

## 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)

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	<b>PCC 21CV34</b>	<b>Earth Resources and Engineering</b>	<b>TD: Geology PSB: Geology</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>03</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>3</b>	
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 21UH36	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 21KKB37/47	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							
									<b>Total</b>	<b>400</b>	<b>400</b>	<b>800</b>	<b>18</b>
9	Scheduled activities for III to VIII semesters	NCMC 21NS83	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 21PE83	Physical Education (PE)(Sports and Athletics)	PE									
		NCMC 21YO83	Yoga	Yoga									
<b>Course prescribed to lateral entry Diploma holders admitted to III semester B.E./B.Tech programs</b>													
1	NCMC 21MATDIP31	Additional Mathematics - I	Maths	02	02	--	--	---	100	---	100	0	
<b>Note:</b> 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 <b>21KSK37/47</b> Samskrutika Kannada is for students who speak, read and write Kannada and <b>21KKB37/47</b> Balake Kannada is for non-Kannada speaking, reading, and writing students. <b>Integrated Professional Core Course (IPCC):</b> 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													

SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2021-22 may be referred.

**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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(Effective from the academic year 2021 - 22)

**IV 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 21MAT41	Complex Analysis, Probability and Statistical Methods.	TD, PSB-Maths	2	2	0	0	03	50	50	100	3
2	IPCC 21CV42	Fluid Mechanics and Hydraulics	TD: Civil Engg PSB: Civil Engg	2	2	2	0	03	50	50	100	4
3	IPCC 21CV43	Public Health Engineering	TD: Civil Engg PSB: Civil Engg	2	2	2	0	03	50	50	100	4
4	PCC 21CV44	Analysis of Structures	TD: Civil Engg PSB: Civil Engg	2	2	0	0	03	50	50	100	3
5	AEC 21BE45	Biology for Engineers	BT, CHE, PHY	1	2	0	0	02	50	50	100	2
6	PCC 21CVL46	Earth Resources and Engineering Lab	TD: Geology PSB: Geology	0	0	2	0	03	50	50	100	1
7	HSMC 21KSK37/47	Sanskritika Kannada	HSMC	0	2	0	0	01	50	50	100	1
	HSMC 21KBK37/47	Balake Kannada										
	OR											
	HSMC 21CIP37/47	Constitution of India & Professional Ethics										
8	AEC 21CV48X	Ability Enhancement Course- IV	TD and PSB: Concerned department	If offered as theory Course				01	50	50	100	1
				0	2	0						
				If offered as lab. course				02				
				0	0	2						
9	UHV 21UH49	UniversalHumanValues	Any Department	0	2	0		01	50	50	100	1
10	INT 21INT49	Inter/Intra Institutional Internship	Evaluation By the appropriate authorities	Completed during the intervening period of II and III semesters by students admitted to first year of BE./B.Tech and during the intervening period of III and IV semesters by Lateral entry students admitted to III semester.				3	100	--	100	2
<b>Total</b>									<b>550</b>	<b>450</b>	<b>1000</b>	<b>22</b>

**Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs**

1	NCMC 21MATDIP41	Additional Mathematics - II	Maths	02	02	--	--	--	100	--	100	0
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**Note:** BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, AEC –Ability Enhancement Courses, HSMC: Humanity and Social Science and Management Courses, UHV- Universal Human Value Courses.

L –Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

21KSK37/47 Sanskritika 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 SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.

**Non – credit mandatory course (NCMC):****Additional Mathematics - II:**

(1) Lateral entry Diploma holders admitted to III semester of B.E./B.Tech., shall attend the classes during the IV semester 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 course Additional Mathematics II shall be indicated as satisfactory in the grade card. Non-completion of the courses. Additional Mathematics II shall be indicated as Unsatisfactory.

**Ability Enhancement Course - IV**

21CV481	Data Cleaning and Preparation with Python Pandas	21CV484	Project Finance
21CV482	GIS with Quantum GIS	21CV485	Green Buildings
21CV483	Technical Writing Skills		

**Internship of 04 weeks during the intervening period of IV and V semesters; 21INT68 Innovation/ Entrepreneurship/ Societal Internship.**

(1) All the students shall have to undergo a mandatory internship of 04 weeks during the intervening period of IV and V 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 VI 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 considered under F (fail) grade and shall have to complete it subsequently after satisfying the internship requirements.

(2) **Innovation/ Entrepreneurship** Internship shall be carried out at industry, State and Central Government /Non-government organizations (NGOs), micro, small and medium enterprises (MSME), Innovation centres, or Incubation centers etc. Innovation need not be a single major breakthrough; it can also be a series of small or incremental changes. Innovation of any kind can also happen outside of the business world.

Entrepreneurship internships offer a chance to gain hands-on experience in the world of entrepreneurship and help to learn what it takes to run a small entrepreneurial business by performing intern duties with an established company. This experience can then be applied to future business endeavors. Start-ups and small companies are a preferred places to learn the business tactics for future entrepreneurs as earning how a small business operates will serve the intern well when he/she manages his/her own company. Entrepreneurship acts as a catalyst to open minds to creativity and innovation. Entrepreneurship internships can be from several sectors, including technology, small and medium-sized sector, and the service sector.

(3) **Societal or Social internship.** Urbanization is increasing on a global scale; and yet, half the world's population still resides in rural areas and is devoid of many things that urban population enjoys. The rural internship is a work-based activity in which students will have a chance to solve/reduce the problems of the rural place for better living.

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**V SEMESTER**

Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination			Credits	
				Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
				L	T	P	S					
1	BSC 21CV51	Hydrology and Water Resources Engineering	TD: Civil Engg PSB: Civil Engg	3	0	0		03	50	50	100	3
2	IPCC 21CV52	Transportation Engineering	TD: Civil Engg PSB: Civil Engg	2	2	2		03	50	50	100	4
3	PCC 21CV53	Design of RC Structural Elements	TD: Civil Engg PSB: Civil Engg	2	2	0		03	50	50	100	3
4	PCC 21CV54	Geotechnical Engineering	TD: Civil Engg PSB: Civil Engg	2	2	0		03	50	50	100	3
5	PCC 21CVL55	Geotechnical Engineering Lab	TD: Civil Engg PSB: Civil Engg	0	0	2		03	50	50	100	1
6	AEC 21CV56	Research Methodology & Intellectual Property Rights	TD: Any Department PSB: As identified by University	1	2	0		02	50	50	100	2
7	HSMC 21CIV57	Environmental Studies	TD: Civil/ Environmental /Chemistry/ Biotech. PSB: Civil Engg	0	2	0		1	50	50	100	1
8	AEC 21CV58X	Ability Enhancement Course-V	Concerned Board	If offered as Theory courses				01	50	50	100	1
				0	2	0						
				If offered as lab. courses				02				
				0	0	2						
<b>Total</b>								<b>400</b>	<b>400</b>	<b>800</b>	<b>18</b>	

**Ability Enhancement Course - V**

21CV581	Data Analysis with Python	21CV584	Quality Control and Quality Assurance
21CV582	Software Applications	21CV585	Offshore Structures
21CV583	Gender Sensitization		

Note: BSC: Basic Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, AEC –Ability Enhancement Course INT – Internship, HSMC: Humanity and Social Science & Management Courses.

L –Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

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

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**VI 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	HSMC 21CV61	Construction Management and Entrepreneurship	TD: Civil Engg PSB: Civil Engg	3	0	0		03	50	50	100	3
2	IPCC 21CV62	Concrete Technology	TD: Civil Engg PSB: Civil Engg	2	2	2		03	50	50	100	4
3	PCC 21CV63	Design of Steel structure	TD: Civil Engg PSB: Civil Engg	2	2	0		03	50	50	100	3
4	PEC 21CV64x	Professional Elective Course-I	TD: Civil Engg PSB: Civil Engg	3	0	0		03	50	50	100	3
5	OEC 21CV65x	Open Elective Course-I	Concerned Department	3	0	0		03	50	50	100	3
6	PCC 21CVL66	Computer Aided Detailing of Structure	TD: Civil Engg PSB: Civil Engg	0	0	2		03	50	50	100	1
7	MP 21CVMP67	Mini Project - Extensive survey project	TD: Civil Engg PSB: Civil Engg	Two contact hours /week for interaction between the faculty and students.				--	100	--	100	2
8	INT 21INT68	Innovation/Entrepreneurship /Societal Internship	Completed during the intervening period of IV and V semesters.				--	100	--	100	3	
<b>Total</b>								<b>500</b>	<b>300</b>	<b>800</b>	<b>22</b>	

**Professional Elective - I**

21CV641	Design of Prestressed Concrete Structures	21CV644	Design Concept in Building Services
21CV642	Applied Geotechnical Engineering	21CV645	Ground Water Hydraulics
21CV643	Railways, Harbours, Tunnelling and Airports	21CV646	Alternative Building Materials

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

21CV651	Remote Sensing and GIS	21CV653	Occupational Health and Safety
21CV652	Traffic Engineering	21CV654	Conservation of Natural Resources

**Note:HSMC:** Humanity and Social Science & Management Courses, **IPCC:** Integrated Professional Core Course, **PCC:** Professional Core Course, **PEC:** Professional Elective Courses, **OEC**–Open Elective Course, **MP** –Mini Project, **INT** –Internship.

**L** –Lecture, **T** – Tutorial, **P** - Practical / Drawing, **S** – Self Study Component, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Examination.

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

**Professional Elective Courses(PEC):**

A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

**Open Elective Courses:**

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

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

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

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

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

In case, any college is desirous of offering a course (not included in the Open Elective List of the University) from streams such as Law, Business (MBA), Medicine, Arts, Commerce, etc., can seek permission, at least one month before the commencement of the semester, from the University by submitting a copy of the syllabus along with the details of expertise available to teach the same in the college.

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

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

Based on the ability/abilities of the student/s and recommendations of the mentor Mini- project can be assigned to a group having not more than 10 students.

**CIE procedure for Mini-project – Extensive Survey Project:**

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

**No SEE component for Mini-Project.**

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

#### Swapping Facility

Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate research internship/ industry internship after the VI semester.

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

#### Elucidation:

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

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

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

#### INT21INT82Research Internship/ Industry Internship/Rural Internship

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

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

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

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

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**Swappable VII and VIII SEMESTER****VII 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	PCC 21CV71	Quantity Survey and Contract Management	TD: Civil Engg PSB: Civil Engg	2	2	0		3	50	50	100	3
2	PCC 21CV72	Construction Technology for Substructure and Super Structures	TD: Civil Engg PSB: Civil Engg	2	0	0		3	50	50	100	2
3	PEC 21CV73X	Professional elective Course-II	TD: Civil Engg PSB: Civil Engg	3	0	0		3	50	50	100	3
4	PEC 21CV74X	Professional elective Course-III	TD: Civil Engg PSB: Civil Engg	3	0	0		3	50	50	100	3
5	OEC 21CV75X	Open elective Course-II	Concerned Department	3	0	0		3	50	50	100	3
6	Project 21CVP76	Project work	TD: Civil Engg PSB: Civil Engg	Two contact hours /week for interaction between the faculty and students.				3	100	100	200	10
<b>Total</b>								<b>350</b>	<b>350</b>	<b>700</b>	<b>24</b>	

**VIII SEMESTER**

Sl. No	Course and Course Code	Course Title	Teaching Department	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	Seminar 21CV81	Technical Seminar	TD: Civil Engg PSB: Civil Engg	One contact hour /week for interaction between the faculty and students.				--	100	--	100	01
2	INT 21INT82	Research Internship/ Industry Internship	TD: Civil Engg PSB: Civil Engg	Two contact hours /week for interaction between the faculty and students.				03 (Batch wise )	100	100	200	15
3	NCMC	21NS83 National Service Scheme (NSS)	NSS	Completed during the intervening period of III semester to VIII semester.				--	50	50	100	0
		21PE83 Physical Education (PE) (Sports and Athletics)	PE									
		21YO83 Yoga	Yoga									
<b>Total</b>								<b>250</b>	<b>150</b>	<b>400</b>	<b>16</b>	

**Professional Elective - II**

21CV721	Advanced Design of RCC and Steel Structures	21CV724	Solid Waste Management
21CV722	Advanced Geotechnical Engineering	21CV725	Design of Hydraulic Structures
21CV723	Pavement Materials and Construction	21CV726	Repair, Retrofitting and Rehabilitation of Structures

**Professional Elective - III**

21CV731	Earthquake Engineering	21CV734	Air Pollution and Control
21CV732	Ground Improvement Techniques	21CV735	Open Channel Hydraulics
21CV733	Pavement Design	21CV736	Design of Masonry Structures

Open Electives - II offered by the Department to other Department students			
21CV741	Finite Element Method	21CV744	Intelligent Transportation Systems
21CV742	Numerical Methods and Applications		
21CV743	Environmental Protection and Management		
<p><b>Note: PCC:</b> Professional Core Course, <b>PEC:</b> Professional Elective Courses, <b>OEC</b>–Open Elective Course, <b>AEC</b> –Ability Enhancement Courses. L –Lecture, T – Tutorial, P- Practical / Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.</p>			
<p><b>Note: VII and VIII semesters of IV year of the programme</b>  <b>(1)</b> Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate research internship/ industry internship after the VI semester.  <b>(2)</b> Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.</p>			
<p><b>PROJECT WORK (21XXP75):</b> The objective of the Project work is</p> <ul style="list-style-type: none"> <li>(i) To encourage independent learning and the innovative attitude of the students.</li> <li>(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.</li> <li>(iii) To impart flexibility and adaptability.</li> <li>(iv) To inspire team working.</li> <li>(v) To expand intellectual capacity, credibility, judgment and intuition.</li> <li>(vi) To adhere to punctuality, setting and meeting deadlines.</li> <li>(vii) To install responsibilities to oneself and others.</li> <li>(viii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.</li> </ul> <p><b>CIE procedure for Project Work:</b>  <b>(1) Single discipline:</b> The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.  The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.  <b>(2) Interdisciplinary:</b> Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.  <b>SEE procedure for Project Work:</b> SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.</p>			
<p><b>TECHNICAL SEMINAR (21XXS81):</b> The objective of the seminar is to inculcate self-learning, present the seminar topic confidently, enhance communication skill, involve in group discussion for the exchange of ideas. Each student, under the guidance of a Faculty, shall choose, preferably, a recent topic of his/her interest relevant to the program of Specialization.</p> <ul style="list-style-type: none"> <li>(i) Carry out a literature survey, and systematically organize the content.</li> <li>(ii) Prepare the report with your own sentences, avoiding a cut and paste act.</li> <li>(iii) Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.</li> <li>(iv) Present the seminar topic orally and/or through PowerPoint slides.</li> <li>(v) Answer the queries and involve in debate/discussion.</li> <li>(vi) Submit a typed report with a list of references.</li> </ul> <p>The participants shall take part in the discussion to foster a friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.</p> <p><b>Evaluation Procedure:</b>  The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session, and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior-most acting as the Chairman.</p> <p><b>Marks distribution for CIE of the course:</b>  Seminar Report:50 marks  Presentation skill:25 marks  Question and Answer: 25 marks. ■ No SEE component for Technical Seminar</p>			
<p><b>Non-credit mandatory courses (NCCM):</b>  <b>National Service Scheme/Physical Education (Sport and Athletics)/ Yoga:</b>  <b>(1)</b> 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.  <b>(2)</b> In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University.  <b>(3)</b> 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 subsequently to earn the qualifying CIE marks subject to the maximum program period.  <b>(4)</b> Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.  <b>(5)</b> 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 a degree.</p>			



**B. E. (Common to all branches)**  
**Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)**  
**SEMESTER - III**

<b>TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES</b>			
Course Code	<b>21MAT 31</b>	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<p><b>Course objectives:</b> The goal of the course Transform Calculus, Fourier series and Numerical techniques 21MAT 31 is</p> <ul style="list-style-type: none"> <li>➤ To have an insight into solving ordinary differential equations by using Laplace transform techniques</li> <li>➤ Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis.</li> <li>➤ To enable the students to study Fourier Transforms and concepts of infinite Fourier Sine and Cosine transforms and to learn the method of solving difference equations by the z-transform method.</li> <li>➤ To develop proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions):</b>            These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.</li> <li>2. State the need for Mathematics with Engineering Studies and Provide real-life examples.</li> <li>3. Support and guide the students for self-study.</li> <li>4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.</li> <li>5. Encourage the students for group learning to improve their creative and analytical skills.</li> <li>6. Show short related video lectures in the following ways:               <ul style="list-style-type: none"> <li>● As an introduction to new topics (pre-lecture activity).</li> <li>● As a revision of topics (post-lecture activity).</li> <li>● As additional examples (post-lecture activity).</li> <li>● As an additional material of challenging topics (pre-and post-lecture activity).</li> <li>● As a model solution for some exercises (post-lecture activity).</li> </ul> </li> </ol>			
<b>Module-1: Laplace Transform</b>			
<p>Definition and Laplace transforms of elementary functions (statements only). Problems on Laplace's Transform of <math>e^{at}f(t)</math>, <math>t^n f(t)</math>, <math>\frac{f(t)}{t}</math>. Laplace transforms of Periodic functions (statement only) and unit-step function – problems.            Inverse Laplace transforms definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) problems. Laplace transforms of derivatives, solution of differential equations. <span style="float: right;"><b>(8 Hours)</b></span></p>			

<b>Self-study:</b> Solution of simultaneous first-order differential equations. <b>(RBT Levels: L1, L2 and L3 )</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method / PowerPoint Presentation
<b>Module-2: Fourier Series</b>	
Introduction to infinite series, convergence and divergence. Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period $2\pi$ and arbitrary period. Half range Fourier series. Practical harmonic analysis. <span style="float: right;"><b>(8 Hours)</b></span>	
<b>Self-study:</b> Convergence of series by D'Alembert's Ratio test and, Cauchy's root test. <b>(RBT Levels: L1, L2 and L3)</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method / PowerPoint Presentation
<b>Module-3: Infinite Fourier Transforms and Z-Transforms</b>	
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. <span style="float: right;"><b>(8 Hours)</b></span>	
<b>Self Study:</b> Initial value and final value theorems, problems. <b>(RBT Levels: L1, L2 and L3)</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method / PowerPoint Presentation
<b>Module-4: Numerical Solution of Partial Differential Equations</b>	
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. <span style="float: right;"><b>(8 Hours)</b></span>	
<b>Self Study:</b> Solution of Poisson equations using standard five-point formula. <b>(RBT Levels: L1, L2 and L3)</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method / PowerPoint Presentation
<b>Module-5: Numerical Solution of Second-Order ODEs and Calculus of Variations</b>	
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. <span style="float: right;"><b>(8 Hours)</b></span>	
<b>Self Study:</b> Hanging chain problem <b>(RBT Levels: L1, L2 and L3)</b>	
<b>Course outcomes:</b> After successfully completing the course, the students will be able :	
<ul style="list-style-type: none"> <li>➤ To solve ordinary differential equations using Laplace transform.</li> <li>➤ Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.</li> <li>➤ To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations</li> <li>➤ To solve mathematical models represented by initial or boundary value problems involving partial differential equations</li> <li>➤ Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.</li> </ul>	

### **Assessment Details (both CIE and SEE)**

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

#### **Continuous Internal Evaluation:**

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

First test at the end of 5<sup>th</sup> week of the semester

Second test at the end of the 10<sup>th</sup> week of the semester

Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

First assignment at the end of 4<sup>th</sup> week of the semester

Second assignment at the end of 9<sup>th</sup> 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)**

At the end of the 13<sup>th</sup> 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**)

The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

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

### **Suggested Learning Resources:**

#### **Text Books:**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed.2018
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed. (Reprint), 2016.

#### **Reference Books**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed.
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> 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.Newyork, Latest ed.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw 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<sup>th</sup> edition, 4<sup>th</sup> Reprint 2019.

**Web links and Video Lectures (e-Resources):**

- <http://.ac.in/courses.php?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicearth.org/>
- <http://www.bookstreet.in>.
- VTU e-Shikshana Program
- VTU EDUSAT Program

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes
- Assignments
- Seminars



### III Semester

<b>Geodetic Engineering</b>			
Course Code	<b>21CV32</b>	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	03
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• Provide basic knowledge about principles of surveying for location, design and construction of engineering projects</li> <li>• Develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass</li> <li>• Make students to familiar with cooperative efforts required in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works</li> <li>• Provide information about new technologies that are used to abstracting the information of earth surface</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b>            These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. The survey of India topomap has to be shared with students and few exercise must be given</li> <li>2. The satellite imagery has to be procured and shared with students</li> <li>3. The manual for conducting field survey has to be provided</li> <li>4. The online courses available should be shared with students</li> <li>5. YouTube videos</li> <li>6. Power point presentations</li> </ol>			
<b>Module-1</b>			
<p><b>Introduction to Surveying:</b> 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</p> <p><b>Compass surveying:</b> Prismatic and surveyor’s compasses, temporary adjustments.</p> <p><b>Plane Table Surveying:</b> plane table and accessories, advantages and disadvantages of plane table survey, method of plotting - radiation, intersection, traversing, resection, two point and three point method</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-2</b>			
<p><b>Levelling</b> – 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 &amp; fall and H. I methods (Numerical)</p> <p><b>Areas and volumes:</b> 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.</p>			
<b>Teaching-Learning</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		

<b>Process</b>	
<b>Module-3</b>	
<b>Theodolite Surveying:</b> 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.	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-4</b>	
<b>Curve Surveying:</b> 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).	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-5</b>	
<b>Photogrammetry and aerial survey:</b> Introduction, definitions, basics principles, methods, importance of scale, height, applications. <b>Remote sensing:</b> Introduction, Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, LIDAR, visual and digital image processing and its applications. <b>Global Positioning System:</b> Definition, Principles of GPS and applications. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications <b>Advanced instrumentation in surveying:</b> classification, measuring principles, Electronic theodolite, EDM, Total Station, Drones	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>LABORATORY EXPERIMENTS</b>	
1.	Study of various instruments used for surveying, namely chain, tape, Compass,
2.	Dumpy level, Auto-level, Theodolite, Tacheometer, Total station and GPS. To find the distance between two points shown in the field using method of pacing, chaining and taping.
3.	To set regular geometric figures (Hexagon and Pentagon) using chain tape and accessories.
4.	To set regular geometric figures (Hexagon and Pentagon) using prismatic compass, given the bearing of one line.
5.	Study of use of Dumpy level and to determine the different in elevation between two points by differential levelling using Dumpy level
6.	To find the true difference in elevation between two points situated far apart by using Reciprocal levelling.

7.	Trigonometrical levelling: Single plane method and Double plane method
8.	Measurement of horizontal angle using theodolite by: i) Method of Repetition and ii) Reiteration method.
9.	Setting simple circular curve-Instrumental method,
10.	Setting compound curve using theodolite
11.	Plane table : Setting, orientation, radiation, intersection
12.	Demo: Total station, GPS

**Course outcome (Course Skill Set)**

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

1. Execute survey using compass and plane table
2. Find the level of ground surface and Calculation of area and volumes
3. Operate theodolite for field execution
4. Estimate the capacity of reservoir
5. Interpret satellite imageries

### **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)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

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

#### **CIE for the practical component of IPCC**

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

#### **Suggested Learning Resources:**

##### **Books**

1. Surveying & levelling Vol. I ,II & III, B. C. Punmia, Laxmi Publications; seventeenth edition (2016)
2. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Pearson 2017 by GopiSatheesh, R.Sathikumar, N. Madhu
3. Surveying Vol.I& II, S. K. Duggal, McGraw Hill Education; Fourth edition (2017)

<ol style="list-style-type: none"> <li>4. Surveying and Levelling, R. Subramanian , second edition, 2012, Oxford University Press;</li> <li>5. Engineering Surveying, Schofield and Breach, 6th edition, Butterworth-Heinemann (Elsevier publication, 2007)</li> <li>6. Surveying , A Banister, S Raymond, R Baker, 7th edition, Pearson , New Delhi</li> </ol>	
<p><b>Web links and Video Lectures (e-Resources):</b></p>	
<ul style="list-style-type: none"> <li>• NPTEL courses</li> </ul>	
<p><b>Activity Based Learning (Suggested Activities in Class)/ Practical Based learning</b></p>	

### III Semester

<b>STRENGTH OF MATERIALS</b>			
Course Code	<b>21CV33</b>	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2+2+2+0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	03 hrs
<p><b>Course objectives:</b>This course will enable students</p> <ol style="list-style-type: none"> <li>1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.</li> <li>2. To know the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural elements.</li> <li>3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.</li> <li>4. To determine slope and deflections of beams.</li> <li>5. To evaluate the behaviour of torsion members, columns and struts.</li> </ol>			
<p><b>Teaching-Learning Process (General Instructions)</b> These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Blackboard teaching/PowerPoint presentations (if needed)</li> <li>2. Regular review of students by asking questions based on topics covered in the class.</li> </ol>			
<b>Module-1</b>			
<p><b>Simple Stresses and Strains:</b> 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</p> <p><b>Compound stresses:</b> 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.</p>			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"> <li>1.Blackboard teaching/PowerPoint presentations (if needed)</li> <li>2.Regular review of students by asking questions based on topics covered in the class.</li> </ol>		
<b>Module-2</b>			
<p><b>Bending moment and shear force diagrams in beams:</b> 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.</p>			
<b>Teaching-Learning Process</b>	<ol style="list-style-type: none"> <li>1.Blackboard teaching/PowerPoint presentations (if needed)</li> <li>2.Regular review of students by asking questions based on topics covered in the class.</li> </ol>		
<b>Module-3</b>			

<p><b>Bending stress in beams:</b> 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</p> <p><b>Shear stress in beams:</b> 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.</p>	
<b>Teaching-Learning Process</b>	<p>1.Blackboard teaching/PowerPoint presentations (if needed)</p> <p>2.Regular review of students by asking questions based on topics covered in the class.</p>
<b>Module-4</b>	
<p><b>Torsion:</b> 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</p> <p><b>Thin cylinders:</b> 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.</p> <p><b>Thick cylinders:</b> 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. U</p>	
<b>Teaching-Learning Process</b>	<p>1.Blackboard teaching/PowerPoint presentations (if needed)</p> <p>2.Regular review of students by asking questions based on topics covered in the class.</p>
<b>Module-5</b>	
<p><b>Elastic stability of columns:</b> 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.</p> <p><b>Deflection of determinate Beams:</b> 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.</p>	
<b>Teaching-Learning Process</b>	<p>1.Blackboard teaching/PowerPoint presentations (if needed)</p> <p>2.Regular review of students by asking questions based on topics covered in the class.</p>
<b>LABORATORY</b>	
<ol style="list-style-type: none"> <li>1. Dimensionality of bricks, Water absorption, Initial rate of absorption</li> <li>2. Specific gravity of coarse and fine aggregate</li> <li>3. Fineness modulus of Fine and Coarse aggregate</li> <li>4. Compressive strength tests on building blocks (brick, solid blocks and hollow blocks)</li> <li>5. Tension test on Mild steel and HYSD bars</li> <li>6. Compression test on HYSD, Cast iron</li> <li>7. Bending Test on Wood under two-point loading.</li> </ol>	

8. Shear Test on Mild steel – single and double shear

9. Impact test on Mild Steel (Charpy& Izod)

**Course outcome (Course Skill Set)**

After completion of the course, students will be able to

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)
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).
3. Evaluate the behaviour when a solid material is subjected to Torque and internal fluid pressure and estimate stresses and corresponding strain developed. (L3)
4. Distinguish the behaviour of short and long column and calculate load at failure & explain the behaviour of spring to estimate deflection and stiffness (L3)
5. Examine and Evaluate the mechanical properties of various materials under different loading conditions

**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)**

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4<sup>th</sup> week of the semester
- Second assignment at the end of 9<sup>th</sup> week of the semester

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

**CIE for the practical component of IPCC**

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

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

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

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

### **Suggested Learning Resources:**

#### **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>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Seminars/Quizz(To assist in GATE Preparations
- Demonstrations in Lab
- Self Study on simple topics
- Simple problems solving using Excel
- Virtual Lab Experiments

**Semester III**

<b>: Earth Resources and Engineering</b>			
Course Code	21CV34	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• This course will enable students;               <ol style="list-style-type: none"> <li>1. To understand the importance of earth's dynamic interior in civil engineering and Geo Hazard mitigation and management</li> <li>2. To analyse the physical characteristics of the rocks and Minerals for its suitable application in Engineering</li> <li>3. To evaluate earth Process for providing sustainable management and Development through Geoengineering.</li> <li>4. Subsurface Exploration for providing safe and suitable site condition and Earth Resources for Reengineering activities</li> <li>5. To application of modern tools and techniques in Earth Resources Management and.</li> </ol> </li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b>            These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ul style="list-style-type: none"> <li>• Chalk and Talk method.</li> <li>• Show Video/animation films to explain earth dynamics and influence of geology in prime civil constructions</li> <li>• Encourage collaborative (Group Learning) Learning in the class</li> <li>• Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking</li> <li>• Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking process such as the ability to evaluate, generalize, and analyse information rather than simply recall it.</li> <li>• Topics will be introduced in a multiple representation.</li> <li>• Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>• Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</li> </ul>			
<b>Module-1</b>			
<p><b>Module /unit – 01 – Introduction, scope of earth science in Engineering, 8 hrs</b>  <b>Geohazards and disasters, Mitigation and management</b></p> <p>Earths internal dynamics ,Plate tectonics, Earth quakes types, causes iso-seismal 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</p>			
<b>Teaching-Learning Process</b>	<ul style="list-style-type: none"> <li>• chalk and talk method,</li> <li>• power point presentation.</li> <li>• Case studies</li> <li>• Field visits</li> </ul>		

<b>Module-2</b>	
<p><b>Earth Resources</b> <span style="float: right;"><b>8hrs</b></span></p> <p>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</p>	
<b>Teaching-Learning Process</b>	<ul style="list-style-type: none"> <li>• Chalk and talk method,</li> <li>• Power point presentation and Animated vedeos</li> <li>• Case studies</li> <li>• Field visits experience the real world examples</li> </ul>
<b>Module-3</b>	
<p><b>Surface investigation for Civil Engineering projects</b> <span style="float: right;"><b>8hrs</b></span></p> <p>Weathering, type, causes, soil insitu, 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</p>	
<b>Teaching-Learning Process</b>	<ul style="list-style-type: none"> <li>• Chalk and talk method,</li> <li>• Power point presentation and Animated vedeos</li> <li>• Case studies</li> <li>• Field visits experience the real world examples</li> </ul>
<b>Module-4</b>	
<p><b>Subsurface investigation for deep foundation</b> <span style="float: right;"><b>8hrs</b></span></p> <p>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, recognitionand their significance in Civil engineering projects like tunnel project, dam project, , Ground improvements like rock bolting, rock jointing, grouting</p>	
<b>Teaching-Learning Process</b>	<ul style="list-style-type: none"> <li>• Chalk and talk method,</li> <li>• Power point presentation and Animated vedeos</li> <li>• Case studies</li> <li>• Field visits experience the real world examples</li> </ul>
<b>Module-5</b>	
<p><b>Geo-tools and techniques for civil Engineering Applications</b> <span style="float: right;"><b>7hrs</b></span></p> <p>Toposheets , Remote sensing and GIS. Photogrammetry ( scale, flight planning, overlap, elevation effects, interpretation keys, numericals on flight, planning scale , elevation, flying height, ....), GPS,, Ground Penetrating Radas (GPR), Drone, and their applications</p>	
<b>Teaching-Learning Process</b>	<ul style="list-style-type: none"> <li>• Chalk and talk method,</li> <li>• Power point presentation and Animated videos</li> <li>• Case studies</li> <li>• Field visits and research institutes experience the real world examples</li> </ul>

### **Course outcome (Course Skill Set)**

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

1. Apply geological knowledge in different civil engineering practice.
2. Students will acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials.
3. competent enough to provide services for the safety, stability, economy and life of the structures that they construct
- . 4. Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems
- . 5. Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction.

### **Assessment Details (both CIE and SEE)**

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

#### **Continuous Internal Evaluation:**

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

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

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> week of the semester

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

6. At the end of the 13<sup>th</sup> week of the semester

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

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

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

#### **Semester End Examination:**

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

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored out of 100, shall be proportionally reduced 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

#### **Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F>
- <https://www.youtube.com/watch?v=EBiLLJAxBuU&index=2&list=PLDF5162B475DD915F>
- <https://www.youtube.com/watch?v=sTY-ao4RZck&list=PLDF5162B475DD915F&index=3>
- <https://nptel.ac.in/courses>
- <https://youtu.be/fvoYHzAhvVM>
- <https://youtu.be/aTVDiRtRook>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- <https://www.earthsciweek.org/classroom-activities>
- Field Visits
- [https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc\\_source=recommendation](https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc_source=recommendation)
- [https://serc.carleton.edu/NAGTWorkshops/visualization/examples/CBezanson.html?serc\\_source=recommendation](https://serc.carleton.edu/NAGTWorkshops/visualization/examples/CBezanson.html?serc_source=recommendation)
- <https://serc.carleton.edu/NAGTWorkshops/coursedesign/goalsdb/14712.html>

**Textbooks -**

1. Engineering Geology, by Parthasarathy et al, Wiley publications
2. A textbook of Engineering Geology by Chenna Kesavulu, Mac Millan India Ltd
3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers
4. Physical and Engineering Geology, by S.K. Garg, Khanna publishers
5. Principles of Engineering Geology, by KVGK Gokhale, BS Publications

**Reference books –**

1. Introduction to Environmental Geology by Edward A Keller, Pearson publications.
2. Engineering Geology and Rock Mechanics B. P. Verma, Khanna publishers
3. Principles of Engineering Geology and Geotechnics, Krynine and Judd, CBS Publications

<b>COMPUTER AIDED BUILDING PLANNING AND DRAWING</b>			
Course Code	<b>21CVL35</b>	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0+0+2+0	SEE Marks	50
Credits	01	Exam Hours	03 hrs
<b>Course objectives:</b>			
Provide students with understanding			
<ol style="list-style-type: none"> <li>1. Gain skill set to prepare Computer Aided Engineering Drawings</li> <li>2. Understanding the details of construction of different building elements</li> <li>3. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings</li> <li>4. Get familiarization of practices used in Industry</li> </ol>			
<b>Sl.NO</b>	<b>Experiments</b>		
<b>Module 1</b>			
1	<b>Drawing Basics:</b> Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS:962.		
2	<b>Simple Engineering Drawings with CAD</b> 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.		
<b>Module 2</b>			
3	<b>Drawings of Different Building Elements:</b> Following drawings are to be prepared for the data given using CAD Software <ol style="list-style-type: none"> <li>a) Cross section of Foundation, masonry wall, RCC columns with isolated &amp; combined footings.</li> <li>b) Different types of bonds in brick masonry.</li> <li>c) Different types of staircases – Dog legged, Open well,</li> <li>d) Lintel and chajja.</li> <li>e) RCC Slabs and beams.</li> <li>f) Cross section of a pavement.</li> <li>g) Septic Tank and sedimentation Tank.</li> <li>h) Layout plan of Rainwater recharging and harvesting system.</li> <li>i) Cross sectional details of a road for a Residential area with provision for all services.</li> <li>j) Steel truss (connections Bolted).</li> </ol> <p><b>Note:</b> Students should sketch to dimension the above in a sketch book before doing the computer drawing.</p>		

<b>Module 3</b>	
4	<p><b>Building Drawings :</b> 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.</p> <p>Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for</p> <ol style="list-style-type: none"> <li>1. Single and double story residential building.</li> <li>2. Hostel building.</li> <li>3. Hospital building.</li> <li>4. School building.</li> </ol> <p>Submission drawing (sanction drawing) of two storied residential building with access to terrace including all details and statements as per the local bye-laws</p> <p>Industry Applications : 3D Modelling and Rendering, 2D Animation, Construction site Simulation</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>. Students should sketch to dimension the above in a sketch book before doing the computer drawing</li> <li>. One compulsory field visit/exercise to be carried out.</li> <li>. Single line diagrams to be given in the examination.</li> </ul>
<p><b>Course outcomes (Course Skill Set):</b> At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Prepare, read and interpret the drawings in a professional set up.</li> <li>2. Know the procedures of submission of drawings and Develop working and submission drawings for building.</li> <li>3. Plan and design of residential or public building as per the given requirements.</li> </ol>	

### **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 course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination(SEE).

#### **Continuous Internal Evaluation (CIE):**

CIE marks for the practical course is **50 Marks**.

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

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

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

#### **Semester End Evaluation (SEE):**

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly

by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

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

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

**Question paper pattern:**

- There will be four full questions with sub divisions if necessary from Module2 with each full question carrying twenty five marks. Students have to answer any two questions.
- There will be two full questions from Modulus 3 with each full question carrying fifty marks. Students have to answer any one question. The conduction of examination and question paper format of should be in line of 1<sup>st</sup> year CAED drawing. It's drawing paper but the exam will be conducted by batches in the computer labs. Question paper should be given in batches.

**Suggested Learning Resources:**

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**Textbook:**

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 RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/Computech Publication 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.

<b>Constitution of India and Professional Ethics (CIP)</b>			
Course Code	21CIP37/47	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	15 Hours	Total Marks	100
Credits	01	Exam Hours	01 Hour
<p><b>Course objectives:</b> This course will enable the students</p> <ul style="list-style-type: none"> <li>• To know the fundamental political structure &amp; codes, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.</li> <li>• To understand engineering ethics and their responsibilities, identify their individual roles and ethical responsibilities towards society.</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b>                      These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <p>✓ Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.</p> <ul style="list-style-type: none"> <li>(i) Direct instructional method ( Low /Old Technology),</li> <li>(ii) Flipped classrooms ( High/advanced Technological tools),</li> <li>(iii) Blended learning ( combination of both),</li> <li>(iv) Enquiry and evaluation based learning,</li> <li>(v) Personalized learning,</li> <li>(vi) Problems based learning through discussion,</li> <li>(vii) Following the method of expeditionary learning Tools and techniques,</li> </ul> <p>1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can enhance the students in theoretical applied and practical skills in teaching of 21CIP39/49 in general.</p>			
<b>Module - 1</b>			
<p><b>Introduction to Indian Constitution:</b> Definition of Constitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly. Preamble of Indian Constitution &amp; Key concepts of the Preamble. Salient features of India Constitution.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).		
<b>Module - 2</b>			
<p><b>Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's) :</b> Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP's and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).		
<b>Module - 3</b>			
<p><b>Union Executive :</b> Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).		

<b>Module - 4</b>	
<b>State Executive &amp; Elections, Amendments and Emergency Provisions:</b> State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.	
<b>Teaching-Learning Process</b>	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).
<b>Module-5</b>	
<b>Professional Ethics:</b> Definition of Ethics & Values. Professional & Engineering Ethics. Positive and Negative aspects of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Professional Risks, Professional Safety and liability in Engineering. Trust & Reliability in Engineering, Intellectual Property Rights (IPR's).	
<b>Teaching-Learning Process</b>	Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).
<b>Course outcome (Course Skill Set)</b>	
At the end of the course the student should :	
CO 1: Have constitutional knowledge and legal literacy.	
CO 2: Understand Engineering and Professional ethics and responsibilities of Engineers.	
<b>Assessment Details (both CIE and SEE)</b>	
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 that is 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 and SEE taken together	
<b>Continuous Internal Evaluation:</b>	
Three Tests each of <b>20 Marks (duration 01 hour)</b>	
<ol style="list-style-type: none"> <li>1. First test at the end of 5<sup>th</sup> week of the semester</li> <li>2. Second test at the end of the 10<sup>th</sup> week of the semester</li> <li>3. Third test at the end of the 15<sup>th</sup> week of the semester</li> </ol>	
Two assignments each of <b>10 Marks</b>	
<ol style="list-style-type: none"> <li>4. First assignment at the end of 4<sup>th</sup> week of the semester</li> <li>5. Second assignment at the end of 9<sup>th</sup> week of the semester</li> </ol>	
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for <b>20 Marks (duration 01 hours)</b>	
<ol style="list-style-type: none"> <li>6. At the end of the 13<sup>th</sup> week of the semester</li> </ol>	
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be <b>scaled down to 50 marks</b>	
<b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b>	
<b>Semester End Examination:</b>	
SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.	
<ul style="list-style-type: none"> <li>• The question paper will have 50 questions. Each question is set for 01 mark.</li> <li>• SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. Duration of the examination is 01 Hour.</li> </ul>	
<b>Textbook:</b>	
<ol style="list-style-type: none"> <li>1. <b>"Constitution of India &amp; Professional Ethics"</b> Published by Prasaranga or published on VTU website with the consent of the university authorities VTU Belagavi.</li> </ol>	









<b>Module-2</b>	
<p>1. ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು - Possessive forms of nouns, dubitive question and Relative nouns</p> <p>2. ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು Qualitative, Quantitative and Colour Adjectives, Numerals</p>	
<p>3. <b>PÁgÁPÀ gÀÆYÀUÀ¼ÄÄ ªÄvÄÄÛ «sÀQÛ YÀævÄÄAiÄÄUÀ¼ÄÄ - ,ÀYÀÛ«Ä «sÀQÛ YÀævÄÄAiÄÄ - (D, CzÄÄ, CªÄÄ, C°è) Predictive Forms, Locative Case</b></p>	
<p>ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು</p>	<p>ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು.</p>
<b>Module-3</b>	
<p>1. <b>ZÀvÄÄyð «sÀQÛ YÀævÄÄAiÄÄzÀ §¼ÁPÉ ªÄvÄÄÛ ,ÀSÁªªÄZÀPÀUÀ¼ÄÄ - Dative Cases, and Numerals</b></p> <p>4. <b>,ÀSÁªªUÀÄªªÄZÀPÀUÀ¼ÄÄ ªÄvÄÄÛ §ªªªZÀ£À £ªªªgÀÆYÀUÀ¼ÄÄ - Ordinal numerals and Plural markers</b></p> <p>5. <b>£ªªª£À / µÉÄzªªªÀðPÀ QªªªiªªªYªªªÀUÀ¼ÄÄ ªÄvÄÄÛ ªªªª UÀÄªªªZÀPÀUÀ¼ÄÄ Defective / Negative Verbs and Colour Adjectives</b></p>	
<p>ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು</p>	<p>ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು, ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು.</p>
<b>Module-4</b>	
<p>1 ಉದಾಹರಣೆ / ಉದಾಹರಣೆ, ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ <b>Permission, Commands, encouraging and Urging words (Imperative words and sentences)</b></p> <p>2. ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ <b>Accusative Cases and Potential Forms used in General Communication</b></p>	
<p>3. “ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ” ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ - Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs</p> <p>6. ಉದಾಹರಣೆ (ತರತಮ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಪದಗಳ - Comparative, Relationship, Identification and Negation Words</p>	
<p>ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ</p>	<p>ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ.</p>
<b>Module-5</b>	
<p>1. ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಸಮಯದ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ - iffereent types of forms of Tense, Time and Verbs</p> <p>2. ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, -ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms</p> <p>3. <b>Kannada Vocabulary List : ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ - Kannada Words in Conversation</b></p>	
<p>ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ</p>	<p>ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ, ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ ಉದಾಹರಣೆ.</p>



### Semester III

<b>Problem Solving with Python</b>			
Course Code	21CV381	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	1	Exam Hours	1 hr
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>To understand why Python is a useful scripting language for developers.</li> <li>To read and write simple Python programs</li> <li>To learn how to identify Python object types.</li> <li>To learn how to write functions and pass arguments in Python.</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b></p> <p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.</li> <li>Use of Video/Animation to explain functioning of various concepts.</li> <li>Encourage collaborative (Group Learning) Learning in the class.</li> <li>Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.</li> <li>Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.</li> <li>Introduce Topics in manifold representations.</li> <li>Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.</li> <li>Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</li> </ol>			
<b>Module-1</b>			
Introduction to Python: Installing Python and Python packages, Managing virtual environments with venv module			
Introduction to NumPy arrays: Array creation, indexing, data types, broadcasting, copies and views, universal functions, I/O with NumPy			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-2</b>			
Introduction to NumPy and SciPy: NumPy subpackages– linalg, fft, random, polynomials, SciPy subpackages– linalg, fftpack, integrate, interpolate, optimize			
Introduction to Matplotlib: Plotting 2D graphs with Matplotlib, annotations, legend, saving plots to file, bar and pie charts, line plots.			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-3</b>			
Linear algebra using NumPy and SciPy: Solving linear simultaneous equations using NumPy and SciPy using numpy.linalg and scipy.linalg – solve, inverse, determinant, least square solution,			
Linear algebra using NumPy and SciPy (continued): Decomposition using lu and cholesky.			
Solving eigenvalue problems using NumPy and SciPy: Using numpy.linalg and scipy.linalg – eig, eigvals.			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		

<b>Module-4</b>	
<p>Solving initial value problems for ODE systems using scipy.integrate subpackage – solve_ivp, RK45, LSODA.</p> <p>Numerical integration of functions using SciPy: Using scipy.integratesubpackage– Definite integral using Gaussian quadrature – quad and quadrature</p> <p>Numerical integration of fixed samples using scipy.integratesubpackage– Trapezoidal rule trapezoid, Simpson’s 1/3 rule using Simpson, Romberg integration romb.</p>	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-5</b>	
<p>Determining roots of equations using SciPy using scipy.optimize subpackage– Bisection method bisect, Brent’s method brentq, Newton-Raphson method newton.</p> <p>Symbolic computing using SymPy and solving civil engineering problems using SymPy: Introduction, defining symbols, derivatives, integrals, limits, expression evaluation, expression simplification, solving equations, solving differential equations.</p>	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Course outcome (Course Skill Set)</b>	
<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.</li> <li>2. Demonstrate proficiency in handling Strings and File Systems.</li> <li>3. Represent compound data using Python lists, tuples, Strings, dictionaries.</li> <li>4. Read and write data from/to files in Python Programs</li> </ol>	
<b>Assessment Details (both CIE and SEE)</b>	
<p>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</p> <p>Continuous internal Examination (CIE)</p> <p>Three Tests (preferably in MCQ pattern with 20 questions) each of 20 Marks (duration 01 hour)</p> <ol style="list-style-type: none"> <li>1. First test at the end of 5th week of the semester</li> <li>2. Second test at the end of the 10th week of the semester</li> <li>3. Third test at the end of the 15th week of the semester</li> </ol> <p>Two assignments each of 10 Marks</p> <ol style="list-style-type: none"> <li>1. First assignment at the end of 4th week of the semester</li> <li>2. Second assignment at the end of 9th week of the semester</li> </ol> <p>Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)</p> <p>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</p> <p>Semester End Examinations (SEE)</p> <p>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.</p>	
<b>Suggested Learning Resources:</b>	
<p>Books</p> <ol style="list-style-type: none"> <li>1. R. Nageswara Rao, “Core Python Programming”, dreamtech</li> </ol>	

2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming, Reema theraja, OXFORD publication

**Web links and Video Lectures (e-Resources):**

1. NumPy documentation at <https://numpy.org/doc/>
2. SciPy documentation at <https://docs.scipy.org/doc/scipy/>
3. Matplotlib documentation at <https://matplotlib.org/stable/users/index>
4. SymPy documentation at <https://docs.sympy.org/latest/index.html>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Real world problem solving: Demonstration of projects developed using python language

**Semester III**

<b>Microsoft Excel and Visual Basic for Applications</b>			
Course Code	21CV382	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	1	Exam Hours	01 hr
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>To learn basic operations using excel</li> <li>To solve problems using functions in excel</li> <li>To design structural elements using excel and VB as a tool</li> </ul>			
<p><b>Teaching-Learning Process (General Instructions)</b>            These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>The online courses available should be shared with students</li> <li>YouTube videos</li> <li>Power point presentations</li> <li>Assignments to solve all the problems using excel and VB.</li> </ol>			
<b>Module-1</b>			
<p>Introduction to Microsoft Excel, Workbooks, Worksheets, User Interface – navigating the interface, entering data, implicit data types, setting cell data types, Basic operations – copy/cut, paste, paste special, row and cell references, using cell names, Simple built-in formulae, Copying and pasting formulae</p> <p>Built-in formulae – Trigonometric, Logarithmic, Exponential, Statistical, Matrix operations such as transpose, multiplication, inverse etc.</p> <p>Plotting charts of different types, bar and pie charts, scatter plots, legend, Using Log and Semilog scales, Customizing chart axes, Using multiple axes, Preparing contour plots, Annotating charts.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-2</b>			
<p>Introduction to Visual Basic for Applications, User Interface – VBA Editor, VBA toolbar, Developing simple functions in VBA – area of a circle, minimum cover to reinforcement in a beam as per IS 456, Calling user defined functions, Organizing code into modules.</p> <p>Debugging VBA code using built-in debugger – breakpoints, watch variables, trace lines of code with run to cursor, step into, step over and step out.</p> <p>Developing subroutines, calling subroutines, Differences between functions and subroutines, Scope of subroutines – Public and Private, Calling a subroutine</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-3</b>			
<p>VBA data types, Working with data types, Enforcing defining types with Option Explicit, Defining, initializing and using arrays within functions/subroutines.</p> <p>Commenting code, Long statements spanning multiple lines, Program flow control – Branching and looping, using conditional statements, Calling Worksheet functions in VBA.</p> <p>Develop functions for simple civil engineering applications – Stability of gravity dams, analysis of</p>			

rectangular footings subjected to axial compression and bending about both axes, etc.	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-4</b>	
<p>Table lookup – Lookup, Vlookup, Hlookup, Match, Index, VBA Object model, creating and using user defined objects.</p> <p>Building forms, triggering subroutines by pressing a button on a form</p> <p>Interacting with other applications with support for VBA, such as, SAP2000/ETABS or any other software used by civil engineers.</p>	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-5</b>	
<p>Using Python to manipulate Microsoft Excel files, creating, editing and saving Microsoft Excel files from Python, Interacting with Microsoft Excel using Python xl wings package, Calling Python from VBA.</p> <p>Developing functions and subroutine for a comprehensive civil engineering application – RC design, Steel design, or other similar problems from other fields of Civil Engineering.</p>	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Course outcome (Course Skill Set)</b>	
<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Solve Trigonometric, Logarithmic, Exponential, Statistical problems and perform Matrix operations</li> <li>2. Solve civil engineering problems using VB as a tool</li> <li>3. Design structural elements by integrating excel and VB</li> </ol>	
<b>Assessment Details (both CIE and SEE)</b>	
<p>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</p>	
<b>Continuous internal Examination (CIE)</b>	
<p>Three Tests (preferably in MCQ pattern with 20 questions) each of 20 Marks (duration 01 hour)</p> <ol style="list-style-type: none"> <li>1. First test at the end of 5th week of the semester</li> <li>2. Second test at the end of the 10th week of the semester</li> <li>3. Third test at the end of the 15th week of the semester</li> </ol>	
<p>Two assignments each of 10 Marks</p> <ol style="list-style-type: none"> <li>1. First assignment at the end of 4th week of the semester</li> <li>2. Second assignment at the end of 9th week of the semester</li> </ol>	
<p>Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)</p>	

1. 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.

**Suggested Learning Resources:**

**Books**

1. Bourg, D.M., Excel Scientific and Engineering Cookbook, O'Reilly Media Inc., 2006.
2. Bilio, E.J., Excel for Scientists and Engineers – Numerical Methods, Wiley-Interscience, 2007.
3. Documentation for xlwings <https://docs.xlwings.org/en/stable/>

**Web links and Video Lectures (e-Resources):**

- <https://freepdf-books.com/excel/>
- <https://jobscaptain.com/ms-excel-book-pdf/>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Assignments to understand the operations in Excel and VB may be given to students

## III Semester

<b>Personality Development and Soft skills (AEC)</b>			
Course Code	<b>21CV383</b>	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	1	Exam Hours	2
<p><b>Course objectives: Enable the students to</b></p> <ol style="list-style-type: none"> <li>1. Experience self-fulfilment and overall development of one's own personality by developing personal skills.</li> <li>2. Develop awareness about the significance of soft skills and impactful personality in professional life.</li> <li>3. Improve the soft skills like effective communication, business correspondence, impressive presentation, leadership qualities, team-work, Time management leading to successful performance in interviews and group discussions.</li> <li>4. Identify opportunities in career building and enhancement with proper time management and stress management.</li> </ol>			
<p><b>Teaching-Learning Process (General Instructions)</b>            These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Chalk and talk</li> <li>2. Power point Presentation, video</li> <li>3. Group discussion</li> <li>4. Enacting, Demonstration</li> <li>5. Industry interaction</li> </ol>			
<b>Module-1</b>			
<p><b>Introduction to Soft-Skills-Personal Skills:</b> Knowing Oneself/Self-Discovery-Confidence Building-Defining Strengths- Developing Positive Attitude- Thinking Creatively-Improving Perceptions - Forming Values.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation		
<b>Module-2</b>			
<p><b>Interpersonal and Social Skills:</b> Understanding others-Developing Inter-personal relationship Team Building-Group dynamics-Networking-Problem-solving.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation.		
<b>Module-3</b>			
<p><b>Communication Skills:</b> Art of Listening-Art of Speaking-Art of Reading-Art of Writing-Art of Writing E-mails: Email etiquette</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, Enacting, Demonstration.		
<b>Module-4</b>			
<p><b>Presentation skills:</b> Group discussion- mock Group Discussion using video recording - public speaking.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk, Enacting, Demonstration, Activity		

## Module-5

**Corporate Skills:** Working with others- Developing a proper body language-behavioural etiquettes and mannerism- Time Management –Stress Management

<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation
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### Course outcome (Course Skill Set)

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

1. Develop effective communication skills (spoken and written) and effective presentation skills. Actively participate in group discussion / meetings / interviews and prepare & deliver presentations
2. Conduct effective business correspondence and prepare business reports which produce results.
3. Develop an understanding of and practice personal and professional responsibility.
4. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

### 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 Marks (duration 01 hour)**

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

Two assignments each of **10 Marks**

1. First assignment at the end of 4<sup>th</sup> week of the semester
2. Second assignment at the end of 9<sup>th</sup> 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.

**Suggested Learning Resources:****Books**

1. Meena K and V. Ayothi (2013) A Book on Development of Soft Skills (Soft Skills: A Road Map to Success), P. R. Publishers & Distributors, No. B-20 & 21, V. M. M Complex, Chatiram Bus Stand, Tiruchirappalli-620002. (Phone No: 0431-2702824 Mobile No.: 9443370597, 9843074472)
2. Alex K. (2012) Soft Skills-Know Yourself & Know the World, S. Chand & Company LTD, Ram Nagar, New Delhi-110055. Mobile No.: 9442514814 (Dr.K.Alex

**Web links and Video Lectures (e-Resources):**

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**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstrations of Videos
- Group Discussion
- Presentation on any social issues
- Quizzes

**Semester III**

<b>Infrastructure Finance</b>			
Course Code	21CV384	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1 hr
<b>Course objectives:</b> <ul style="list-style-type: none"> <li>To understand the infrastructure components</li> <li>Opportunities in infrastructure development</li> <li>Financial sources and investment for infrastructure</li> </ul>			
<b>Teaching-Learning Process (General Instructions)</b> These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> <li>The online courses available should be shared with students</li> <li>YouTube videos</li> <li>Power point presentations</li> <li>Visit to government, public and private organizations to understand infrastructure projects planning and execution procedures</li> </ol>			
<b>Module-1</b>			
<b>An Introduction to Infrastructure Finance</b> What is Infrastructure Business? Infrastructure then and now, Sector Structure and Size, Estimating the per capita cost.			
<b>Models of the Infrastructure Sectors</b> Classification system, Infrastructure and Service Organization, Business Models of Infrastructure Subsystems, Matrix of Owners and users of Infrastructure systems			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-2</b>			
<b>Infrastructure and services:</b> How Infrastructure systems serve the built environment, , Services Structures and Equipment, Infrastructure support sector.			
<b>Investor and Business Opportunities in Infrastructure</b> Introduction, Bond Market, Stocks of Infrastructure Companies, infrastructure Funds, Infrastructure Indices, Commodity markets, Mortgage-Backed Securities, Private Equity and Infrastructure, The Infrastructure Support Sector, Infrastructure Investment Media, Corruption in Infrastructure Business, International Spending Plans.			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-3</b>			
<b>Infrastructure Performance</b> Tracking Infrastructure Performance, Systems to measure, Performance Standards, Infrastructure scorecard.			
<b>Financial Models for Infrastructure Organisations</b> General Management Model, General Financing Model, Sector Financing Models, Public Private Partnerships, Regulations.			
<b>Teaching-Learning</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		

<b>Process</b>	
<b>Module-4</b>	
<b>Capital Markets for Infrastructure</b> Capital Requirement of Sectors, Capital flows of Infrastructure, Capital structure of Infrastructure sectors, Sources of Capital, Investment Banking.	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Module-5</b>	
<b>Revenues for the Infrastructure Sectors</b> Flow of Revenues, Rate Regulation, Revenue and cost of service analysis, Infrastructure revenue by Sector.	
<b>Opportunities and Risks for Infrastructure</b> Infrastructure as a policy sector, Infrastructure Policy elements, Sector Issues, Transformational Issues.	
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos
<b>Course outcome (Course Skill Set)</b> At the end of the course the student will be able to: <ol style="list-style-type: none"> <li>1. Prepare a comprehensive development plan for infrastructure projects</li> <li>2. Plan funding required and procedure to be adopted for infrastructure development</li> <li>3. Estimate revenue generation and implement investment plans</li> <li>4. Understand risk involved and policy issues related to infrastructure projects</li> </ol>	
<b>Assessment Details (both CIE and SEE)</b> 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	
<b>Continuous internal Examination (CIE)</b> Three Tests (preferably in MCQ pattern with 20 questions) each of <b>20 Marks (duration 01 hour)</b> <ol style="list-style-type: none"> <li>1. First test at the end of 5<sup>th</sup> week of the semester</li> <li>2. Second test at the end of the 10<sup>th</sup> week of the semester</li> <li>3. Third test at the end of the 15<sup>th</sup> week of the semester</li> </ol>	
Two assignments each of <b>10 Marks</b> <ol style="list-style-type: none"> <li>1. First assignment at the end of 4<sup>th</sup> week of the semester</li> <li>2. Second assignment at the end of 9<sup>th</sup> week of the semester</li> </ol>	
Quiz/Group discussion/Seminar, any two of three suitably planned to attain the COs and POs for <b>20 Marks (duration 01 hours)</b>	
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.

#### **Suggested Learning Resources:**

##### **Books**

1. Infrastructure Finance, Dr. K B Singh, Dr. Ajay Pratap Yadav, ISBN: 9788195248070, First edition, 2021, Raj Publications
2. Project and Infrastructure Finance: Corporate Banking Perspective, Vikas Srivastava , V. Rajaraman, Oxford University press, ISBN-13 978-0199465002, 2017

#### **Web links and Video Lectures (e-Resources):**

- <https://www.pdfdrive.com/project-finance-e40552174.html>
- <https://www.yumpu.com/en/document/view/63829168/e-book-download-principles-of-project-finance-full-free-collection>

#### **Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Assignments on new planning and design of an infrastructure facility may be given

**Semester III**

<b>Fire Safety in Buildings</b>			
Course Code	21CV385	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1 hr
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To understand the importance fire safety</li> <li>• To learn various techniques involved in fire safety</li> <li>• To design fire resistant buildings using proper materials and methods</li> </ul>			
<b>Teaching-Learning Process (General Instructions)</b>			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.			
<ol style="list-style-type: none"> <li>1. The online courses available should be shared with students</li> <li>2. YouTube videos</li> <li>3. Power point presentations</li> <li>4. Visit to fire stations and understand various fire accidents</li> </ol>			
<b>Module-1</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-2</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-3</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		
<b>Module-4</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, YouTube videos		

### 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

#### Teaching-Learning Process

Chalk and talk, PowerPoint Presentation, YouTube videos

#### Course outcome (Course Skill Set)

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

1. Understand types of fire, combustion process and fire resistance
2. Plan for fire safety and design of lifts
3. Design flow network in buildings
4. Design of electrical systems and maintenance
5. Perform health evaluation of buildings and suggest remedies

#### Assessment Details (both CIE and SEE)

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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.

**Suggested Learning Resources:****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.
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.

## List of reference materials/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. ConcreteStructures:materials,Maintenance And Repair D.CAMPBELL,ALLEN & H.ROPER

**Web links and Video Lectures (e-Resources):**

- <https://archive.nptel.ac.in/courses/105/102/105102176/>

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Assignment students: A case study of fire hazard in building and restoration procedure adopted