexure, Torque, internal fluid pressure) and estimate stresses and corresponding strain developed. (L3)	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Estimate the forces developed and draw schematic diagram for stresses, forces, moments for simple beams with different types of support and are subjected to various types of loads	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 2
3	Assignment 3: Questions on module 3	Evaluate the behaviour when a solid material is subjected to Torque and internal fluid pressure and estimate stresses and corresponding strain developed.	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 2
4	Assignment 4: Questions on module 4	Distinguish the behaviour of short and long column and calculate load at failure & explain the behaviour of spring to estimate deflection and stiffness	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 2
5	Assignment 5: Questions on module 5	Examine and evaluate the mechanical properties of various materials under different loading conditions	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 3



14.0 QUESTION BANK

MODULE 1

1. A bar of a rectangular section of 20 mm × 30 mm and a length of 500 mm is subjected to an axial compressive load of 60 kN. If $E = 102 \text{ kN/mm}^2$ and $\nu = 0.34$, determine the changes in the length and the sides of the bar.
2. A bar uniformly tapers from diameter 20 mm at one end to diameter 10 mm at the other end over an axial length 300 mm. This is subjected to an axial compressive load of 7.5 kN. If $E = 100 \text{ kN/mm}^2$, determine the maximum and minimum axial stresses in bar and the total change in length of the bar.
3. An aluminium flat of a thickness of 8 mm and an axial length of 500 mm has a width of 15 mm tapering to 25 mm over the total length. It is subjected to an axial compressive force P , so that the total change in the length of flat does not exceed 0.25 mm. What is the magnitude of P , if $E = 67,000 \text{ N/mm}^2$ for aluminium?
4. A stepped steel bar is suspended vertically. The diameter in the upper half portion is 10 mm, while the diameter in the lower half portion is 6 mm. What are the stresses due to self-weight in sections B and A as shown in the figure. $E = 200 \text{ kN/mm}^2 = 0.7644 \times 10^{-3} \text{ N/mm}^3$. Weight density, ρ . What is the change in its length if $E = 200000 \text{ MPa}$?
5. A flat bar of steel of 24 mm wide and 6 mm thick is placed between two aluminium alloy flats 24 mm × 9 mm each. The three flats are fastened together at their ends. An axial tensile load of 20 kN is applied to the composite bar. What are the stresses developed in steel and aluminium alloy? Assume $E_S = 210000 \text{ MPa}$ and $E_A = 70000 \text{ MPa}$.

MODULE 2

1. An overhanging beam ABC is loaded as shown in Fig. 3.42. Draw the shear force and bending moment diagrams. Also locate point of contra flexure. Determine maximum +ve and —ve bending moments.
2. Draw SFD and BMD for the beam shown in Fig. 3.48. Determine the maximum BM and its location. Locate the points of contra flexure.
3. A beam ABCDE is 12m long simply supported at points B and D. Spans $AB=DE=2\text{m}$ is overhanging. $BC=CD=4\text{m}$. The beam supports a udl of 10kN/m over AB and 20kN/m over CD. In addition, it also supports concentrated load of 10kN at E and a clockwise moment of 16kNm at point C. Sketch BMD and SFD
4. A beam 6m long rests on two supports with equal overhangs on either side and carries a uniformly distributed load of 30kN/m over the entire length of the beam as shown in Fig. 3.51. Calculate the overhangs if the maximum positive and negative bending moments are to be same. Draw the SFD and BMD and locate the salient points.
5. Draw the Shear Force and Bending Moment Diagram for a simply supported beam subjected to uniformly varying load.

MODULE 3

1. A wooden beam 150mm x 250mm is simply supported over a span of 5m when a concentrated w is [placed at distance a from the left support the maximum bending stress is beam is 11.2 N/mm^2 and maximum shear stress 0.7 N/mm^2 determine W and A .
2. A concrete beam 200mm x 250mm is simply supported over a span of 5m when a concentrated w is [placed at distance a from the left support the maximum bending stress is beam is 9 N/mm^2 and maximum shear stress 0.5 N/mm^2 determine W and A .
3. A concrete beam 200mm x 250mm is Cantilever beam over a span of 5m when a concentrated w is [placed at



distance a from the left support the maximum bending stress in beam is 9 N/mm^2 and maximum shear stress 0.5 N/mm^2 determine W and A .

- Derive the Equation for $M/I = E/R = F/Y$
- A timber beam is to be designed to carry a load of 5 KN/m over a simply supported span of 6m . permissible stress is 10 N/mm^2 . Take depth as twice the breadth. design the beam. If the permissible stress in shear is 1 N/mm^2 . check for shear.


MODULE 4

- What pressure may be allowed in a cylindrical boiler 2.5 m internal diameter with plates 20 mm thick, if the safe intensity of tensile stress is 65 MPa .
- Determine the minimum thickness of the plate required for boilers of internal diameter 1.5 m and internal pressure of 1 MPa if the efficiency of riveted joints is 60% . The permissible stress in steel plate is 150 MPa .
- A thin cylinder of internal diameter 1m and thickness 15 mm is made of number of sheets which are riveted together. If the efficiency the longitudinal joint is 90% and that of the circumference joint is 40% , determine the safe allowable internal pressure. Assume the allowable tensile stress as 50 MPa .
- A thin cylindrical shell 1m in diameter and 3m long has a metal thickness of 10 mm . It is subjected to an internal fluid pressure of 3 MPa . Determine the changes in length, diameter and volume. Also find the maximum shear stress in the shell. Assume $E = 210 \text{ GPa}$ and $\nu = 0.3$.
- A thick cylindrical pipe of external diameter 300 mm and thickness 50 mm is subjected to an internal fluid pressure of 40 MPa and an external pressure of 2.5 MPa . Calculate the maximum and minimum intensities of circumferential and radial stresses in the pipe section. Sketch the variation of stresses across the pipe section.

MODULE -5

- Derive the expression for both ends hinged
- Derive the expression for one end fixed and another end free
- Derive the expression for both ends fixed
- Derive the expression for one end hinged and other is fixed
- calculate the critical load strut which is made of a bar of circular in section and 5m long and which is pinned jointed at both ends the same bar when used as simply supported beam gives a mid span deflection of 10mm with a load of 10N . at the center.

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

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Subject Title	Earth Resources and Engineering		
Subject Code	21CV34	IA Marks	50
Number of Lecture Hrs / Week	3:0:0:0	Exam Marks	50
Total Number of Lecture Hrs	40	Exam Hours	03
			Credits: 3

FACULTY DETAILS:		
Name: Prof. S.S.Beesanakoppa	Designation: Asst. Professor	Experience: 1 Years
No. of times course taught: 01		Specialization: Wastewater Management

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

2.0 Course Objectives

1. To inculcate the importance of earth's interior and application of Geology in civil engineering. Attempts are made to highlight the industrial applications of minerals.
2. To create awareness among Civil engineers regarding the use of rocks as building materials.
3. To provide knowledge on dynamic Geology and its importance in modifying the physical character of rocks which cause rocks suitable or unsuitable in different civil engineering projects such as Dams, bridges, tunnels and highways.
4. To educate the ground water management regarding diversified geological formations, climatologically dissimilarity which are prevailed in the country. To highlight the concept of rain water harvesting.
5. To understand the application of Remote Sensing and GIS, Natural disaster and management and environmental awareness.

3.0 Course Outcomes

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

CO	Course Outcome	Cognitive Level	POs
C304.1	Apply geological knowledge in different civil engineering practice.	L1, L2, L3, L4	1,2,3,4, 6,8,12
C304.2	Students will acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials	L1, L2, L3, L4	1,2,3,4, 6,8,12
C304.3	Competent enough to provide services for the safety, stability, economy and life of the structures that they construct.	L1, L2, L3, L4, L5	1,2,3,4, 6,8,12
C304.4	Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.	L1, L2, L3, L4, L5	1,2,3,4,5, 6,8,12
C304.5	Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction	L1, L2, L3, L4, L5	1,2,3,4,5, 6,8,12
Total Hours of Instruction		50	



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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****4.0 Course Content****Module-1**

Introduction, scope of earth science in Engineering Earths internal dynamics ,Plate tectonics, Earth quakes types, causes iso-seismic line, seismic zonation map, seismic proof structures, Numerical problems on location of epicenter; volcanic eruption, types, causes, ; landslides, causes types, preventive measures; tsunamis causes consequences, mitigation; cyclones, causes management

Module-2

Earth Resources Minerals -Industrial, rock forming and ore minerals. Physical properties, composition and uses Rocks as a construction materials- physical properties, texture, composition, applications for aggregate, decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, rocks as aquifers, water bearing properties igneous, sedimentary

Module-3

Surface investigation for Civil Engineering projects Weathering, type, causes, soil in-situ, drifted soil, soil profile, soil mineralogy , structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks, River morphology and basin investigation for engineering Projects like earthen dam, gravity dam, arch dam, features of river erosion, deposition and their influences on river valley projects, morphometric analysis of river basin, selection of site for artificial recharge,, interlinking of river basins, coastal process and landforms, sedimentation /siltation, erosion

Module-4

Subsurface investigation for deep foundation Borehole data (and problems), Dip and strike, and outcrop problems (numerical problem geometrical/ simple trigonometry based), Electrical Resistivity meter, depth of water table, (numerical problems) seismic studies, faults, folds, unconformity, joints types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Ground improvements like rock bolting, rock jointing, grouting

Module-5

Geo-tools and techniques for civil Engineering Applications Toposheets, Remote sensing and GIS. Photogrammetry (scale, flight planning, overlap, elevation effects, interpretation keys, numerical on flight, planning scale, elevation, flying height,), GPS, Ground Penetrating Radas (GPR), Drone, and their applications

5.0 Relevance to future subjects


Sl No	Semester	Subject	Topics
01	IV	Engineering geology lab	All topics

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Identification of rocks, maps, & soil

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Study of map

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8.0 Books Used and Recommended to Students

Suggested Learning Resources: Books

1. Earthquake Tips - Learning Earthquake Design and Construction - C V R Murthy Published by National Information Centre of Earthquake Engineering, Indian Institute of Technology, Kanpur. Dimitri P Krynine and William R Judd, "Principles of Engineering Geology and Geotechnics", CBS Publishers and Distributors, New Delhi.
2. K V G K Gokhale, "Principles of Engineering Geology", B S Publications, Hyderabad.
3. M Anji Reddy, "Text book of Remote Sensing and Geographical Information System", BS Publications, Hyderabad.
4. Ground water Assessment, development and Management by K.R. Karanth, Tata Mc Graw Hills.
5. K. Todd, "Groundwater Hydrology", Tata Mac Grow Hill, NewDelhi.
6. D. Venkata Reddy, "Engineering Geology", New Age International Publications, NewDelhi .
7. S.K Duggal, H.K Pandey and N Rawal, "Engineering Geology", McGrawHill Education (India) Pvt, Ltd. New Delhi.
8. M.P Billings, "Structural Geology", CBS Publishers and Distributors, New Delhi.
9. K. S. Valdiya, "Environmental Geology", Tata Mc Grew Hills.
10. M. B. Ramachandra Rao, "Outlines of Geophysical Prospecting A Manual for Geologists", Prasaranga, University of Mysore, Mysore.

Other Reference Books

8. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers
9. B Bhatia, Remote Sensing and GIS, Oxford University Press, New Delhi.
10. T.M Lillesand, R.W Kiefer, and J.W Chipman, Remote sensing and Image interpretation, 5th edition, John Wiley and Sons India
11. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication.
12. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill Higher Education.
13. Sateesh Gopi, Global Positioning System, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Additional Study Material & e-Books

1. NPTEL notes, videos and courses
2. VTU online notes,
3. Activity Based Learning (Suggested Activities in Class)/ Practical Based learning


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

Website and Internet Contents References

- 01) AEÜ - International Journal of engineering geology
- 02) www.journals.elsevier.com/aeu
<https://en.wikipedia.org/wiki/>
- 03) <https://en.wikipedia.org/wiki/>

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	Website
01	wekipidia	www. https://cse.umn.edu

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11.0 Examination Note

Assessment Details (both CIE and SEE)

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

Continuous internal Examination (CIE) Three Tests (preferably in MCQ pattern with 20 questions) each of 20 Mark (duration 01 hour)

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


1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

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

Semester End Examinations (SEE) SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

12.1 Course Delivery Plan (Theory)

Module	Lecture No.	Content of Lecture	% of portion
1	1	Introduction, scope of earth science in Engineering , Earths internal dynamics ,	20%
	2	Plate tectonics,	
	3	Earth quakes types	
	4	Causes iso-seismic line, seismic zonation map, seismic proof structures,	
	5	Numerical problems on location of epicenter	
	6	volcanic eruption, types, causes, ;;	
	7	landslides, causes types, preventive measures	
	8	Tsunamis causes consequences, mitigation; cyclones, causes management	
2	9	Earth Resources Minerals	20%
	10	Industrial, rock forming and ore minerals	
	11	Uses Rocks as a construction material	
	12	Physical properties, texture, composition	
	13	Applications for aggregate	
	14	Decorative (facing/polishing), railway ballast, rocks for masonry work	
	15	Monumental/architecture, rocks as aquifers	
16	Water bearing properties igneous, sedimentary		
3	17	Surface investigation for Civil Engineering projects	20%
	18	Weathering, type, causes, soil in-situ, drifted soil, soil profile, soil mineralogy, structure,	
	19	Types of soil, Black cotton soil v/s Lateritic soil;	
	20	Effects of weathering on monumental rocks	
	21	River morphology and basin investigation for engineering Projects like earthen dam, gravity dam, arch dam,	

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	22	Features of river erosion, deposition and their influences on river valley projects,	
	23	morph metric analysis of river basin, selection of site for artificial recharge,	
	24	Interlinking of river basins, coastal process and landforms, sedimentation /siltation, erosion	
4	25	Subsurface investigation for deep foundation	20%
	26	Borehole data (and problems), Dip and strike, and outcrop	
	27	Problems (numerical problem geometrical/ simple trigonometry based)	
	28	Electrical Resistivity meter, depth of water table, (numerical problems)	
	29	Seismic studies, faults, folds, unconformity, joints types	
	30	Recognition and their significance in Civil engineering	
	31	Projects like tunnel project, dam project,	
5	32	Ground improvements like rock bolting, rock jointing, grouting	20%
	33	Geo-tools and techniques for civil Engineering Applications,	
	34	Toposheets , Remote sensing and GIS.	
	35	Applications Photogrammetry	
	36	Scale, flight planning, overlap, elevation effects, interpretation keys,	
	37	Numerical on flight, planning scale, elevation, flying height,	
	38	GPS, Ground Penetrating Radas (GPR)	
	39	Drone, and their applications	
40	Applications of GPS, GPR		

13.0 Internal Assessments, Assignments, Group Discussion, Seminars, Quiz, Mini Project.

Sl. No.	Title	Outcome expected	Allied study	Week No.	Max Marks	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Questions on module 1	Students study the topics Apply geological knowledge in different civil engineering practice	Module 1 of syllabus	4	10	Individual Activity, Written solution expected.	Book 1, 2, 3 & notes, also 4-13 of reference list.
2	Internal Assessment - I	Students study the topics will acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials	Module 2 of syllabus	5	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.
3	Assignment 2: Questions on module 3	Students study the topics and write the Answers. competent enough to provide services for the safety, stability, economy and life of the structures that they construct	Module 3 of syllabus	9	10	Individual Activity, Written solution expected.	Book 1, 2, 3 & notes, also 4-13 of reference list.
4	Internal Assessment - II	Students study the topics Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems	Module 4 of syllabus	10	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.
5	Internal Assessment - III	Students study the topics & Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction.	Module 5 of syllabus	15	20	Individual Assessment, Blue Books as record	Book 1, 2, 3 & notes, also 4-13 of reference list.



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QUESTION BANK

MODULE - 1

1. Discuss scope geology in the civil engineering field.
2. Explain internal structure & composition of earth with neat sketch.
3. What is mineral? Define & describe different physical properties which help in the identification of minerals
4. Describe the following with mineral examples a) Lustre & its types b) Fracture & its types
5. Write the physical properties, chemical composition & uses of a) Orthoclase b) Calcite
6. Write description of any two-carbonate group of minerals
7. Write the description of minerals: a) Asbestos b) Galena c) Hematite d) Gypsum.
8. Explain the role of Engineering Geology in civil engineering projects

MODULE - 2

1. Define Igneous rocks. Explain formation & forms of Igneous rocks.
2. What are rocks? Based on their origin how the rocks have been classified & how are they formed with examples
3. Describe rocks their geological properties & add their engineering uses.
4. Write short note on i) metamorphic rocks ii) sedimentary rocks
5. Write briefly selection of rocks as materials for construction
6. What are folds? How are they caused? With neat sketch, mention the parts of the fold. Describe the different types of folds with figures. Also add a note on their civil engineering considerations.
7. What is Rock Weathering? Describe the different types of weathering What is Metamorphism? Describe the different agents of metamorphism
8. Describe the following with mineral examples
 - i) Lustre and its types ii) Fracture and its types
9. Write the physical properties of minerals and their chemical composition.

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MODULE - 3

1. What is Fold? With a neat diagram, describe the different parts of fold (05 Marks) Describe the different types of faults based on their mode of occurrence, with neat diagram.
2. What are Joints? Write the classification and describe different types of tension joints
3. What is Fault? With a neat diagram, describe the different parts of a fault.
4. Describe the different types of folding on the basis of their axial plane, with neat diagram.
5. Describe the causes of folding.
6. Write a note on i) RQD ii) RSR
7. Explain geological site characterization for dams & reservoirs.
8. Discuss the tunnel with respect to geology


MODULE – 4

1. Describe with a neat diagram the hydrological cycle.
2. Describe the vertical distribution of ground water in soil and Describe: i) Specific yield ii) Specific retention.
3. What is an Aquifer? Describe the types of aquifers.
4. Describe i) Porosity ii) Permeability.
5. Describe the ground water exploration by Electrical Resistivity Method.
6. Discuss SAR, RSC & TH of ground water
7. Discuss SAR, RSC & TH of ground water
8. Discuss ground water pollution
9. Explain floods & its control & cyclone & its effects

MODULE - 5

1. What is an Earth quake? Describe its causes and effects
2. What are Landslides? Describe the causes and control measures
3. What is Remote sensing? Describe the principles, advantages and disadvantages
4. Describe tsunami causes & its effects
5. Describe the process involved in Geographic Information System (GIS) & global positioning system
6. Discuss areal photography & LANDSAT Imagery
7. Describe the impact of mining on Environment. Describe the impact of reservoir on Environment.

Prepared by	Checked by		
			
Prof. S.S. Beesanakoppa	Prof. Preethi R. Patil	HOD	Principal

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Subject Title	COMPUTER AIDED BUILDING PLANNING AND DRAWING LABORATORY		
Subject Code	21CVL35	CIE Marks	50
Number of Lecture Hrs / Week	02	SEE Marks	50
Number of Credits	01	Exam Hours	03

FACULTY DETAILS:		
Name: Sudarshan V Jore	Designation: Asst. Professor	Experience: 02 Years
No. of times course taught: 01		Specialization: CTM

1.0 Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I/II	Elements of Civil Engineering and Mechanics.
01	Civil Engineering	III	Basic knowledge of Construction materials and Various elements of Building.
02	Civil Engineering	III	Basic Knowledge of Building Construction.


2.0 Course Objectives

1. To design and test half wave and full wave rectifier circuits.
2. Provide students with a basic understanding
3. Achieve skill sets to prepare computer aided engineering drawings
4. Understand the details of construction of different building elements.
5. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings.

3.0 Course Outcomes

After studying this course, students will be able to

	Course Outcome	RBT Level	POs
C207.1	Gain a broad understanding of planning and designing of buildings.	L1, L2, L3, L4	1,2,3,6,8,9,12
C207.2	Prepare, read and interpret the drawings in a professional set up.	L2, L3, L4, L5	1,2,3,6,8,9,12
C207.3	Know the procedures of submission of drawings and Develop working and submission drawings for building.	L1, L2, L3, L4	1,2,3,6,8,9,12
C207.4	Plan and design a residential or public building as per the given requirements.	L1, L2, L3, L4	1,2,3,6,8,9,12

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Course Content

Module-1

- Drawing Basics:** Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962.
- Simple engineering drawings with CAD drawing tools:** Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse,

Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text,

Special Features: View tools, Layers concept, Dimension tools, Hatching, customizing toolbars, Working with multiple drawings.

Module-2

Drawings Related to Different Building Elements:

Following drawings are to be prepared for the data given using CAD Software

- Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings.
- Different types of bonds in brick masonry.
- Different types of staircases – Dog legged, Open well.
- Lintel and chajja.
- RCC slabs and beams.
- Cross section of a pavement.
- Septic Tank and sedimentation Tank.
- Layout plan of Rainwater recharging and harvesting system.
- Cross sectional details of a road for a Residential area with provision for all services. ,
- Steel truss (connections Bolted).


Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing.

Module-3

Building Drawings: Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.

Drawing of Plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for:

- Single and double story residential building.
- Hostel building.
- Hospital building.
- School building.

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5.0 Relevance to future subjects

SL. No	Semester	Subject	Topics / Relevance
01	VI	Software Application Laboratory	Analysis of plane trusses, continuous beams, portal frames. 3D analysis of multistoried frame structures.
02	VI	Extensive Survey project	All drawings done using CAD
03	VII	Computer Aided Detailing of Structures	Draft the detailing of RC & Steel Structural member
04	VII	Design of RCC and Steel Structures	Draft the detailing of RC & Steel Structural member

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Planning and Drafting of various components of Building Structures
02	Using of CAD Software for Drafting Building Components
03	Development of various drawings

7.0 Books Used and Recommended to Students


Text Books
1. MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd., New Delhi
2. Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
3. Malik R S and Meo G S, "Civil Engineering Drawing", Asian Publishers/Computech Publications Pvt Ltd.
Reference Books
1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2. IS: 962-1989 (Code of practice for architectural and building drawing).
3. National Building Code, BIS, New Delhi.
Additional Study material & e-Books
1. "Building Planning and Drawing: With CD containing AutoCAD commands with screen shots," by S.S Bhavikatti & M.V. Chitawadagi

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

Website and Internet Contents References
https://bit.ly/2VNGRVW
https://en.wikipedia.org/wiki/Computer-aided_design

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
01	Computer-Aided-Design	https://www.journals.elsevier.com/computer-aided-design
02	Architectural Design Exposed: From Computer-Aided Drawing to Computer-Aided Design	https://journals.sagepub.com/doi/abs/10.1068/b130385
03	Analysis of Computer Aided Landscape Planning and Design Strategy	https://iopscience.iop.org/article/10.1088/1742-6596/1992/2/022100/pdf

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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 (50 Marks)

- (a) Continuous Assessment: **20 marks**
 (b) Internal Assessment test in the same pattern as that of the main examination: **30 marks.**
 Write up- 10 marks
 Conduction and Result- 15 marks
 Viva Voce- 5 marks


Conduct of Practical SEE:

- Students can pick one experiment from the questions lot prepared by the examiners.
- 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	Name of the Experiment	% of Portion
1	Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962. Simple engineering drawings with CAD drawing tools: Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse,	6.25 %
2	Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, customizing toolbars, Working with multiple drawings.	6.25 %
3	Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings.	6.25 %
4	Different types of bonds in brick masonry	6.25 %
5	Different types of staircases – Dog legged, Open well	6.25 %
6	Lintel and chajja	6.25 %
7	RCC slabs and beams	6.25 %
8	Cross section of a pavement	6.25 %
9	Septic Tank and sedimentation Tank	6.25 %
10	Layout plan of Rainwater recharging and harvesting system.	6.25 %
11	Cross sectional details of a road for a Residential area with provision for all services.	6.25 %
12	Steel truss (connections Bolted).	6.25 %
13	Single and Double story residential building	6.25 %
14	Hostel building	6.25 %
15	Hospital building	6.25 %
16	School building	6.25 %

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Question Bank

1. What are different drawing tools?
2. What is the purpose of using multiline?
3. What is use of ARC and what is short cut for it?
4. What is the function of polar tracking?
5. What is the function of ortho mode and what is the short cut for it?
6. What is the function of Object snapping?
7. A RCC column 400X400 mm is resting on a square RCC footing. The depth of footing is 1.2m and thickness of PCC bed is 150mm. The column reinforcement consist of 6 bars of 16mm dia, with 2 legged 8mm dia stirrups at 200mm c/c and the footing reinforcement consist of 12,, dia bars @150mm c/c, both ways. The size and thickness of footing are 1200X1200mm and 750mm respectively. Draw to scale the following.
 - i) Plan of footing showing reinforcement details
 - ii) Vertical section of the column with footing.
 - iii) Cross section of column.
8. Draw a cross section of a SS Masonry foundation to be provided for a load bearing wall 300mm thick in burnt brick masonry is a superstructure of a residential building. Use the following data
 - a) Width of foundation = 1.2m
 - b) Depth of foundation below GL = 1.2m
 - c) Width of PCC = 1.2m
 - d) Thickness of PCC in 1:3:6 = 75mm
 - e) Width of first footing above PCC = 1.05m
 - f) Depth of first footing Above PCC = 0.375m
 - g) Width of second step = 0.9m
 - h) Depth of second footing = 0.375m
 - i) Width of third footing = 0.75m
 - j) Depth of third footing = 0.375m
 - k) Width of plinth wall = 0.45m
 - l) Depth of plinth wall = 0.60m
 - m) Thickness of DPC in 1:2:4 = 100mm
9. Draw to scale the elevation and Plan of English bond with all details for 10 Courses.
10. Draw to scale the elevation and Plan of Flemish Bond with all details for 10 Courses.
11. Draw to scale the elevation and Plan of Header bond with all details for 10 Courses.
12. Draw to scale the elevation and Plan of Stretcher Bond with all details for 10 Courses
13. Draw a cross section and plan of a RCC dog legged stair for a building having the following particulars
 - i) Clear Size of Stair hall = 2.5m X 4.5m
 - ii) Width of landing = 1.2m
 - iii) Width of each flight = 1.2m
 - iv) Rise = 150mm Tread = 300mm
 - v) Thickness of Waist slab = 150mm
 - vi) Height of floor = 3.6m
14. Draw a cross section and plan of a RCC open well stair for a building having the following particulars
 - i) Clear Size of Stair hall = 4.25m X 5.25m
 - ii) Width of landing = 1.5m
 - iii) Rise = 150mm Tread = 250mm
 - iv) Thickness of Waist slab = 150mm
 - v) Height of floor = 3.9m
15. Draw the cross section of lintel beam and chejja for the following details:
 - i) Size of opening of the window = 1.5m
 - ii) Bearing of lintel = 0.2m
 - iii) Thickness of wall = 0.23m
 - iv) Depth of Lintel Beam = 0.2m
 - v) Projection of Chejja = 0.6m
 - vi) Thickness of Chejja at face of lintel = 100mm and at end 50mm
 - vii) Reinforcement details in Lintel at bottom = 3#10 and at top = 2#8
 - viii) Stirrups 2LVS 8mm Dia @150mm c/c
 - ix) Chejja main reinforcement 8mm@100mmc/c, Distribution 6mm@150mmc/c
16. Draw the longitudinal section, Cross section of a rectangular simply supported RCC beam with the following data.

Clear span = 4m
 Width of beam = 250mm
 Overall depth of beam = 300mm
 Bearing width in support = 200mm
 Main reinforcement = #5-16mmdia bars with 2 bars bent up at L/7 from center of support
 Anchor/hangar bars = #2-10mm dia
 Stirrups = 6mm dia @200mmc/c
17. A two way slab for a hall of internal dimension 4.5mX5.5m has the following details
 - i) Thickness of slab = 120mm
 - ii) Wall thickness = 230mm
 - iii) Short span steel = 10mm@120mm C/c
 - iv) Long span steel = 8mm@140mm c/c
 Draw to suitable scale the following
 1. Plan showing reinforcement details
 2. Cross section of a slab @mid span along short span
 3. Cross section of a slab @mid span along Long span
18. A one-way slab for a hall of internal dimension 7mX11.77m has the following details:
 - i) Thickness of slab = 150mm



- ii) Wall Thickness = 230mm
- iii) Main steel along short span = 10mm @ 100mm c/c
- iv) Distribution steel = 8mm @ 150mm c/c

Draw to scale the following

- 1) Plan showing the reinforcement details
 - 2) Cross section of slab @ mid span along short span
 - 3) Cross section of slab @ mid span along long span
19. Draw to scale the cross section of a pavement showing thickness of all layers.
20. Draw a plan and section for a septic tank for the following details.

Depth of tank is 1.75m, length of PCC bed 4.7m width of PCC bed 1.9m, thickness of PCC bed is 0.15m.

Width of tank wall in brick work above PCC bed = 0.4m for a height 0.4m.

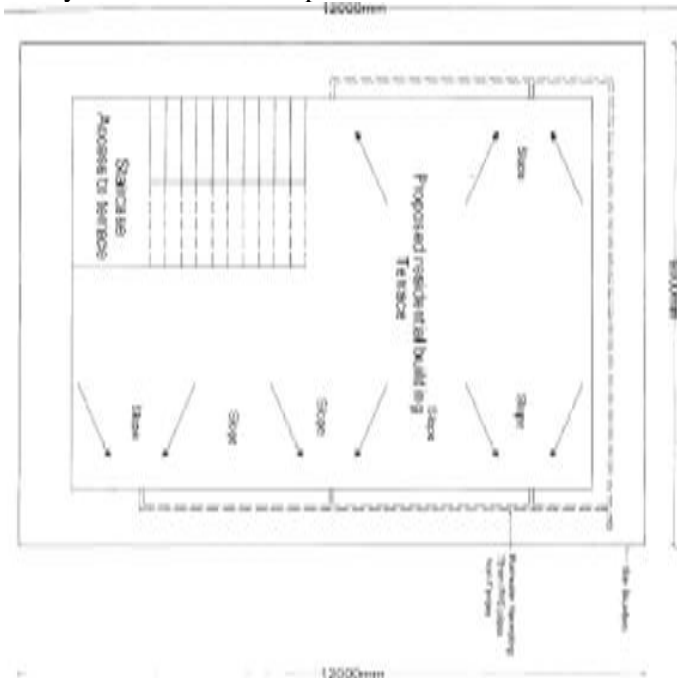
Width of tank wall in brick work = 0.3 m for a height 0.5m

Width of tank wall in brick work = 0.2 m for a height 0.7m

The tank consist of a RCC precast slab of thickness 75mm.

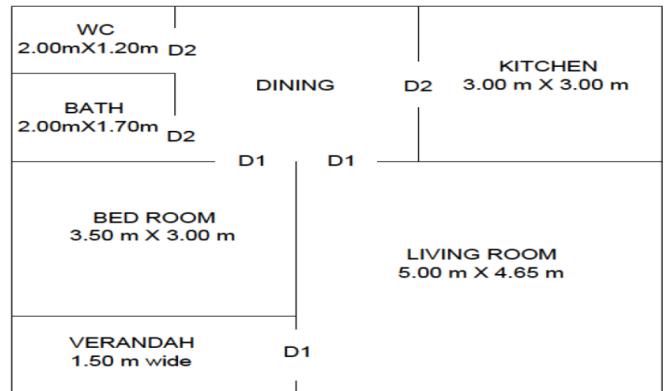
Also show the provision of inlet and outlet pipes.

21. Show the rainwater recharging and harvesting system for the below plan.

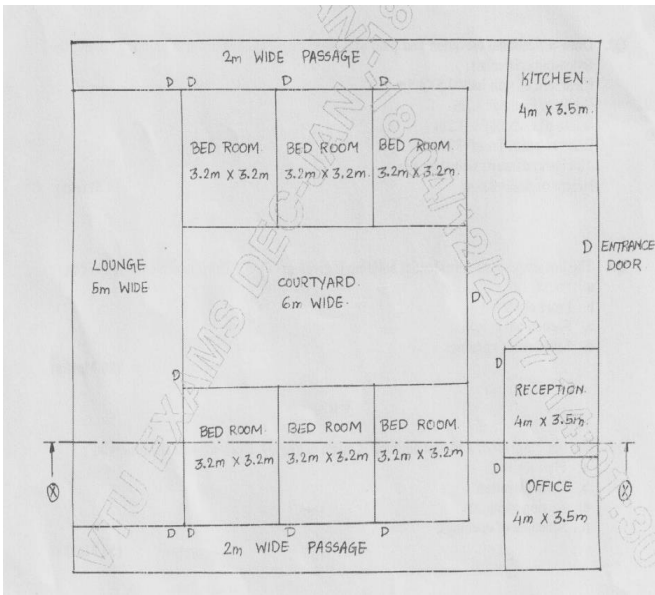


22. Draw the cross section of a divided highway in urban area having width of pavement 10.5m, footpath 3m, cycle track 3.8m and reserve space 1.2m and area separator or divider 6m in width.

23. Draw the cross section of a divided highway in urban area having width of pavement 7m, footpath 2m, cycle track 1.8m and reserve space 2.2m and area separator or divider 4m in width.
24. The line diagram of a residential building is given in fig 1(a). Draw to scale the following
- i) Plan at Sill
 - ii) Front elevation
 - iii) Section along AA'
 - iv) Schedule of openings
25. For the same line diagram, Draw to scale the following
- i) Electrical Service
 - ii) Plumbing and Sanitary services.

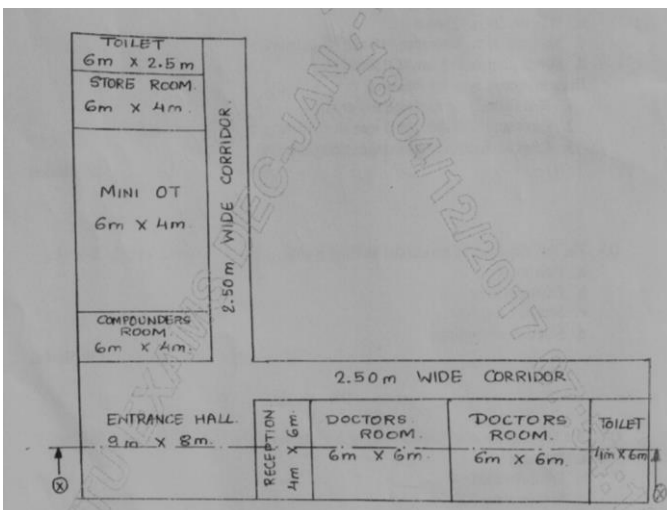


26. 1. The line diagram of a hostel building is given in fig1(a), Draw to scale the following
- Plan at Sill
 - Front elevation
 - Section along AA'
 - Schedule of openings
2. For the same line diagram, Draw to scale the following
- Electrical Service
 - Plumbing and Sanitary services.



27. 1. The line diagram of a hospital building is given in fig 1(a), Draw to scale the following
 Plan at Sill
 Front elevation
 Section along AA'
 Schedule of openings

2. For the same line diagram, Draw to scale the following
 Electrical Service
 Plumbing and Sanitary services.



28. 1. The line diagram of a hospital building is given in fig 1(a), Draw to scale the following
 Plan at Sill
 Front elevation
 Section along AA'
 Schedule of openings

2. For the same line diagram, Draw to scale the following
 Electrical Service
 Plumbing and Sanitary services.

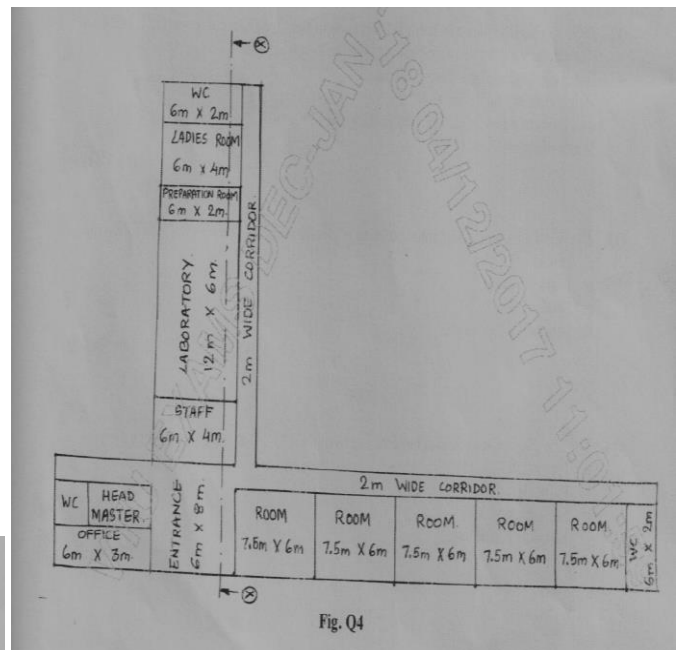



Fig. Q4

Prepared by	Checked by		
Prof. Sudarshan V Jore	Prof. Preethi R Patil	HOD	Principal

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Subject Title	Social Connect and Responsibility		
Subject Code	21UH36/ 21SCR36	Activity & Reports (10) x 5	50
Number of Lecture Hrs/Week /	01(P)	Exam Marks (appearing for)	50
Total Number of Lecture Hrs	15 Lab Slots	Exam Hours	03
CREDITS – 01			

FACULTY DETAILS:		
Name: Prof. S.B.Sarwadi	Designation: Physical Education Director	Experience: 20 years
No. of times course taught: 00	Specialization: M.P.Ed	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Students should have the knowledge of basic subjects	1 & 2	Universal Human Values

2.0 Course Objectives

- Enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government & build solutions to alleviate these complex social problems through immersion, design & technology.
- Provide a formal platform for students to communicate and connect with their surroundings.


3.0 Course Outcomes

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

CO's	Course Outcome	Cognitive Level	PO's
206.1	Develop an eco-friendly relationship for saving natural resources and preservation of nature.	U	
206.2	Develop multicultural awareness and appreciation for Music and Drama by exposing learners to various forms of Art.	U	
206.3	Understand the concept of agricultural operations.	U	
206.4	Develop an eco-friendly relationship for saving natural resources & preservation of nature.	U	
206.5	Describe the regional culinary practices and its importance in day-to-day life	U	
Total Hours of instruction		15	

4.0 Course Content

Practical/Theory		
Modules	Teaching Hours	Bloom's Taxonomy (RBT) level
Module 1		
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.	03	L1
Module -2		
Heritage walks and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.	03	L1
Module-3		
Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.	03	L1
Module-4		
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.	03	L1
Module-5		
Food Walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking.	03	L1

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5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	I/II	Universal Human Values	Social Connectivity

6.0 Relevance to Real World

SL.No	Real World Mapping
01	Connecting to Nature and

7.0 Books Used and Recommended to Students

Reference Books
1. Universal Human Values and Professional Ethics, Dr. Ritu Soryan, 2022 2. Universal Human Values and Professional Ethics - S.K. Kataria

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

Website and Internet Contents References
1) https://nptel.co.in
2) http://www.uhv.org.in/uhv-1

9.0 Examination Note

Assessment Details both (CIE and SEE):

Continuous Internal Evaluation (CIE)

After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

Marks allotted for the diary are out of 50.

Planning and scheduling the social connect

Information/Data collected during the social connect

Analysis of the information/data and report writing

Considering all above points allotting the marks as mentioned below-


Excellent	80 to 100
Good	60 to 79
Satisfactory	40 to 59
Unsatisfactory and fail	<39

Semester End Examination (SEE)

This Jamming session will be conducted at the end of the course for 50 marks

Jamming session includes -Platform to connect to others. Share the stories with others. **Share the experience of Social Connect.** Exhibit the talent like playing instruments, singing, one-act play, art painting, and fine art.

Faculty mentor has to design the evaluation system for the Jamming session.

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10.0 Course Delivery Plan

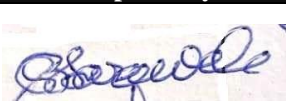



Module No.	Session No.	Content of Lecture	Teaching Method	% Portion Covered
1. Plantation and adoption of a tree	1	Plantation in campus	Activity	20
	2	Excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life,	Activity	
	3	Its appearance in folklore and literature.	Activity	
2. Heritage walk and crafts corner	4	Visit Heritage place near to college	Activity	20
	5	Knowing the history and culture of the city, connecting to people around through their history, knowing the city	Activity	
	6	Its craftsman, photoblog and documentary on evolution and practice of various craft forms.	Activity	
3. Organic farming and waste management	7	Visiting nearby Village	Activity	20
	8	Usefulness of organic farming, wet waste management in neighboring villages.	Activity	
	9	Implementation in the campus	Activity	
4. Water Conservation	10	Visiting nearby Village	Activity	20
	11	Knowing the present practices in the surrounding villages.	Activity	
	12	Implementation in the campus, documentary or photo blog presenting the current practices.	Activity	
5. Food Walk	13	Visiting food streets. Or food corners	Activity	20
	14	City's culinary practices, food lore	Activity	
	15	indigenous materials of the region used in cooking.	Activity	


11.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity
1	Activity Report 1: Plantation and adoption of a tree	Students carry the activity and will prepare for Final Exam.	Module-1 of the syllabus	3	Group Activity
2	Activity Report 2: Heritage walk and crafts corner	Students carry the activity and will prepare for Final Exam.	Module-2 of the syllabus	6	Group Activity
3	Activity Report 3: Organic farming and waste management	Students carry the activity and will prepare for Final Exam.	Module-3 of the syllabus	9	Group Activity
4	Activity Report 4: Water Conservation	Students carry the activity and will prepare for Final Exam.	Module-4 of the syllabus	12	Group Activity
5	Activity Report 5: Food Walk	Students carry the activity and will prepare for Final Exam.	Module-5 of the syllabus	15	Group Activity

12.0 University Result

NEW SCHME

Prepared by	Checked by		
			
Prof. S. B. Sarwade	Prof. Sachin S. Patil	HOD	Principal

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Subject Title	Fire safety in building		
Subject Code	21CV385	CIE Marks	50
Number of Lecture Hrs / Week	0:2:0:0	SEE Marks	50
Total Number of Lecture Hrs	15	Exam Hours	1
CREDITS – 01			

FACULTY DETAILS:		
Name: Prof.S.S Beesanakoppa	Designation: Asst. Professor	Experience: 1 Years
No. of times course taught: 01	Specialization: Fire safety in Building	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Civil Engineering	I/II	Elements of Civil Engineering

2.0 Course Objectives

To understand the importance fire safety


To learn various techniques involved in fire safety

To design fire resistant buildings using proper materials and methods

3.0 Course Outcomes

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

	Course Outcome	RBT Level	POs
C204.1	Understand types of fire, combustion process and fire resistance	L1,L2,L3,L4	1,2,3,5,6,8,12
C204.2	Plan for fire safety and design of lifts	L1,L2,L3,L4	1,2,3,5,6,8,12
C204.3	Design flow network in buildings	L1,L2,L3,L4	1,2,3,5,6,8,12
C204.4	Design of electrical systems and maintenance	L1,L2,L3,L4	1,2,3,5,6,8,12
C204.5	Perform health evaluation of buildings and suggest remedies	L1,L2,L3,L4	1,2,3,5,6,8,12
Total Hours of instruction			15

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4.0 Course Content

Module-1

Fire: Introduction, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel-controlled fire, process of combustion: flashover condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure

Module-2

Fire safety: urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal, different cases, simulation, arrangements and escalators

Module-3

Introduction to flow system: water supply, constant demand, variable demand and diversity factor, control systems Flow in pipe networks and fixture units, design of water supply distribution system, flow in waste water pipes

Module-4

Introduction to HVAC: governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation-based approach Electrical systems: design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance, periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance

Module-5

Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice of test location Non-destructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	V	RCC	Design of beams, column

6.0 Relevance to Real World


Sl No	Real World Mapping
01	Estimation of fire safety in Hospitals, apartments.

7.0 Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	NPTEL	Fire safety in building

8.0 Books Used and Recommended to Students

Text Books
1. J A Purkiss, Fire Safety Engineering: Design of Structures, ISBN 13 978-8131220085, Elsevier, 2009
2. V K Jain, Fire Safety in Buildings, ISBN-13 978-938980219, New Age International Private Limited; Third edition, 2020
3. Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
4. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP-32)", BIS 1987 and 1989.

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5. Markus, T.A. & Morris, E.N., "BUILDING CLIMATE AND ENERGY" Pitman publishing limited. 1980.
6. Croome, J.D. & Roberts, B.M., "AIRCONDITIONING AND VENTILATION OF BUILDINGS VOL-1". Pergamon press.
7. Building Services Design - T.W. MEVER
8. Building Engineering & System Design - F.S. MERRIT & J. AMBROSE
9. SP-35 (1987): Handbook of Water supply & drainage-BIS
10. N.B.C.-2007 BIS
11. Concept of building fire safety - D. EGAN.
12. Design of fire resisting structures - H.L. MALHOTRA.

Reference Books

1. An introduction to fire dynamics -D. DRYSDALE
2. Structural fire protection Edt by T.T.LIE
3. Elevator technology - G.C. BARNEY
4. HEATING VENTILATING AND AIR CONDITIONING Analysis and Design - Faye C. McQuiston and Jerald D. Parker.
5. Building Maintenance Management-R.LEE
6. Developments In Building Maintenance -I.EJ. GIBSON
7. Concrete Structures: materials, Maintenance And Repair D. CAMPBELL, ALLEN & H.ROPER

Additional Study material & e-Books

1. Electronic Devices and Circuits Anil K. Maini Vasha Agarwal Wiley 1st Edition, 2009

9.0

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

Website and Internet Contents References

https://en.wikipedia.org/wiki/transistor_amplifier

<https://en.wikipedia.org/wiki/oscillators>

10.0

Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Elsevier journals	www.journals.elsevier.com/aeu

11.0

Examination Note

Scheme of Evaluation for CIE (50 Marks)

Three Tests (preferably in MCQ pattern with 20 questions) each of 20 Marks (duration 01 hour)

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


Two assignments each of 10 Marks

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

Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) The sum of total marks of three tests, two assignments, and quiz /seminar/ group discussion will be out of 100 marks and shall be scaled down to 50 marks


SCHEME OF EXAMINATION: 100 Marks, scaled down to 50 in VTU result sheet.

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE 1	1	Fire: Introduction, Basic concepts of fire protection,	20
	2	Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel-controlled fire,	
	3	process of combustion: flashover condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure	
MODULE 2	4	Fire safety: urban planning, escape and refuge, internal planning,	20
	5	detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal,	
	6	different cases, simulation, arrangements and escalators	
MODULE 3	7	Introduction to flow system: water supply, constant demand, variable demand and diversity factor,	20
	8	control systems Flow in pipe networks and fixture units,	
	9	design of water supply distribution system, flow in waste water pipes	
MODULE 4	10	Introduction to HVAC: governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation-based approach	20
	11	Electrical systems: design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance,	
	12	periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance	
MODULE 5	13	Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice of test location	20
	14	Non-destructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair,	
	15	rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results	

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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 basics of fire	Module 1 of the syllabus	3	Individual Activity.	Text 1 & 2 Ref Book 1&2
2	Assignment 2: Questions on module 2	Students study the Prepare a comprehensive development plan for infrastructure projects	Module 2 of the syllabus	5	Individual Activity.	Text 1 & 2 Ref Book 7 &8
3	Assignment 3: Questions on module 3	Students study the Plan funding required and procedure to be adopted for infrastructure development	Module 3 of the syllabus	8	Individual Activity.	Text 1 & 2 Ref Book 8 & 9
4	Assignment 4: Questions on module 4	Students Estimate revenue generation and implement investment plans	Module 4 of the syllabus	10	Individual Activity.	Text 1& 2 Ref Book 7
5	Assignment 5: Questions on module 5	Students Study Understand risk involved and policy issues related to infrastructure projects	Module 5 of the syllabus	12	Individual Activity.	Text 1 & 2 Ref Book 3

14.0 QUESTION BANK

MODULE 1

1. What are fire risks in a factory?
2. What is fire protection?
3. What colors should be used for fire related signs?

MODULE 2

- 1 Why is fire safety education and training important?
- 2 What are 5 fire safety rules?
- 3 What are flammable and combustible liquids?
- 4 What should be included in a fire safety plan?

MODULE 3





- 1 How are flammable and combustible materials an explosion hazard?
- 2 What fire safety equipment should I have in my facility?


MODULE 4

1. How many fire extinguishers should a workplace have?
2. How are flammable and combustible materials an explosion hazard?

MODULE 5

1. What are some examples of fire protection measures?
- 2 . What are fire risks in an office?

Prepared by	Checked by		
			
Prof. S S Beesanakoppa	Prof. S. M. Chandrakanth	HOD	Principal

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COURSE PLAN

Subject Title	Additional Mathematics-I		
Subject Code	21MATDIP31	IA Marks	100
Number of Lecture Hrs /Week	03	Exam Marks	0
Total Number of Lecture Hrs	30	Exam Hours	03
CREDITS – 0			
FACULTY DETAILS:			
Name: 1) Prof. S. A. Patil	Designation: Asst. Professor	Experience: 1) 12	
No. of times course taught: 1) 01	Specialization: Mathematics		

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Common to all	I/II	Applied Mathematics-I/II

2.0 Course Objectives


Course Learning Objectives:

- To provide basic concepts of complex trigonometry, vector algebra, differential and integral calculus.
- To provide an insight into vector differentiation and first order ODE's.

3.0 Course Outcomes

On completion of this course, students are able to:

	Course Outcome
CO1	Use derivatives and partial derivatives to calculate the rate of change of multivariate functions.
CO2	Apply concepts of complex numbers and vector algebra to analyse the problems arising in a related
CO3	Analyse position, velocity and acceleration in two and three dimensions of vector-valued functions..
CO4	Learn techniques of integration including the evaluation of double and triple integrals.
CO5	Identify and solve first-order ordinary differential equations.

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4.0 Course Content

MODULES	RBT Levels
MODULE-1 Differential Calculus: Successive differentiation-problems. Taylor's & Maclaurin's series expansions-problems. Partial Differentiation: Euler's theorem (without Proof)-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems. 8 Hours	L1,L2,L3
MODULE-2: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof), Problems. Vector Algebra: Scalar and vectors. Addition, subtraction and multiplication of vectors- Dot and Cross products, problems. Scalar triple product, Problems. 8 Hours	L1,L2,L3
MODULE-3: Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems. 8 Hours	L1,L2,L3
MODULE-4: Integral Calculus: Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^n x \cos^n x$ (without proof) and evaluation of these with standard limits-problems. Double and triple integrals-Simple problems. 8 Hours	L1,L2,L3
MODULE-5: Ordinary Differential Equations (ODEs): Introduction-solutions of first order and first-degree differential equations: Variable separable method, Homogeneous differential equations, linear differential equations. Exact differential equations. 8 Hours	L1,L2,L3

5.0 Relevance to future subjects


Sl No	Semester	Subject	Topics
01	Common to all	Common to all engineering Subjects	Signal and Analysis, Field Theory, Thermodynamics, Fluid Dynamics etc

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Numerical methods are used to solve engineering problems. For examples will be drawn from a variety of engineering problems, including heat transfer, vibrations, dynamics, fluid mechanics, etc.
02	Special functions are used to wave propagation and scattering, fiber optics, heat conduction in solids, and vibration phenomena.
03	In sampling is the reduction of a to a. A common example is the conversion of a (a continuous signal) to a sequence of samples (a discrete-time signal).

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Integral Calculus

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8.0 Books Used and Recommended to Students

Text Books

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 43rd Edition, 2015.
2. Advanced Engineering Mathematics, E. Kreyszig John, Wiley & Sons, 10th Edition, 2015.
3. Engineering Mathematics, N. P. Bali and Manish Goyal, Laxmi Publishers, 7th Edition, 2007.
4. Higher Engineering Mathematics, H. K. Das and Er. Rajnish Verma, S. Chand & Company PVT.LTD, Third Revised Edition 2014.

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

Website and Internet Contents References

Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>
4. VTU EDUSAT PROGRAMME - 20

10.0 Magazines/Journals Used and Recommended to Students

Sl. No	Magazines/Journals	website
1	+ Plus Magazine	https://plus.maths.org/issue44 .
2	Mathematics Magazine	www.mathematicsmagazine.com

11.0 Examination Note

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks(100). A student shall be deemed to have satisfied the academic requirements if the student secures not less than 40% (40 Marks out of 100) in the CIE.

Continuous Internal Evaluation:

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

1. The first test at the end of 5th week of the semester
2. The second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

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

Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours).

The sum of three tests, two assignments, and a seminar will be out of 100 marks

The student shall secure a minimum of 40% of marks of the course to qualify and become eligible for the award of a degree.



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12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
MODULE-1	1	Successive differentiation, problems	20
	2	Taylor's series expansions-problems.	
	3	Maclaurin's series expansions-problems.	
	4	Partial Differentiation:	
	5	Euler's theorem (without Proof)-problems on 1 st order derivatives only.	
	6	Total derivatives	
	7	Differentiation of composite functions	
	8	Jacobins of order two-Problems	
MODULE-2	9	Definitions and properties of complex numbers.	20
	10	Modulus and amplitude of a complex number,	
	11	De-Moivre's theorem (without proof), Problems.	
	12	Scalar and vectors	
	13	Addition, subtraction and multiplication of vectors.	
	14	Problems	
	15	Dot and Cross products, problems	
	16	Scalar triple product, Problems	
MODULE-3	17	Differentiation of vector functions	20
	18	Velocity and acceleration of a particle moving on a space curve	
	19	Scalar and vector point functions	
	20	Gradient problems	
	21	Divergence problems	
	22	Curl-simple problems	
	23	Solenoidal and irrotational vector fields	
	24	Problems	
MODULE-4	25	Review of elementary integral calculus	20
	26	Reduction formulae for $\sin^n x$, (with proof) Problems	
	27	Reduction formulae for $\cos^n x$ (with proof) Problems	
	28	Reduction formulae for $\sin^m x \cos^n x$ (without proof) Problems	
	29	Evaluation of standard limits-Examples	
	30	Problems	
	31	Double and triple integrals	
	32	Problems	
MODULE-5	33	Introduction-solutions of first order and first-degree differential Equations	20
	34	Variable separable method	
	35	Problems	
	36	Homogeneous differential equations	
	37	Exact differential equations	
	38	Problems	
	39	Linear differential equations	
	40	Problems	

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13.0 Assignments, Pop Quiz, Mini Project, Seminars

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

14.0 QUESTION BANK

Module-1: Complex Trigonometry:

- Express the complex number in the form of $x+iy$ and hence find its Modulus & amplitude of $\frac{(1+i)(1+3i)}{(1+5i)}$
- Find the Modulus & amplitude of $(1 + \cos\theta + i\sin\theta)$
- Evaluate $\frac{(\cos 5\theta - i\sin 5\theta)^2 (\cos 7\theta + i\sin 7\theta)^{-3}}{(\cos 4\theta - i\sin 4\theta)^9 (\cos \theta - i\sin \theta)^5}$
- Express $\sqrt{8} + 4i$ in the polar form and hence find its modulus and amplitude.
- Show that $(1 + \cos\theta + i\sin\theta)^n + (1 + \cos\theta - i\sin\theta)^n = 2^{n+1} \cos^n\left(\frac{\theta}{2}\right) \cos\left(\frac{n\theta}{2}\right)$
- Find the argument of $\frac{1+\sqrt{3}i}{1-\sqrt{3}i}$
- Define dot product between two vectors A and B. Find the sine of the angle between the vectors A . B
 $\vec{A} = \vec{i} - 3\vec{j} + 2\vec{k}$ and $\vec{B} = 2\vec{i} - \vec{j} + \vec{k}$
- If $\vec{A} = \vec{i} - 2\vec{j} + \vec{k}$ and $\vec{B} = \vec{i} + 2\vec{j} - \vec{k}$, show that $(\vec{A} + \vec{B})$ and $(\vec{A} - \vec{B})$ are orthogonal.
- S.T. the positive vectors of the vertices of triangle $\vec{A} = 3(\sqrt{3}\vec{i} - \vec{j})$, $\vec{B} = 6\vec{j}$ and $\vec{C} = 3(\sqrt{3}\vec{i} + \vec{j})$, form an isosceles triangle.
- S.T. $\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(\frac{n\pi}{2} - n\theta\right) + i\sin\left(\frac{n\pi}{2} - n\theta\right)$
- Express $\sqrt{7} + 9i$ in the polar form and hence find its modulus and amplitude.

Module-2: Differential Calculus:



- Expand $e^{\sin x}$ by Maclaurin's series up to the term containing x^4 .
- Expand $\log(1 + \cos x)$ by Maclaurin's series up to the term containing x^4 .
- Obtain the Taylor's expansion of $\log_e x$ about $x=1$ up to the term containing 4th degree & hence obtain $\log_e(1.1)$.
- Using Maclaurin's series expand $\log(\sec x)$ up to the term containing x^5
- If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$, and $w = \frac{xz}{y}$, find $J = \frac{\partial(u,v,w)}{\partial(x,y,z)}$
- If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x+y}}\right)$ & $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$, then P T $x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy} = \frac{-\sin u \cos 2u}{4 \cos^3 u}$
- If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$
- If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$
- Using Maclaurin's series to prove that $\sqrt{1 + \sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{6}$
- If $u = \log\left[\frac{x^4 + y^4}{x+y}\right]$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$
- If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$
- Find the total derivative of the function and also verify the result by direct substitution $z = xy^2 + x^2y$ where $x = at$, $y = at$
- If $u = x + 3y^2 - z^3$, $v = 4x^2yz$, $w = 2z^2 - xy$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at $(1, -1, 0)$

Module-3: Vector Differentiation:

- Find $\text{div } \vec{F}$ & $\text{curl } \vec{F}$ if $\vec{F} = (x^3 + y^3 + z^3 - 3xyz) \vec{i}$
- If $\phi = x^2 + y^2 + z^2$ and $\vec{F} = x^2 \vec{i} + y^2 \vec{j} + z^2 \vec{k}$, then find $\text{grad } \phi, \text{div } \vec{F}, \text{curl } \vec{F}$
- Find the value of the constants a, b & c such that the vector field, $\vec{F} = (x + y + az)\vec{i} + (bx + 2y - z)\vec{j} + (x + cy + 2z)\vec{k}$ is irrotational and hence find a scalar
- If $u = x^2 \vec{i} + y^2 \vec{j} + z^2 \vec{k}$ & $v = yz \vec{i} + xz \vec{j} + yx \vec{k}$ then prove that $\vec{u} \times \vec{v}$ is a Solenoidal vector
- Prove that $\text{div}(\phi \vec{A}) = \phi(\text{div } \vec{A}) + \text{grad } \phi \cdot \vec{A}$
- Prove that $\text{curl}(\text{grad } \phi) = 0$
- Prove that $\text{div } \text{curl } \vec{F} = \nabla \cdot \nabla \times \vec{F} = 0$
- If $u = x^2 \vec{i} + y^2 \vec{j} + z^2 \vec{k}$ & $v = yz \vec{i} + xz \vec{j} + yx \vec{k}$ then prove that $\vec{u} \times \vec{v}$ is a Solenoidal vector
- If $\vec{v} = \vec{w} \times \vec{r}$, prove that $\text{curl } \vec{v} = 2\vec{w}$ where \vec{w} is a constant vector
- A Particle moves along the curve $x = t^3 - 4t$, $y = t^2 + 4t$, $z = 8t^2 - 3t^3$ where t is the time variable determine its velocity and acceleration and also find magnitude of velocity and acceleration at $t=2$.
- If $\vec{A} = x^2 yz \vec{i} + y^2 zx \vec{j} + z^2 xy \vec{k}$ find $\text{div } \vec{A}, \text{curl } \vec{A}$
- Show that $\vec{F} = (y + z)\vec{i} + (z + x)\vec{j} + (x + y)\vec{k}$ is irrotational. Also find scalar function ϕ such that $\vec{F} = \nabla \phi$.
- Find the value of the constant 'a' such that the $\vec{A} = y(ax^2 + z)\vec{i} + x(y^2 - z^2)\vec{j} + 2xy(z - xy)\vec{k}$ is Solenoidal and show that $\text{curl } \vec{A}$ is also Solenoidal.

MODULE-4: Integral Calculus:

- Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dx dy dz$
- Evaluate $\int_0^5 \int_0^{x^2} x(x^2 + y^2) dx dy$
- Evaluate $\int_0^1 \int_0^2 \int_1^2 (x^2 yz) dx dy dz$
- Evaluate $\int_0^1 \int_0^1 \int_0^y (xyz) dx dy dz$.
- Evaluate $\iint_A xy dx dy$, where A is the domain bounded by x-axis, ordinate $x=2a$ & the curve $x^2=4ay$
- Evaluate $\int_0^{\pi/2} \sin^n x dx$



7. Evaluate $\int_0^{\pi/2} \cos^n x \, dx$
8. Evaluate i) $\int_0^{\pi/2} \sin^6 x \cos^5 x \, dx$, ii) $\int_0^{\pi/2} \sin^8 x \cos^6 x \, dx$
9. Evaluate $\int_0^1 \int_x^{\sqrt{x}} x y \, dy \, dx$

MODULE-5: Ordinary differential equations (ODE's):

- Solve $3e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$.
- Solve $\frac{dy}{dx} = x \tan(y - x) + 1$
- Solve $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$
- Solve $(x - y \log y + y \log x) \, dx + x(\log y - \log x) \, dy = 0$
- Solve $(x \tan y/x - y \sec^2) \, dx + x \sec^2 y/x \, dy = 0$
- Solve $\frac{dy}{dx} = \frac{2x - y + 1}{x + 2y - 3}$
- Solve $e^y \left(\frac{dy}{dx} + 1 \right) = e^x$
- Solve $(x^2 - 4xy - 2y^2) \, dx + (y^2 - 4xy - 2x^2) \, dy = 0$
- Solve $\frac{dy}{dx} + y \cot x = \cos x$.
- Solve $\frac{dy}{dx} + x \sin 2y = x^3 \cos 2y$
- Solve $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$
- Solve $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$
- Solve $(xy^3 + y) \, dx + (x^2 y^2 + x + y^4) \, dy = 0$
- Solve $xy(1 + xy^2) \frac{dy}{dx} = 1$
- Solve $\sec^2 y \frac{dy}{dx} + x \tan y = x^3$
- Solve $(y^3 - 3x^2 y) \, dx - (x^3 - 3xy^2) \, dy = 0$
- Solve $(x^2 + y^2 + x) \, dx + xy \, dy = 0$
- Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x$
- Solve $\frac{dy}{dx} - y \tan x = \frac{\sin x \cos^2 x}{y^2}$
- Solve $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$

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