SGT University, Chandu-Budhera, Gurugram

Faculty of Engineering & Technology

Department of Civil Engineering

B. Tech. Civil Engineering

Scheme & Syllabus (2020-21)

Vision of SGT University

“Driven by Research & Innovation, we aspire to be amongst the top ten Universities in the Country by 2022”

Vision of the Department

To be among the top leaders who provide competitive and dedicated professionals through application of innovative technologies in the field of Civil Engineering and Research.

Mission of the department

- To provide State-of-the-Art facilities for research as well as teaching, learning and providing hands-on-experience through experimentation.
- To be highly effective leaders in the conduct of interdisciplinary research and maintain an intellectually challenging and collaborative environment which enables and encourages our students, faculty and staff to achieve their best in a diverse community.
- To develop and transfer innovative applications of engineering, science and technology to improve civil engineering knowledge base.
- Enabling him or her to understand the relevance of their learning to the world beyond the classroom by engaging in activities leading to development of social and ethical values.

Program Specific Outcomes (PSOs)

Civil Engineering Graduates will have the capacity to:

PSO1 To enable the understudies to analyze, design, build & maintain, Civil Engineering projects in the context of environmental, economic, and social requirements.

PSO2 To empower the understudy so that they can use the techniques, skills, and modern engineering tools necessary for civil engineering practice and serve the community as ethical and responsible professionals.

PSO3 A capacity to function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary environment.

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design solutions/processes for problems pertaining to Civil Engineering projects in sub- and super structure construction, water treatment, highway alignment with due consideration for the structural stability and safety, durability with respect to environmental effects, cultural and societal needs of the public.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Demonstrate knowledge and understanding of the civil engineering and project management principles and apply them to manage/complete within the stipulated period and funds.

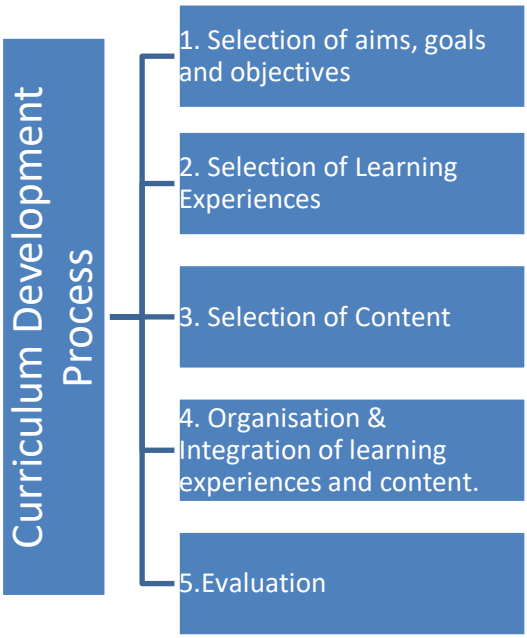
PO11: Communicate effectively by comprehending designs and drawings, including use of relevant codes, writing effective technical reports and make oral or written presentation as per the need of the project.

PO12: Recognize the need for and develop competencies necessary for life-long learning so as to offer enhanced knowledge and skill in the globally changing and challenging project environment.

Curriculum Design & development Process

Engineering Science is a new concept of multidisciplinary program that emphasizes enhanced understanding and integrated application of engineering, science and mathematics. B. Tech. in Civil Engineering gaining greater acceptance from the employers, as student are industry ready possessing greater skills. The B.Tech. courses are being carefully crafted after integrating inputs from leading national and international experts both from industries as well as academia. Here are some of the highlights of the program.

- Departmental subjects are introduced from 3rd semester onwards. The curriculum is based on a unique mix of basic sciences, humanities, core engineering, and discipline-specific subjects.
- There are many choices of elective subjects, which may or may not be related to the parent discipline comes under open elective.
- The Choice based credit system is introduced. CBCS provides a "cafeteria" type approach in which the students can take courses of their choice, learn as per interest, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.
- Huge emphasis is given on the industrial projects to address real-life issues and problems faced by the industries. Students are encouraged and facilitated to undergo training and internship during summer vacation to industries and/or national and international universities/research laboratories



Curriculum (Scheme of Examination)

&

Syllabus

B.Tech. – Civil Engineering

Session: 2020-21 Onwards

SGT University, Gurugram

Scheme of Studies (B.Tech) Program Code: CE

Bachelor of Technology in Civil Engineering (2020-21)

Undergraduate Core (UC)		AICTE Credits	Undergraduate Elective (UE)		AICTE Credits
Category	**Credits**		**Category**	**Credits**	
Program Core (PC)	61	47	Program Electives Courses (PEC)	18	23
Basic Sciences (BS)	19	26	Open Electives (OE)	9	11
Engineering & Applied Science (EAS)	21	29	Value Added Course (VA courses)	0	0
HSMC & CRC Courses	12	12	Mandatory Courses	0	0
Internships & Project	20	12			
Core	**133**	**126**	**Elective**	**27**	**34**
Total Credits				***160***	***160***

Basic Sciences (BS) Core		**L**	**T**	**P**	**C**
13010101	Engineering Mathematics I	3	1	0	4
13010201	Engineering Mathematics II	3	1	0	4
13010102	Industrial Chemistry	3	0	2	4
13010202	Engineering Physics	3	0	0	3
13010301	Strength of materials	3	0	2	4
	Total BS Core	**15**	**2**	**6**	**19**
Mandatory Courses (Non-Creditable)					
13010106	Environmental Science	2	0	0	-
13010310	Indian Constitution	2	0	0	-
13010407	Organizational Behavior	2	0	0	-
		6	**0**	**0**	**-**
Engg. & Applied Science (EAS) core					
13010105	Basic Electrical Engineering	3	0	0	3
13010203	Basic of Electrical engineering	3	0	2	4
13010110	Computer Programming Lab (C++)	0	0	4	2
13010206	Advance Programming Lab (C++)	0	0	4	2
13010205	Engineering Graphics Lab	0	0	4	2
13010104	Workshop Technology	1	0	4	3
13010304	Engineering Mechanics	3	0	0	3
13010307	Computer-aided Civil Engineering Drawing	0	0	4	2
	Total EAS Core	**10**	**0**	**22**	**21**
HSMC & CRC					
13010103	Communications Skills	2	0	2	3
13010208	Communications Skills II Lab	0	0	2	1
13010406	Technical report writing	0	0	2	1
13010703	Energy Efficient Buildings	3	0	0	3
13010204	Universal Human Values	3	0	2	4
	Total HSMC & CRC Core	**8**	**0**	**8**	**12**
Program Core(PC)					
13010403	Surveying	3	0	2	4
13010303	Fluid Mechanics	3	0	2	4
13010402	Structure Analysis	3	0	2	4
13010301	Soil Mechanics	3	0	2	4
13010305	Engineering Geology	3	0	2	4
13010401	Concrete Technology	3	0	2	4
13010501	Reinforced Concrete Structures	3	0	2	4
13010502	Water treatment and Supply System	3	0	2	4
13010602	Design of Steel Structure-1	4	0	0	4
13010702	Geo-Technology	3	0	2	4
13010603	Highway Engineering	3	0	2	4
13010701	Irrigation Engineering	3	0	0	3
13010302	Building Construction and Material	3	0	0	3
13010606	Building Information Modeling Lab	0	0	4	2
13010609	Highway Design Lab	0	0	2	1
13010707	Waterways Design Lab	0	0	4	2
13010706	Structure Design Lab (Stad-pro)	0	0	4	2
13010601	Estimation and Costing	3	0	2	4
	Total PC Core	**43**	**0**	**36**	**61**
Industrial Training and Project (IT&P)					
13010526	Industrial Training-I	0	0	0	-
13010719	Industrial Training-II	0	0	0	-
13010801	Internship/ Major Project	0	0	20	20
	Total(IT&P)Core	**0**	**0**	**20**	**20**

Program Electives					
Elective- I	Composite materials	3	0	0	3
	Air and Noise Pollution	3	0	0	3
	Open channel flow	3	0	0	3
	Ground Improvement Techniques	3	0	0	3
	Construction Planning and Management	3	0	0	3
Elective-II	Advance Structure Analysis	3	0	0	3
	Solid waste management	3	0	0	3
	Hydropower	3	0	0	3
	Advanced Surveying	3	0	0	3
	Quantitative technique in construction management	3	0	0	3
Elective-III	Pre-stressed concrete structure	3	0	0	3
	Environment impact assessment	3	0	0	3
	Hydrology	3	0	0	3
	Urban transportation planning	3	0	0	3
	Management of quality and safety in construction	3	0	0	3
Elective-IV	Bridge engineering	3	0	0	3
	Natural Disaster Mitigation and management	3	0	0	3
	Urban water resources management	3	0	0	3
	Architecture and Town Planning	3	0	0	3
	Construction economics and financial management	3	0	0	3
Elective-V	Design of Steel Structure-II	3	0	0	3
	Climate Change	3	0	0	3
	Analysis and design of hydraulic structures.	3	0	0	3
	Traffic engineering	3	0	0	3
	Resource management and control in construction	3	0	0	3
Elective-VI	Earthquake Engineering	3	0	0	3
	Waste water treatment	3	0	0	3
	Ground water engineering	3	0	0	3
	Railways, Tunnel and Airport Engineering	3	0	0	3
	Construction methods and equipments	3	0	0	3
	Total PE Core	**18**	**0**	**0**	**18**
Open Elective					
13010416	Foreign Language-I Elective	3	0	0	3
13010615	Foreign Language-II Elective	3	0	0	3
13010418	Recent Trends in Automotive Technology	3	0	0	3
13010419	Nanotechnology and Surface Engineering	3	0	0	3
13010520	Industrial Safety Engineering	3	0	0	3
13010521	Plant Layout and Material Handling	3	0	0	3
13010616	Supply Chain and Logistic Managements	3	0	0	3
13010617	Hydrogen and Fuel Cells	3	0	0	3
13010420	Signal And System	3	0	0	3
13010421	Digital electronics & computer	3	0	0	3

	organization				
13010522	Real time embedded system	3	0	0	3
13010523	Sensors	3	0	0	3
13010422	Ethical hacking	3	0	0	3
13010423	Internet of things	3	0	0	3
13010524	Software Project management	3	0	0	3
13010525	E- Commerce	3	0	0	3
13010618	Data structure and algorithm	3	0	0	3
13010417	Mathematics III	3	0	0	3
	Total OE	**09**	**0**	**0**	**09**

SGT University

Faculty of Engineering And Technology

B.Tech. Civil Engineering

Semester	Subject									Lecture course	L	T	P	Hours per week	Credits
I	Engineering Mathematics-I 3-1-0 (4)	Industrial Chemistry 3-0-2 (4)	Communication Skills 2-0-2 (3)	Basic of Electrical engineering 3-0-0 (3)	Workshop Technology 1-0-4 (3)	Environmental Science 2-0-0 (MC1)	Computer Programming Lab (C++) 0-0-4(2)			6	14	1	12	27	19
II	Engineering Mathematics-II 3-1-0 (4)	Basic of Electronics Engineering 3-0-2 (4)	Engineering Physics 3-0-0 (3)	Universal Human Values 3-0-2(4)	Communication Skill Lab 0-0-2(1)	Engineering Graphics Lab 0-0-4 (2)	Advance Programming Lab (C++) 0-0-4(2)			4	12	1	14	27	20
III	Strength of materials 3-0-2 (4)	Building Construction & Material 3-0-0(3)	Fluid Mechanics 3-0-2 (4)	Engineering Mechanics 3-0-0 (3)	Engineering Geology 3-0-2(4)	Computer-aided Civil Engineering Drawing 0-0-4(2)	Constitution of India 2-0-0(MC2)			6	17	0	10	27	20
IV	Concrete technology 3-0-2(4)	Structural Analysis 3-0-2 (4)	Surveying 3-0-2 (4)	Program Elective-I 3-0-0 (3)	Open Elective-I 3-0-0 (3)	Technical Report Writing 0-0-2(1)	Organizational behavior 2-0-0 (MC3)			6	17	0	8	25	19
Summer	Industry Training-I Practical (6 weeks)														
V	Reinforced Concrete Structures 3-0-2 (4)	Water Treatment & Supply Systems 3-0-2 (4)	Soil Mechanics 3-0-2 (4)	Program Elective-II 3-0-0 (3)	Program Elective-III 3-0-0 (3)	Open Elective-II 3-0-0 (3)				6	18	0	6	24	21
VI	Estimation & Costing 3-0-2 (4)	Design of Steel Structures-1 4-0-0 (4)	Highway Engineering 3-0-2 (4)	Open Elective-III 3-0-0 (3)	Program Elective-IV 3-0-0 (3)	Building Information Modeling Lab 0-0-4(2)	Highway Design Lab 0-0-2(1)			5	16	0	10	26	21
Summer	Industrial Training-II Practical (6 weeks)														
VII	Irrigation Engineering 3-0-0 (3)	Geo-Technology 3-0-2 (4)	Program Elective-V 3-0-0 (3)	Program Elective-VI 3-0-0 (3)	Energy Efficient Buildings 3-0-0(3)	Waterways Design Lab 0-0-4(2)	Structure Design Lab (Stad-pro) 0-0-4 (2)			5	15	0	10	25	20
VIII	Major Project 0-0-24 (20) / Internship(20)									0	0	0	24	24	20
	Total Credits														160

List of Program Elective

S. No.	**Specialization**	**Program Elective I**	**Program Elective II**	**Program Elective III**
1	Structural Engineering	Composite materials	Advance Structure Analysis	Pre-stressed concrete structure
2	Environmental Engineering	Air and Noise Pollution	Solid waste management	Environment impact assessment
3	Water Resource Engineering	Open channel flow	Hydropower	Hydrology
4	Transportation Engineering	Ground Improvement Techniques	Advanced Surveying	Urban transportation planning
5	Construction Management	Construction Planning and Management	Quantitative technique in construction management	Management of quality and safety in construction

S. No	**Specialization**	**Program Elective IV**	**Program Elective V**	**Program Elective VI**
1	Structural Engineering	Bridge engineering	Design of Steel Structure-II	Earthquake Engineering
2	Environmental Engineering	Natural Disaster Mitigation and management	Climate Change	Waste water treatment
3	Water Resource Engineering	Urban water resources management	Analysis and design of hydraulic structures.	Ground water engineering
4	Transportation Engineering	Architecture and Town Planning	Traffic engineering	Railways, Tunnel and Airport Engineering
5	Construction Management	Construction economics and financial management	Resource management and control in construction	Construction methods and equipments

Scheme of Examination for B.Tech. Civil Program 2020-2021

SEMESTER WISE COURSE STRUCTURE

First Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010101	Engineering Mathematics-1	3	1	0	4	60	40	100
2	13010102	Industrial Chemistry	3	0	0	3	60	40	100
3	13010103	Communication Skills	2	0	0	2	60	40	100
4	13010104	Workshop Technology	1	0	0	1	60	40	100
5	13010105	Basics of Electrical Engineering	3	0	0	3	60	40	100
6	13010106	Environment Science	2	0	0	0	60	40	*
7	13010107	Industrial Chemistry Lab	0	0	2	1	40	60	100
8	13010108	Communication Skills Lab	0	0	2	1	40	60	100
9	13010109	Workshop Technology Lab	0	0	4	2	40	60	100
10	13010110	Computer Programming Lab (C++)	0	0	4	2	40	60	100
		Total	**14**	**1**	**12**	**19**	**440**	**460**	**900**

Second Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010201	Engineering Mathematics II	3	1	0	4	60	40	100
2	13010202	Engineering Physics	3	0	0	3	60	40	100
3	13010203	Basics of Electronics Engineering	3	0	0	3	60	40	100
4	13010204	Universal Human Values	3	0	2	4	60	40	100
5	13010205	Engineering Graphics Lab	0	0	4	2	40	60	100
6	13010206	Advance Programming Lab (C++)	0	0	4	2	40	60	100
7	13010207	Basic Electronics Lab	0	0	2	1	40	60	100
8	13010208	Communication Skill II Lab	0	0	2	1	40	60	100
9		Universal Human Values Lab	0	0	2	1	40	60	100
		Total	**12**	**1**	**14**	**20**	**440**	**460**	**900**

Scheme of Examination for B.Tech. Civil Program 2020-2021

SEMESTER WISE COURSE STRUCTURE

Third Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010301	Strength of materials	3	0	0	3	60	40	100
2	13010302	Building Construction & Material	3	0	0	3	60	40	100
3	13010303	Fluid Mechanics	3	0	0	3	60	40	100
4	13010304	Engineering Mechanics	3	0	0	3	60	40	100
5	13010305	Engineering Geology	3	0	0	3	60	40	100
6	13010306	Strength of materials Lab	0	0	2	1	40	60	100
7	13010307	Computer-aided Civil Engineering Drawing	0	0	4	2	40	60	100
8	13010308	Fluid Mechanics Lab	0	0	2	1	40	60	100
9	13010309	Engineering Geology Lab	0	0	2	1	40	60	100
10	13010310	Constitution of India	2	0	0	MC2	40	60	*
		Total	**17**	**0**	**10**	**20**	**460**	**440**	**900**

Fourth Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010401	Concrete technology	3	0	0	3	60	40	100
2	13010402	Structural Analysis	3	0	0	3	60	40	100
3	13010403	Surveying	3	0	0	3	60	40	100
4		Program Elective-I	3	0	0	3	60	40	100
5		Open Elective-I	3	0	0	3	60	40	100
6	13010406	Technical Report Writing	0	0	2	1	40	60	100
7	13010407	Organizational Behavior	2	0	0	MC2	40	60	*
8	13010408	Concrete technology Lab	0	0	2	1	40	60	100
9	13010409	Structural Analysis Lab	0	0	2	1	40	60	100
10	13010410	Surveying Lab	0	0	2	1	40	60	100
		Total	**17**	**0**	**8**	**19**	**460**	**440**	**900**

Scheme of Examination for B.Tech. Civil Program 2020-2021

SEMESTER WISE COURSE STRUCTURE

Fifth Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010501	Reinforced Concrete Structures	3	0	0	3	60	40	100
2	13010502	Water Treatment & Supply Systems	3	0	0	3	60	40	100
3	13010503	Soil Mechanics	3	0	0	3	60	40	100
4		Program Elective-II	3	0	0	3	60	40	100
5		Program Elective-III	3	0	0	3	60	40	100
6		Open Elective-II	3	0	0	3	60	40	100
7	13010507	Reinforced Concrete Structures Lab	0	0	2	1	40	60	100
8	13010508	Water Treatment & Supply Systems Lab	0	0	2	1	40	60	100
9	13010509	Soil Mechanics Lab	0	0	2	1	40	60	100
		Total	**18**	**0**	**6**	**21**	**420**	**480**	**900**

Sixth semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010601	Estimation & Costing	3	0	0	3	60	40	100
2	13010602	Design of Steel Structures-1	4	0	0	4	60	40	100
3	13010603	Highway Engineering	3	0	0	3	60	40	100
4		Program Elective-IV	3	0	0	3	60	40	100
5		Open Elective-III	3	0	0	3	60	40	100
6	13010606	Building Information Modeling Lab	0	0	4	2	40	60	100
7	13010607	Estimation & Costing Lab	0	0	2	1	40	60	100
8	13010608	Highway Engineering Lab	0	0	2	1	40	60	100
9	13010609	Highway Design Lab	0	0	2	1	40	60	100
		Total	**16**	**0**	**10**	**21**	**460**	**440**	**900**

Scheme of Examination for B.Tech. Civil Program 2020-2021

SEMESTER WISE COURSE STRUCTURE

Seventh Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010701	Irrigation Engineering	3	0	0	3	60	40	100
2	13010702	Geo-Technology	3	0	0	3	60	40	100
3	13010703	Energy Efficient Buildings	3	0	0	3	60	40	100
4		Program Elective-V	3	0	0	3	60	40	100
5		Program Elective-VI	3	0	0	3	60	40	100
6	13010706	Structure Design Lab (Stad-pro)	0	0	4	2	40	60	100
7	13010707	Waterways Design Lab	0	0	4	2	40	60	100
8	13010708	Geo-Technology Lab	0	0	2	1	40	60	100
		Total	**15**	**0**	**10**	**20**	**420**	**380**	**800**

Eighth Semester

S. No.	Subject Code	Course Title	L	T	P	C	Examination marks		Subject Total
							Ext.	Int.	
1	13010801	Major Project /Internship	0	0	20	20	100	100	200
		Total	**0**	**0**	**20**	**20**	**100**	**100**	**200**

*** These marks are used for grading purpose only.**

O: - Above or = 90%

A+:- 80% - 90%

A: - 70% -80%

B+:- 60% - 70%

B: - 50% - 60%

Fail: - Below 50%

1. Name of the Department- Mathematics							
2. Course Name	**Engineering Mathematics - I**	**L (3)**		**T (1)**		**P (0)**	
3. Course Code	13010101						
4.Type of Course (use tick mark)		**Core ()**	**EAS()**	**BSC (✓)**			
1. Pre-requisite (if any)	**Mathematics at +2 Level**	**2. Frequency (use tick marks)**		Even ()	Odd (✓)	Either Sem ()	Every Sem ()
3. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures = 36		**Tutorials = 12**		**Practical = 0**			

4. Brief Syllabus

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, vector analysis and infinite series. The subject aims to show the relevance of mathematics to engineering and applied sciences. This module also facilitates articulation to Degree courses in all streams of Engineering and forms a basis for more specialist branches of mathematics.

5. Learning objectives:

The goal of the Engineering Math sequence is to master the basic tools for the study of science, business and engineering and become skilled in its use for solving problems in science and engineering.

6. Course Outcomes (COs):

i) To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
ii) The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
iii) The tool of power series and Fourier series for learning advanced Engineering Mathematics.
iv) To deal with functions of several variables that are essential in most branches of engineering.
v) The essential tool of matrices and linear algebra in a comprehensive manner.

7. Unit wise detailed content

Unit-1	**Number of lectures = 10+3**	**Title of the unit: Calculus**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integration, change of order of integration, polar form etc.

Unit – 2	**Number of lectures = 10+3**	**Title of the unit: Calculus**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

Unit - 3	**Number of lectures = 8+3**	**Title of the unit: Sequences and series**

Infinite series, Convergence & Divergence of sequence and series, tests for convergence; Ratio test, Integral test, logarithmic test, root test etc & Alternate series.

Unit - 4	**Number of lectures =**	**Title of the unit: Matrices**

	8+3	

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skewsymmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

8. **Brief Description of self-learning / E-learning component**

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

9. Books Recommended

Text Book:

- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010

Reference Books:

- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008
- D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
- Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

1. Name of the Department: Chemistry						
2. Course Name	Industrial Chemistry	**L (3)**	**T (0)**		**P (0)**	
3. Course Code	13010102					
4. Type of Course (use tick mark)		**Core ()**	**EAS ()**		**BSC (✓)**	
5. Pre-requisite (if any)	Chemistry at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 00**	**Practical = 0**			

8. Brief Syllabus

This course intends to introduce students the basic concept of chemistry with atomic and molecular structures. The students will learn about the stereochemistry and organic principles involved in various reactions. They will also be made aware of different intermolecular forces, fuel/ water chemistry, corrosion phenomenon's and kinetics of reactions. The students will understand the spectroscopic techniques and its applications.

9. Learning objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of chemical kinetics, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereo-chemistry and structural aspects useful for understanding reaction pathways.

10. Course Outcomes (COs):

The basic concepts included in this course will help the student to gain:

10. The knowledge of atomic, molecular and electronic changes, chemical interactions, band theory related to conductivity.
11. The required principles and concepts of chemical kinetics, corrosion and in understanding the problem of water and its treatments.
12. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
13. The knowledge of structural analysis of molecules and reaction mechanisms.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Title of the unit: Bonding Theories, Solid State Chemistry &Periodic properties, Introduction to Spectroscopy**

Molecular Orbital theory and its applications in MO energy level diagrams of diatomic molecules (N_2 and O_2). Pi-molecular orbitals of butadiene and benzene and aromaticity.

Crystal Field Theory (CFT): Salient Features of CFT- Crystal Field. Splitting of transition metal ion d-orbitals in Tetrahedral and Octahedral geometries.

Solid state chemistry: Band structure of solids and effect of doping on conductance.Radius ratio rule, Type of Unit Cells and Bragg's Law. Graphite as two dimensional solid and its conducting properties. Fullerene and its applications.

Effective Nuclear Charge, Penetration of orbitals& Energies, (s, p, d and f orbital). Atomic and ionic sizes, Ionization Energies, Electron Affinity and Electronegativity, Coordination numbers.

Basic principles of Spectroscopic Methods and Selection Rules.

Unit - 2	**Number of lectures = 8**	**Title of the unit: Stereochemistry, Organic**

		Principles&Applications of Spectroscopy
Stereochemistry:Structural isomers and Stereoisomers; Enantiomers, Diastereomers, Optical Isomerism. Isomerism in transitional metal compounds. Inductive, Mesomeric and Hyperconjugative effects. Reaction intermediates e.g. Carbocation and Free Radicals. Electrophilic Addition reactions: Addition of HBr to propene. Markownikoff and Anti Markownikoff's additions. Applications of UV-Vis, IR, ^{1}H&^{13}C NMR Spectroscopy.		
Unit - 3	**Number of lectures = 8**	**Title of the unit: Intermolecular forces, Fuel Chemistry &Chemical Kinetics**
Ionic, Dipolar and Van Der Waals Interactions. Classification of fuels, Coal and Biogas. Octane number & Cetane number and their significance. Thermodynamic Terms: Energy, Entropy,Free Energy and Cell potentials. Nernst equation and its applications. Order and molecularity of Reactions. Order Reactions, Zero order, First order and Second order reactions.		
Unit - 4	**Number of lectures = 8**	**Title of the unit: Water Chemistry, Corrosion& Spectroscopy**
Hardness of water-Introduction. Causes of Hardness. Types of hardness: Temporary and Permanent. Units of hardness. Method of water softening (Lime Soda & Zeolite process). Disinfection of water by chlorination and Ozonization. Desalination of water-Reverse osmosis. Corrosion: Introduction and types of corrosion (dry and wet corrosion), protective measures against corrosion. Spectroscopy: Introduction& Principle to Magnetic resonance imaging.		
12. **Brief Description of self-learning / E-learning component** This will involve the NPTEL and SWAYAM portal system for the holistic knowledge. Power Point Presentation will be used and assist in the pictorial based learning and enhance the knowledge in a planned way. Lecture series on the online platform will be beneficial for the students. Online assignment will be designated to students at large.		
13. Books Recommended (5 Text Books + 3 Reference Books)		
TEXT BOOKS: • Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, Wiley, 1999. **REFERENCE BOOKS:** • March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007. • Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005. • Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004. • Applied Chemistry (Latest ed.), By H.D. Gesser.		

<table>
<tr><td colspan="8">1. Name of the Department: Chemistry</td></tr>
<tr><td>2. Course Name</td><td colspan="2">Industrial Chemistry Lab</td><td colspan="2">L (0)</td><td colspan="2">T (0)</td><td>P (2)</td></tr>
<tr><td>3. Course Code</td><td colspan="2">13010107</td><td colspan="2"></td><td colspan="2"></td><td></td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">EAS ()</td><td colspan="2">BSC (✓)</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Chemistry at +2 or Equivalent Level</td><td colspan="2">6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Brief Syllabus
This practical course intends to enhance the students' knowledge related to the basic concept of chemistry through experimentation. The students will learn about the chemicalphenomena'sand proper laboratory safetytechniques.This will help them in better understanding of the information obtained from different scientific instrumentations.</td></tr>
<tr><td colspan="8">9. Learning objectives:</td></tr>
</table>

- To impart practical overview of common laboratory techniques including pH measurement, acid/base titrations, UV/Visible spectroscopy, conduct meter and Viscometer.
- To provide exposure of the scientific techniques mentioned above, to have better knowledge of chemical phenomena.
- To engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.
- Learn about how to maintain a detailed scientific notebook.

10. Course Outcomes (COs):

The basic concepts included in this course will help:

1. Students to carry out scientific experiments as well as accurately record & analyze the results of such experiments.
2. Students will be skilled in handling of various scientific instruments.
3. Students will learn the different synthetic methodologies and chemical phenomena.

11. Detail Content

Sr. No.	Title	CO covered
1	Determination of surface tension of given liquid by drop number method.	**ii**
2	Determine the viscosity of given liquid by using Ostwald's viscometer / Redwood viscometer.	**ii**
3	Calculate the Rf value of given sample using Thin layer chromatography / Paper chromatography.	**i**
4	Removal of Ca^{2+} and Mg^{2+} hardness from given water sample using ion exchange column.	**i**
5	Determination of chloride content in given water sample.	**i**
6	Calculate the strength of strong acid by titrating it with strong base using conductometer.	**iii**
7	To prepare the of urea formaldehyde and phenol formaldehyde resin.	**iii**
8	To Prepare iodoform.	**iii**
9	Calculate the saponification value / acid value of given oil sample.	**i**
10	Chemical analysis of two anions and two cations in given sample of salt.	**i**
11	To determine the total hardness of given water sample by EDTA method.	**i**
12	Study the adsorption phenomena using acetic acid and charcoal.	**iii**

1. Name of the Department: Electronics & Communication Engineering						
2. Course Name	Basics of Electrical Engineering	**L (3)**	**T (0)**		**P (0)**	
3. Course Code	13010105					
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**		**BSE ()**	
5. Pre-requisite (if any)	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

Electrical Technology is a field of engineering that deals with the study and applications of electrical laws and theorems in electrical and electronic systems. The course covers the analysis of basics of electrical engineering, electrical parameters measurement and introduction of electrical machines. Upon completion,

students should be able to deal with the various devices and able to construct the circuits for given specification, also able to analyze and study construction and working of electrical machine using electrical basics.

9. Learning objectives:

This course gives an idea to students about analyzing and solving different electrical and electronic circuits by applying different laws and theorems. The objectives are:

- To prepare students to know the characteristics of different electrical circuits and devices.
- Explain the fundamental principles necessary for the analysis and design of electrical circuits and machines.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Understanding various theorems and applying them to solve different electrical circuits.
- Verifying the characteristics of DC machine, Induction Machine and Synchronous Machine.
- Identify different electrical devices, apply subject knowledge and solve electrical circuit and device problems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit: DC Network Laws and Theorems**

D.C. Network Laws And Theorems: (a). Concepts of network, Active and passive elements, Ohm's law and its limitations, Kirchhoff's laws, Nodal and Loop methods of analysis, Star to Delta & Delta to Star transformation.

(b).Thevenin's theorem, Norton's theorem, Superposition theorem, maximum power transfer theorem, Millman's theorem.

Unit - 2	**Number of lectures = 9**	**Title of the unit: Single Phase AC Circuits**

Single Phase A.C. Circuits: (a). Sinusoidal signal, Instantaneous and peak values, RMS and average values, crest and peak factor, Concept of phase, representation-polar & rectangular, exponential and trigonometric forms, behaviors of R, L and C components in A. C. circuits.

(b). Series and parallel A.C. circuits, Concept of active and reactive power, power factor, series and parallel resonance, Q factor, cut-off frequencies and bandwidth.

Unit - 3	**Number of lectures = 10**	**Title of the unit: 3-Phase Circuits, Magnetic Circuits & Single Phase Transformers.**

Three Phase A.C. Circuits, Magnetic Circuits & Transformer: Three phase system and its necessity and advantages, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement by two Wattmeter method.

Magnetic Circuits: Magnetic Effects of Electric Current; Magnetization Characteristics; Electromagnetic, Induction and Self and Mutual Inductance; Hysteresis and Eddy Current Losses.

Introduction to different Electrical measuring Instruments i.e. Wattmeter, Ammeter, voltmeter and Energy meter

Single Phase Transformers: Construction, Ideal Transformer, Transformer under No-Load and Loading Conditions, Phasor diagram under different Load conditions, Equivalent Circuit of Transformer, O.C and S.C test on transformer, Voltage Regulation Efficiency of a transformer.

Unit - 4	**Number of lectures = 07**	**Title of the unit: DC Machines, 3-Phase induction Motor and Synchronous Machines**

DC machines: Construction, EMF Equation, Torque Equation, Circuit Model – Generating and Motoring Modes. Armature Reaction, Methods of Excitation, Characteristics of DC Motors, Speed Control of Shunt Motor (Field and Armature Control), DC Motor Starting, Application of DC Motors.

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

Synchronous Machines: Construction, Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor with applications.

12. Brief Description of self-learning / E-learning component

The students can utilize following resources for further learning and practice

http://nptel.ac.in/courses/108108076/

https://www.circuitglobe.com

13. Books Recommended (3 Text Books + 2-3 Reference Books)

TEXT BOOKS:

- Basic Electrical Engineering (2nd Edition), Kothari, TMH.

REFERENCE BOOKS:

- Basic Electrical Engineering", S N Singh; Prentice Hall International.
- Electrical and Electronics Technology, Edward Hughes; Pearson Education.
- Electrical technology, (Volume I, II), B L Theraja& A K Theraja, S. Chand & Company.
- Electric Machines, I.J. Nagrath and D.P. Kothari, Tata McGraw-Hill Publishing Company Limited.

1. Name of the Department: Electronics & Communication Engineering						
2. Subject Name	Basics of Electrical Engineering Lab	**L (0)**	**T (0)**		**P (2)**	
3. Subject Code						
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**		**BSE ()**	
5. Pre-requisite (if any)	Physics at +12 Level	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 24**			

8. Brief Syllabus

Electrical Technology is a field of engineering that deals with the study and applications of electrical laws and theorems in electrical and electronic systems. The course covers the analysis of basics of electrical engineering, electrical parameters measurement and introduction of electrical machines. Upon completion, students should be able to perform the experiments based on various circuits and machines. Students able to construct the circuits for given specification, also able to determine the different parameters construction and working of electrical machine using electrical basics.

9. Learning objectives:

This course gives an idea to students about analyzing and solving different electrical and electronic circuits by applying different laws and theorems. The objectives are:

- To prepare students to know the characteristics of different electrical circuits and devices.
- Explain the fundamental principles necessary for the analysis & design of electrical circuits & machines.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Understanding various theorems and applying them to solve different electrical circuits.
- Verifying the characteristics of DC machine, Induction Machine and Synchronous Machine.
- Identify different electrical devices, apply subject knowledge and solve electrical circuit and device problems.

11. List of Experiments:

Sr. No.	Title	CO Covered
1	To study and verify Kirchhoff's Voltage and Current Laws.	i
2	To study and verify Thevenin's theorem.	i
3	To study and verify Nortons's theorem.	i
4	To study and verify Superposition theorem.	i
5	To study and verify Maximum power transfer theorem.	i
6	To study frequency response of RLC series circuit and find out its quality factor and resonance frequency.	iii
7	To study frequency response of RLC parallel circuit and find out its quality factor and resonance frequency.	iii
8	To study O.C and S.C tests on transformer.	ii
9	To study various type of measuring instruments meters.	ii
10	To perform direct load test of a transformer and plot efficiency v/s load characteristics.	ii
11	To perform direct load test of a DC shunt generator and plot load voltage v/s load current curve.	ii
12	To study the working of DC machines.	ii

1. Name of the Department : Centre for Languages and Communication

2. Course Name	**Communication Skills**	**L-2**	**T-0**		**P-0**	
3. Course Code	13010108					
4. Type of Course (use tick mark)		**Core ()**	**EAS ()**		**HSC (✓)**	
5. Pre-requisite (if any)	English at +2 level	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)

Lectures = 24	**Tutorials = 0**	**Practical = 0**

8. Brief Syllabus:

Introduction to Communication: Types of Communication, Process of CommunicationBarriers to Communication and ways to overcome the barriers to communication.Greetings and introducing oneself, Framing questions and answers, Role play, Buying: asking details etc. Word formation strategies, vocabulary building, One word substitution, Antonyms, Synonyms, Homophones, HomonymsSimple narration and Stories, Simple Passages, Newspaper and articles clippings, Pronunciation: Syllable and Stress.Sentences: Types , Tenses, Parts of speech, Articles, Phrasal verbs, Types of Reading, Regular reading session: Newspaper, Articles, and Stories etc. Correct the sentences, Letter Writing, Brief introduction to Types of Letter, Format of Letter, Précis Writing, Paragraph Writing, Report Writing, Difference between Report and Proposal

9. Learning objectives:

i) To enhance the communication skills in a effective manner
ii) To develop communication skills as well as positive personality traits
iii) To enhance usage of English vocabulary and grammar
iv) To make students competent in professional and technical communication

10.Course Outcomes (COs):

- **i)** Able to communicate and expand the knowledge of communication.
- **ii)** Able to communicate in English confidently
- **iii)** Able to improve pronunciation and accent
- **iv)** Able to improve listening and speaking skills
- **v)** Able to improve reading and writing skills

11.Unit wise course details:

Unit-1	**Number of lectures = 06**	**Title of the unit: Effective Communication**

Introduction to Communication, Importance of Communication, Process of communication, Barriers to communication and ways to overcome the barriers to communication, Interviews clipping followed by exercises.

Unit - 2	**Number of Lectures=06**	**Title of the unit: Conversation Skills**

Greetings and introducing oneself, Framing questions and answers, Role play, Buying: asking details etc. Word formation strategies, vocabulary building, One word substitution, Antonyms, Synonyms, Homophones, Homonyms

Unit - 3	**Number of lectures = 06**	**Title of the unit: Reading Comprehension and Pronunciation**

Simple narration and Stories, Simple Passages, Newspaper and articles clippings, Pronunciation: Syllable and Stress. Sentences: Types , Tenses, Parts of speech, Articles, Phrasal verbs		
Unit - 4	**Number of lectures = 06**	**Title of the unit: Listening and Writing Comprehension**
Types of Reading, Regular reading session: Newspaper, Articles, and Stories etc. Correct the sentences, Letter Writing, Brief introduction to Types of Letter, Format of Letter, Précis Writing, Paragraph Writing, Report Writing, Difference between Report and Proposal		
12. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal: https://elearning.sgtuniversity.ac.in/course-category/general/		
13. Books Recommended (3 Text Books + 2-3 Reference Books)		
i) **Improve your Writing**, V.N. Arora, Lakshmi Chandra, Oxford University Press, New Delhi 2014		
ii) **Fluency In English II**, Promodini Varma, Mukti Sanyal, OUP India 2006		
iii) **Communication Skills in English,** D. G. Saxena and Kuntal Tamang, Top Quark, 2011		
iv) **Complete Course in English**, Robert J. Dixson PHI Private Limited 2009 **iv)**		
v) **Effective Technical Communication** M Asharaf Rizvi Tata McGraw Hill Education Private Limited 2005		
v) **English Grammar in Context**, R K Agnihotri and A L Khanna Ratna Sagar 1996		
vi) **Professional Communication**, Malti Agrawal Krishna Educational Publishers 2013		

1. Name of the Department- Mechanical Engineering							
2. Course Name	**Workshop Technology**	**L**		**T**		**P**	
3. Course Code	13010104	**1**		**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**	**BSE ()**			
5. Pre-requisite (if any)	**Physics at +2 Level**	**6. Frequency (use tick marks)**		Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures = 12		**Tutorials = 0**		**Practical = 0**			

8. Brief Syllabus:

Workshop technology deals with different processes by which component of a machine or equipment's are made. The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

9. Learning objectives:

i) As the need of hand on practice for the engineers this course has special weightage.

ii) To be industry ready a student must have the knowledge of various welding processes, should have knowledge about the foundry and various machine tools. So this course fulfills all these needs.

10. Course Outcomes (COs): After the completion of the course, the student shall be able to

i) Practice workshop safety rules effectively.

ii) Acquire knowledge and use simple measuring and gauging instruments.

iii) Acquire knowledge and use simple hand tools

iv) Operate simple drilling machines for producing small holes

v) Operate various machine tools for producing simple metal components and articles

vi) Acquire knowledge and practice on foundry, forging and welding

11. Unit wise detailed content

Unit-1	**Number of lectures = 2**	**Title of the unit: Introduction**

INTRODUCTION: Introduction to Manufacturing Processes and their Classification, automation in manufacturing**,** Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, Electric Safety Measures, First Aid. Plant Layout, Principles of Plant Layout, Objectives of Layout, Types of Plant and shop layouts and their Advantages.

Unit - 2	**Number of lectures = 2**	**Title of the unit: Welding**

WELDING: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing, Comparisons among Welding, Brazing and Soldering

Surface Finishing Processes, Introduction to Heat Treatment Processes, Estimating of Manufacturing Cost

Unit - 3	**Number of lectures = 2**	**Title of the unit: Cold Working**

Cold Working (Sheet Metal Work): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining - Advantages and Limitations. Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing.

Unit - 4	**Number of lectures = 6**	**Title of the unit: Introduction to Machine Tools & Foundry**

Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear, Mechanics of Chips Formation, Type of Chips, Use of Coolants in machining.

Foundry: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern allowances, Risers, Runners, Gates, Molding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies. Testing of Castings

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

i) Workshop Technology (Manufacturing Process) – S K Garg, Laxmi Publications; Fourth edition (2018), ISBN-10: 8131806979

Reference Books:

i) Process and Materials of Manufacture -- Lindberg, R.A. Prentice Hall of India, New Delhi, Fourth Edition, ISBN-10: 9788120306639

ii) Principles of Manufacturing Materials and Processes - Campbell, J.S. - McGraw- Hill, New Edition, ISBN-10: 0070992525

iii) Manufacturing Science - Amitabha Ghosh & Ashok Kumar Malik, - East-West Press, PEARSON India, Second Edition (2010), ISBN-10: 8176710636

1. Name of the Department- Mechanical Engineering							
2. Course Name	**Workshop Technology Lab**	**L**		**T**		**P**	
3. Course Code	13010109	**0**		**0**		**4**	
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**	**BSE ()**			
5. Pre-requisite (if any)	**Physics at +2 Level**	**6. Frequency (use tick marks)**		Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures = 0		**Tutorials = 0**		**Practical = 48**			

8. Brief Syllabus:

Workshop technology deals with different processes by which component of a machine or equipment's are made. The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

9. Learning objectives:

i) As the need of hand on practice for the engineers this course has special weightage.

ii) To be industry ready a student must have the knowledge of various welding processes, should have knowledge about the foundry and various machine tools. So this course fulfills all these needs.

10. Course Outcomes (COs): After the completion of the course, the student shall be able to

i) Practice workshop safety rules effectively.

ii) Acquire knowledge and use simple measuring and gauging instruments.

iii) Acquire knowledge and use simple hand tools

iv) Operate simple drilling machines for producing small holes

v) Operate various machine tools for producing simple metal components and articles

vi) Acquire knowledge and practice on foundry, forging and welding

11. Unit wise detailed content

Sr. No.	**Title**	**CO covered**
1	To perform machining operations like turning, step turning, threading etc. on the Lathe.	v
2	To make slot on work piece by using Milling Machine.	iv
3	To prepare groves on work piece by using Shaper Machine.	v
4	To perform surface finishing operation on Surface Grinder.	iv, v
5	To perform drilling operations.	iv
6	To make cross lap joint.	iii, iv

7	To make butt joint	i, ii, vi
8	To make Lap joint by using Electric Arc Welding.	i, ii, vi
9	To make butt joint by using Electric Arc Welding	i, ii, vi
10	To practice fitting operations.	ii, iii, vi
11	To make male and female joint.	ii, iii, vi
12	To prepare open box tray.	ii, iii, vi

1. Name of the Department: Environment Science						
2. Course Name	Environment Science	**L (2)**	**T (0)**		**P (0)**	
3. Course Code	13010106					
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**		**BSE ()**	
5. Pre-requisite (if any)	Basic Knowledge of Environment	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical-0						
Lectures = 24		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

The course intends to introduce students the objective of environmental sciences and the importance of conservation of natural resources. The students will learn about the sources, effects and control measures of air, water, soil, noise, thermal pollution. They will also be made aware of global environmental issues. The students will understand the need of sustainable development, environment pacts, role of information technology in the environment. The students will be explained basic principles of green building and environmental remedial measures.

9. Learning objectives:

- To develop awareness about our environmental scenarios.
- To develop a concern about sustainable development through future strategies.

10. Course Outcomes (COs)

On completion of this course, the student should be able to:

- Understand about environment and its components and Problems associated with natural resources and their sustainable use.
- Sources of pollution in air, water and soil and Solid waste management and natural Disaster management.
- Understanding about environmental andsocial issues, ecosystems, biodiversity.
- Understanding of role of information technology to address environmental issues through human involvement.

11. Unit-wise Detailed Content

Unit-1	**Number of lectures=6**	**Title of the unit: Multi-disciplinary Approaches and Environmental Pollution and Control Technologies**

Introduction and Components of the Environment, Factors leading to Environment Degradation. Environmental Pollution; Air Pollution, Water pollution and Noise Pollution. Solid waste (E-wastes): Sources, andRemedial Measures.

Unit - 2	**Number of lectures=6**	**Title of the unit: Natural Resources**

Natural Resources:Renewable and Non-Renewable resources; Water resources: use and Over utilization of surface and ground water, Role of Dams. Changes in agricultural ways:Water logging, Salinity; Mineral Resources: Use and Over-exploitation; Land resources:Man induces Landslides, Soil Erosion, and Desertification; Energy resources: Use of Alternate Energy Sources.

Unit - 3	**Number of lectures=6**	**Title of the unit: Eco-Systems and its Characteristics**

Ecosystem: Classification, Structure, and Function of an ecosystem, Food Chains, Food Webs, and Ecological Pyramids.Biogeochemical cycles, Biomagnification, Introduction and characteristic featuresof the following Eco-systems:Forest ecosystem, Desert ecosystem, Aquatic Eco-systems.

Unit - 4	**Number of lectures=6**	**Title of the unit: Bio-diversity and Global Environmental Issues**

Definition, Genetic, Species and Ecosystemdiversity. Threats to biodiversity: habitat loss, poaching of wildlife, impactof mankind onwildlife;conservation of biodiversity: In-Situ and Ex-situ conservation.

Global Environmental Issues: Ozone depletion and Ozone depleting substances (ODS). Deforestation and Desertification, Acid Rain and Global Warming. Concept of Green Building. Legal Aspects Air Act, Water Act, Forest Act, Wild life Act.

12. Brief Description of self-learning / E-learning component

E-Learning, the online platform, will involve the NPTEL and SWAYAM portal system for the holistic knowledge. Power Point Presentation will be used. Online Lecture series will be beneficial for the students. Online assignment will be designated to students at large. Seminars will be conducted for the broad-spectrum knowledge.

13. Books Recommended (1Text Books + 5 Reference Books)

TEXT BOOKS:

- Environmental Studies, AninditaBasak, Pearson Education, 2009.

REFERENCE BOOKS:

- Tata McGraw Hill Education Private Limited, 2007.
- Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons, 2008.
- Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
- Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.

1. Name of the Department: Computer Science & Engineering						
2. Course Name	Computer Programming Lab	**L**	**T**		**P**	
3. Course Code	13010110	0	0		4	
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**	**BSE ()**		
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 48**			

8. Course Description:

Experiments include the problem-solving skillsinput/output and arithmetic rules, conditional branching, looping, functions, array, structure, pointers for parameter passing, referencing and dereferencing, and linking data structures.

This subject help students to develop problem-solving skills to translate 'English' described problems into computer programs using the programming language. It helps students to gain fundamental knowledge of general principles of computer programming languages such as input/output and arithmetic rules, conditional branching, looping, functions, array, structure, pointers for parameter passing, referencing and dereferencing, and linking data structures. Students also acquire fundamental knowledge on basics of computers hardware and number systems.

9. Course Objectives:

i) To impart practical knowledge of general principles of computer programming languages.
ii) The objective of this course is to teach students advanced problem solving through programmingand
iii) To train students in realizing computer algorithms with efficient programs.

10. Course Outcomes (COs):

After successful completion of the course, students will be able to

i) Identify and abstract the programming task involved.
ii) Choose the right data representation formats based on the requirements of the problem.
iii) Write the program on a computer, edit, compile, debug, correct, recompile and run it.
iv) Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task

11. List of Experiments

Sr. No.	Title	CO Covered
1	Assembly and disassembly of a Desktop Computer with connections.	i
2	Operating System Installation-Formatting, Partitioning	ii
3	Additional Hardware Installation like printer, mobile, scanner.	iii

4	Application Software Installation-MS Office and CD/DVD Writing	i	
5	To connect two PC's using the interconnecting devices and transfer the data between them.	ii	
6	To study various connections and ports used in computer communication. PS/2 port and its specification, VGA Port and its specification, Serial port and its specification and applications, Parallel Ports and its specification, USB Port and its specification, RJ45 connector, DVI Monitor port.	iii	
7	To study various cards used in a Computer System. (Ethernet Card, Sound Card, Video/Graphics Card, Network Interface card ,TV Tuner Card, Accelerator card)	i	
8	Write a program to find the largest of three numbers. (if-then-else)	ii	
9	Write a program to find the largest number out of ten numbers (for-statement)	iii	
10	Write a program to find roots of quadratic equation using functions and switch statements.	i	
11	Write a program using arrays to find the largest and second largest no. out of given 50 nos.	ii	
12	Write a program to multiply two matrices.	iii	
13	Write a program to check that the input string is a palindrome or not.	i	
14	Write a program to concatenate two strings.	ii	
15	Write a program which manipulates structures (write, read, and update records).	iii	
16	Write a program which creates a file and writes into it supplied input.	i	

1. Name of the Department: Mathematics							
2. Course Name	**Engineering Mathematics - II**	**L (3)**		**T (1)**		**P (0)**	
3. Course Code	13010201						
4. Type of Course (use tick mark)		**Core ()**	**EAS ()**	**BSC (✓)**			
5. Pre-requisite (if any)	**Engineering Mathematics - I**	**6. Frequency (use tick marks)**		Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures = 36		**Tutorials = 12**		**Practical = 0**			

8. Brief Syllabus

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of, calculus, complex variables and differential equation. The subject aims to show the relevance of mathematics to engineering and applied sciences. This module also facilitates articulation to Degree courses in all streams of Engineering and forms a basis for more specialist branches of mathematics.

9. Learning objectives:

The goal of the Engineering Math sequence is to master the basic tools for the study of science, business and engineering and become skilled in its use for solving problems in science and engineering.

10. Course Outcomes (COs):

i) Upon completion of this course, students will be able to solve field problems in engineering involving PDEs.

ii) They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

11. Unit wise detailed content

Unit-1	**Number of lectures: 08+3**	**Title of the unit: Multivariable Calculus (Integration) and Laplace transform**

Vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes. Laplace transform and its applications.

Unit - 2	**Number of lectures: 09+3**	**Title of the unit: Oordinary differential equations and its Applications**

Exact and linear differential equations, Equation reducible to Exact differential equations and its application. Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Legendre polynomials.

Unit - 3	**Number of lectures : 10+3**	**Title of the unit: Applied Statistics and Small samples**

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Unit - 4	**Number of lectures : 09+3**	**Title of the unit: Probability Distributions**
Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares-fitting of straight lines, second degree parabolas and more general curves.		
12. **Brief Description of self-learning / E-learning component** The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.The link to the E-Learning portal.https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.		
13. Books Recommended		
i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.		
ii) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.		
iii) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).		
iv) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.		

1. Name of the Department: Physics						
2. Course Name	Engineering Physics	**L (3)**	**T (0)**		**P (0)**	
3. Course Code	13010202					
4. Type of Course (use tick mark)		**Core ()**	**EAS ()**	**BSE (✓)**		
5. Pre-requisite (if any)	Intermediate courses	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description:

Engineering physics course provide an opportunity to students to learn fundamental concepts of physics and apply these concepts in today's rapidly changing and highly technical/engineering environment. This course also emphasizes the solid foundations of modern scientific principles.

9. Course Objectives:

i) To give students a basic exposure to Physics that will better prepare them for more rigorous courses that will be taken later on.

ii)To make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully.

10. Course Outcomes (COs):

At the completion of this course, students will be able to:

i) Describe the behavior of and make predictions regarding the phenomena of the physical world.

ii) Apply fundamental principles of physics to solve problems relating to waves, crystal structure, band theory of solids, quantum physics and special theory of relativity.

iii)Understand the importance of record-keeping and have practiced its use during labs and/or lectures.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit: Wave Optics**

Interference: Coherent sources, conditions for sustained interference. Division of Wave-Front - Fresnel's Biprism, Division of Amplitude- Newton's Rings, applications.

Diffraction: Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, dispersive power and resolving power of grating.

Polarization: Polarized and unpolarised light, uniaxial crystal, double refraction, Nicol prism, Quarter and Half wave plates, Detection and production of different types of polarized light.

Unit – 2	**Number of lectures = 09**	**Title of the unit: Crystal Structure and Band theory of solids**

Crystal Structure: Space lattice, unit cell and translation vector, Miller indices, simple crystal structure, Bragg's law, defect in solids.

Free Electron Theory: Elements of classical free electron theory and its limitations. Drude's theory of conduction, quantum theory of free electrons, Fermi level, density of states, Fermi-Dirac distribution function.

Band Theory of solids: Origin of energy bands, Kroning-Penney model ,E-K diagrams, Brillouin zones, Concept of effective mass and holes, Classification of solids into metals, semiconductors and insulators, Hall effect and its applications.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Special Theory of RelativityLaser and Quantum Physics**

Special Theory of Relativity: Postulates of special theory of relativity, Lorentz transformations. Consequences of LT (length contraction and time dilation). Variation of mass with velocity, Mass energy equivalence.

Quantum Physics: Inadequacies of classical physics, introduction to quantum mechanics-simple concepts, Black body radiations Discovery of Planck's constant, wave particle duality, phase velocity and group velocity. Schrodinger wave equations-time dependent and time independent, Expectation value, particle in a one-dimensional box.

Unit – 4	Number of lectures = 09	Title of the unit: LASER and Electromagnetic theory

LASER: Spontaneous and Stimulated emission, characteristics of laser beam, principle of laser, lasing action, three level laser, four level laser, He-Ne laser, applications.

Fiber Optics: Propagation of light in optical fibers, numerical aperture, V-number, single and multimode fibers, attenuation, dispersion, applications**.**

Electromagnetic theory: Gradient, divergence and curl, stokes theorem, gauss- divergence theorem, gauss law, faraday law, ampere circuital law, displacement current, Maxwell's equation.

12. Brief Description of self-learning / E-learning component

To understand basic concepts in detail, students may get study materials on following links.
https://onlinecourses.nptel.ac.in/noc18_ph02
https://ocw.mit.edu/courses/physics/

13. Books Recommended

Text Books:

- Modern Physics for Engineers – S.P.Taneja (R. Chand)

Reference Books:

- Engineering Physics – SatyaPrakash (PragatiPrakashan)
- Modern Engineering Physics – A.S.Vasudeva (S. Chand)
- Perspectives of Modern Physics - Arthur Beiser (TMH)
- Optics - AjoyGhatak (TMH)
- Fundamentals of Physics – Resnick & Halliday (Asian Book)
- Introduction to Electrodynamics- David J. Griffiths (PEARSON)

1. Name of the Department: Electronics & Communication Engineering						
2. Course Name	Basics of Electronics Engineering	**L (3)**	**T (0)**		**P (0)**	
3. Course Code	13010203					
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**		**BSE ()**	
5. Pre-requisite (if any)	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

The course intends to introduce students to the fundamental concepts of Analog and Digital electronics. The physical structure, working principle and characteristics of widely used components such as diodes, transistors and measuring instruments such as voltmeter, ammeter and oscilloscopes is covered. The working theory of basic digital components such as logic gates and flip flops is also included.

9. Learning objectives:

- To explain the origins of semiconductor device physics.
- To explain the physical structure and I-V characteristics of the standard p-n junction diode and other special types of diodes.
- To explain the construction and working principle of meters and displays.
- To explain the application of logic gates and flip flops.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Explain the structure and working of various types of diodes.
- Demonstrate the different applications of diodes and transistors.
- Explain the working principle and limitations of various measuring instruments.
- Explain the process of minimizing Boolean functions & differentiate between different types of Flip Flops.

11. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Semiconductor Diodes**

P-N junction diode: theory, depletion region, biasing, I-V characteristics, temperature dependence, equivalent circuit and capacitance.

Construction, Working principle and I-V characteristics of Zener diode, Photodiode, LED, Schottky diode, Tunnel diode and Varactor diode.

Unit - 2	**Number of lectures = 10**	**Title of the unit: Application of Diodes and Transistor Basics**

Application of Diodes: Rectifiers (types and performance), Clippers & Clampers (series, parallel and biased), Voltage Regulators.

Transistor Basics: Schematic Diagrams and Working of Bipolar Junction Transistors (BJT), Junction Field Effect Transistor (JFET)

Unit - 3	**Number of lectures = 10**	**Title of the unit: Instrumentation & Digital Electronics**

Instrumentation: Construction & Operation of Voltmeter, Ammeter, Multimeter, CRT, CRO, DSO, Function Generator and Regulated Power Supply.

Digital Electronics: Logic gates, Realization of Logic operations using Universal Gates, Application of Boolean Laws in Minimizing logic functions, Number Systems and their inter conversion, Flip Flops (S-R, J-K, D and T).

Unit - 4	**Number of lectures = 08**	**Title of the unit: Fundamentals Of Communication System**

Block Diagram of Communication, System & its types; Classification of signals-Periodic/aperiodic, even/odd, deterministic /random, exponential/sinusoidal, representation of unit step, unit impulse & unit ramp function, reversal, time shifting, time scaling.

12. **Brief Description of self-learning / E-learning component**

The students can utilize following resources for further learning and practice

http://nptel.ac.in/courses/117103063/

https://www.circuitglobe.com

13. Books Recommended (3 Text Books + 2-3 Reference Books)

TEXT BOOKS:

- Basics of Electronics, J.B. Gupta, Dhanpat Rai Publications

REFERENCE BOOKS:

- Basics of Electronics Engineering, Vijay Baru*et. al.*, Wiley India Private Limited.
- Electronic Fundamentals and Application, J. D. Ryder, Prentice Hall India.
- Electronic Instrumentation, H. S. Kalsi, Tata McGraw Hills India, 3rd Edition.
- Integrated Electronics, Millman & Halkias, Tata McGraw Hills India, 2007.
- Robert L. Boylestad & Louis Nashelsky "Electronic Devices and Circuit Theory", 10th Ed. Pearson Education, 2013.
- A Course in Electrical & Electronic Measurement and Instrumentation, A.K. Sawhney and Puneet Sawhney, Dhanpat Rai Publications,

1. Name of the Department: Electronics & Communication Engineering						
2. Course Name	Basics of Electronics Engineering Lab	**L (0)**	**T(0)**		**P (2)**	
3. Course Code	13010207					
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**		**BSE ()**	
5. Pre-requisite (if any)	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 24**			

8. Brief Syllabus

The course intends to introduce students to the fundamental concepts of Analog and Digital electronics. The physical structure, working principle and characteristics of widely used components such as diodes, transistors and measuring instruments such as voltmeter, ammeter and oscilloscopes working and applications. The working theory of basic digital components such as logic gates and flip flops is also included.

9. Learning objectives:

- To study the I-V characteristics and other parameters of different types of diodes.
- To study the construction and working principle of different measuring instrument and displays.
- To study the application of logic gates and flip flops.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

i) Use various types of diodes for Industrial applications.
ii) Use various measuring instruments.
iii) Explain the process of minimizing Boolean functions & differentiate between different types of Flip Flops.

1. Lab Experiment

Sr. No.	Title	CO covered
1	To study the I-V characteristics of a p-n junction diode.	i
2	To study the application of a Zener diode as a voltage regulator.	i
3	To study the working of a Light Emitting Diode.	i
4	To study the application of a diode as a rectifier.	i
5	To study the application of a diode as a clipper and a clamper	i
6	To study the working of a CRO and a DSO.	ii
7	To study the working of a Function Generator.	ii
8	To study the working of a Regulated Power Supply.	i
9	To study different types of logic gates.	iii
10	To study the application of NOR & NAND gates as Universal logic gates.	iii
11	To study the working of different Flip Flops (S-R, J-K, D and T)	iii
12	To study the I-V characteristics of a bipolar junction transistor in CB, CE & configuration.	i & ii

1. Name of the Department- Management							
2. Course Name	**Universal Human Values**	**L**		**T**		**P**	
3. Course Code	13010204	3		0		2	
4. Type of Course (use tick mark)		**Core ()**	**EAS (✔)**	**BSE ()**			
5. Pre-requisite (if any)	Basic Knowledge of Human Values	**6. Frequency (use tick marks)**		Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures =36		**Tutorials = 0**		**Practical = 24**			

8. Brief Syllabus

Introduction to Value Education, Harmony in the Human Being, Harmony in the Family and Society and Harmony in the Nature, Social Ethics

9. Learning objectives:

The objective of this course is to:

i) To assist students in understanding the differences between values and skills, and in understanding the need, basic guidelines, content and the process of value education.
ii) To help students initiate a process of dialog within themselves to understand what they 'really want to be' in their lives and professions
iii) To help students understand the meaning of happiness and prosperity for human beings.
iv) To help students understand harmony at all the levels of human living and to lead an ethical life.

10. Course Outcomes (COs):

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

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the value of harmonious relationships based on trust and respect in their life and profession
4. Understand the role of a human being in ensuring harmony in society and nature.
5. Distinguish between ethical and unethical practices, and start identifying a strategy to actualize a harmonious environment wherever they work.

11. Unit wise detailed content

Unit-1	**Number of lectures = 9+6**	**Title of the unit: Introduction to Value Education**

Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.

Unit – 2	**Number of lectures = 10+6**	**Title of the unit: Harmony in the Human Being**

Human Being is more than just the Body, Harmony of the Self ('I') with the Body, Understanding Myself as

Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.

Unit – 3	**Number of lectures = 9+6**	**Title of the unit: Harmony in the Family and Society and Harmony in the Nature**

Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love, Comprehensive Human Goal: The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence.

Unit – 4	**Number of lectures = 8+6**	**Title of the unit: Social Ethics**

The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

13. Books Recommended

TEXT BOOKS

1.A.N Tripathy, New Age International Publishers.
2.Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted.
3.Bertrand Russell Human Society in Ethics & Politics

REFERENCE BOOKS

1.Corliss Lamont, Philosophy of Humanism
2.Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books.
3.Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books.

1. Name of the Department- Management Studies							
2. Course Name	**Universal Human Values Practical**	**L**		**T**		**P**	
3. Course Code		**0**		**0**		**2**	
4. Type of Course (use tick mark)		**Core ()**	**EAS(✓)**	**BSE ()**			
5. Pre-requisite (if any)	Basic Knowledge of Human Values	**6. Frequency (use tick marks)**		Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures = 0		**Tutorials = 0**		**Practical = 24**			

8. Brief Syllabus:

Introduction to Value Education, Harmony in the Human Being, Harmony in the Family and Society and Harmony in the Nature, Social Ethics

9. Learning objectives:

The objective of this course is to:

i. To assist students in understanding the differences between values and skills, and in understanding the need, basic guidelines, content and the process of value education.
ii. To help students initiate a process of dialog within themselves to understand what they 'really want to be' in their lives and professions
iii. To help students understand the meaning of happiness and prosperity for human beings.
iv. To help students understand harmony at all the levels of human living and to lead an ethical life

Course Outcomes (COs):

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

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the value of harmonious relationships based on trust and respect in their life and profession
4. Understand the role of a human being in ensuring harmony in society and nature.
5. Distinguish between ethical and unethical practices, and start identifying a strategy to actualize a harmonious environment wherever they work.

10. Unit wise detailed content

Sr. No.	Title	CO covered
1	Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario	iii
2	understanding and living in harmony at various levels	iii
3	Programs to ensure Sanyam and Swasthya	ii
4	Understanding Harmony in the family – the basic unit of human interaction	iii
5	Understanding values in human	i
6	Understanding the harmony in the society	iv
7	Understanding the harmony in the Nature	iv

8	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space	v
9	Holistic perception of harmony at all levels of existence	ii
10	Understanding the meaning of Vishwas; Difference between intention and competence	ii
11	Method to fulfill the human aspirations	i
12	Right understanding	iv

1. Name of the Department- Mechanical Engineering							
2. Course Name	**Engineering Graphics Lab**	**L**		**T**		**P**	
3. Course Code	13010205	0		0		4	
4. Type of Course (use tick mark)		**Core ()**	**EAS (✔)**	**BSE ()**			
5. Pre-requisite (if any)	**Geometry and Drawing at +2 Level**	**6. Frequency (use tick marks)**		Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)							
Lectures =0		**Tutorials = 0**		**Practical = 48**			

8. Brief Syllabus

Engineering Graphics and design is considered as language of engineers. This course is introduced to provide basic understanding of importance of designing aspects in engineering applications. The topics are covered in a sequence and starts from the basic concepts of introduction to computer aided design and then designing of planes and solids. Towards the end of the course it is expected that students would be matured to visualize the engineering components from any drawing sheet, followed by the projection techniques. A number of chosen problems will be solved to illustrate the concepts clearly.

9. Learning objectives:

i) To understand the basic concepts of drawing and projection techniques.
ii) To enhance the knowledge of reading the layouts.
iii) To develop designs.
iv) To develop engineering imagination which is essential for creation of successful designs.

10. Course Outcomes (COs):

i) Clarity in Drawing
ii) Can read shop layout and industrial layouts
iii) Design any layout by using projection techniques.

11. Unit wise detailed content

Sr. No.	Title	CO Covered
1	Different types of lines with illustration and application.	i, ii
2	Design sheet layout with dimensioning and lettering.	ii
3	Applications of drawing commands	i, iii
4	Projection of points in four quadrants.	i
5	Projection of straight lines in parallel, perpendicular and inclined planes.	i
6	Projection of plane in perpendicular positions.	i
7	Projection of cones and solid cylinders with axes parallel, perpendicular and inclined to both reference planes.	i

8	Projection of prisms and pyramid.	i, ii, iii
10	Design Orthographic projection of simple machine elements.	i, ii, iii
11	Design Isometric projection of simple machine elements.	i, ii. iii
12	Design Sectional views of simple machine elements.	i, ii, iii

1. Name of the Department: Computer Science & Engineering						
2. Course Name	Advance Programming Lab	**L**	**T**		**P**	
3. Course Code	13010206	0	0		4	
4. Type of Course (use tick mark)		**Core ()**	**EAS ()**	**BSE (✓)**		
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 48**			

8. Course Description:

Experiments include the problem-solving skillsinput/output and arithmetic rules, conditional branching, looping, functions, array, structure, pointers for parameter passing, referencing and dereferencing, and linking data structures.
This subject help students to develop problem-solving skills to translate 'English' described problems into computer programs using the C language. It helps students to gain fundamental knowledge of general principles of computer programming languages such as input/output and arithmetic rules, conditional branching, looping, functions, array, structure, pointers for parameter passing, referencing and dereferencing, and linking data structures. Students also acquire fundamental knowledge on basics of computers hardware and number systems.

9. Course Objectives:

i) Introduce the student to the concepts of advanced programming in computer science.
ii) Acquire knowledge to make functions , Files etc

10. Course Outcomes (COs):

After successful completion of the course, students will be able to

i) Apply the concepts of advanced programming in daily life problem.
ii) Understand operation object oriented concepts.
iii) Apply the concepts of inheritance and polymorphism in software development.

11. List of Experiments

Sr. No.	Title	CO Covered
1	Functions	i
2	Arrays	i
3	Pointers	i
4	This pointer	iii
5	Friend Function	ii
6	Virtual Function	ii
7	Abstract Class	iii
8	Inheritance	iii
9	Operator Overloading	iii
10	File Handling	ii
11	Template	iii
12	Handling of Exceptions	i

SEMESTER III

1. Name of the Department –CIVIL ENGINEERING						
2. Subject Name	**Strength of Materials**	**L**	**T**		**P**	
3. Subject Code	13010301	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 0**	**Practical =0**			
7. Brief Syllabus Properties of materials, Stresses and strains, Shear Force, Columns and Struts, Deflection of beams and failures theory and Bending Moment						
8. Learning objectives: 1. Confidently tackle equilibrium equations, moments and inertia problems 2. Master calculator/computing basic skills to use to advantage in solving mechanics problems. 3. Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering						
9. Subject Outcomes : By the end of this course the student will be able to: 1. Identify different materials and their behaviour 2. Analyse various civil engineering structures under different loading conditions 3. Apply the principles of structural mechanics in design structural elements 4. Apply the concepts of failure theories for design of structures						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 9**	**Properties of Materials**				
Introduction ,Normal and Shear stresses, stress- Strain diagrams for ductile and brittle material ,Elastic constants, One Dimensional loading of members of varying cross sections Compound stresses: General state of stress, resultant stress and strain, principal stresses and principal strains, Mohr's circle for compound stresses and strains.						
Unit – 2	**Number of lectures = 8**	**Shear Force and Bending Moment & bending of beams**				
Introduction ,shear force and bending moment ,Differential equations for equilibrium ,shear force and bending moment diagrams for statistically determinate beams Introduction - Failure Criteria of beams - Theory of bending - deflection of beams by Macaulay's method - moment area method and conjugate beam method - application of principle of impulse and momentum.						
Unit – 3	**Number of lectures =8**	**Columns and Struts**				
Criteria for stability of columns, Buckling of columns, Euler's formula for various end restraints, Rankin's formula, eccentrically loaded struts, struts with initial curvature, and struts with lateral loading.						
Unit – 4	**Number of lectures = 8**	**Torsion and Truss**				
Torsion: Torsion: Introduction, Torsion shafts of circular section, torque and twist, Shear stress due to torque. Truss: Introduction, Simple Truss and solution of simple truss, Method of joints and method of sections.						
11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.						
12. Books Recommended						
Text Books:						

1 Er. R.K Rajput (2011), ISBN No. 81/219/2594/0 Engineering Mechanics, 7th Edition, S Chand publications.

Reference Books:

2 F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.

3 R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

4 Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press.

5 Shames and Rao (2006), Engineering Mechanics, Pearson Education.

1. Name of the Department –CIVIL ENGINEERING						
2. Subject Name	**Strength of Materials Lab**	**L**	**T**		**P**	
3. Subject Code	13010306	0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 0**	**Practical =20**			

7. Brief Syllabus

Properties of materials, Stresses and strains, Shear Force, Columns and Struts, Deflection of beams and failures theory and Bending Moment

8. Learning objectives:

1. Confidently tackle equilibrium equations, moments and inertia problems.
2. Master calculator/computing basic skills to use to advantage in solving mechanics problems.
3. Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering.

9. Subject Outcomes : By the end of this course the student will be able to:

1. Identify different materials and their behaviour.
2. Analyse various civil engineering structures under different loading conditions.
3. Apply the principles of structural mechanics in design structural elements.

Sr. No.	**Title**	**CO covered**
1.	Tension test on a mild steel and HYSD bars	1
2	Compression test on Bricks and Concrete cubes	1
3	Experimental determination of elastic constant of steel beams.	1
4	Verification of Maxwell theorem	2
5	Compression and tension test on helical springs	1
6	Torsion test on mild steel and HYSD bars.	2
7	Determination of critical buckling load and deformation of column for different end conditions	3
8	To determine deflection of steel truss	3

1. Name of the Department		CIVIL ENGINEERING				
2. Subject Name	**Building construction and materials**	**L**	**T**		**P**	
3. Subject Code	13010302	3	0		0	
4. Type of Subject (use tick mark)		**HSMC&CRC (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewerage systems, pipelines, structural components of buildings, and railways.

8. Learning objectives:

1. To teach students about the physical and mechanical properties of various construction materials and their testing procedure.
2. To teach students about the principles and methods to be followed in constructing various components of a building.
3. To make the students aware of precautionary measures to be taken during construction to avoid any damage to the structure at a later date.
4. To teach students about assessment of damages and methods of repairs and restoration.

9. Subject Outcomes:

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

1. Follow BIS and NBO codes for different components of building construction along with testing procedure of building materials with respect to relevant codes.
2. Supervise construction work with technical ability within the frame work of codal provision.
3. Select the modern construction materials appropriate to the climate and functional aspects of the buildings.
4. Supervise the construction technique to be followed in brick and stone masonry, concreting, flooring, roofing and plastering etc.
5. Understand the common lapses during the construction which results in the deterioration/damage to the structure at the later date.
6. Study the causes of deterioration, crack pattern and assessment of damage to the structure due to faulty construction or natural calamity.
7. Construction techniques in repairing and rehabilitation of structures

10. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Title of the unit: Properties of materials and Miscellaneous Materials**

Physical and Mechanical properties of construction materials – stones, brick, cement, aggregate, timber, tiles. Testing of said materials as per BIS specifications

Structural Steel and Aluminum, Roofing Material, Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials, Timber and its Products, Modern materials, Neoprene, thermocol, vinyl flooring, decorative panels and laminates, anodized aluminum, architectural glass and ceramics.

Unit - 2	**Number of lectures = 8**	**Title of the unit: Brick & Stone Masonry, Foundations**

Brick masonry construction- Principles of construction, types of bonds, introduction to reinforced brick work, lintels and arches.
Stone masonry – Types of stone masonry & method of its construction, lintels and arches.
Finishing- Pointing, Plastering, Paintings, varnishing.
General Principles of – Flooring and its types, Roofing and its types, Damp proof course (DPC).
Function of foundation, Types of foundation- Shallow and deep foundation

Unit - 3	**Number of lectures = 9**	**Title of the unit: Thermal Insulation and Acoustic**

Thermal insulation- Types of materials, Heat transfer and basic definition, methods of thermal insulations for roof, exposed walls, doors and windows in building construction.
Acoustics- Types of materials for improvement of acoustics in building construction, audible sound, behavior of sound, reflection of sound, reverberation and absorption, sound insulation and acoustic design of hall.

Unit - 4	**Number of lectures = 8**	**Title of the unit : Repair, Rehabilitation**

Preventive measures during construction for a durable and safe building structures, assessment of damage due to faulty construction and natural and manmade calamities, repair and rehabilitation of structures using Polymer concrete, Sulphur infiltrated concrete, Fiber reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

11. Books Recommended

Text Books

1. Rangawala , Building Construction (2010) ISBN No. 978-93-80358-15-4,Charotar Publications Pvt. Ltd. 28th Edition

Referance books

1. P.C.Varghese, Engineering Materials, 1st edition, PHI Learning.
2. S.K.Duggal, Building Materials, 3rd Edition, New Age International Publishers.
3. Sushil Kumar, Building Construction, Standard Publishers Distributors.
4. M.S.Shetty, Concrete Technology: Theory and Practice, S. Chand Publishers.
5. A.R.Santhakumar, Concrete Technology, Oxford University Press.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Fluid Mechanics**	**L**	**T**		**P**	
3. Subject Code	13010303	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Brief Syllabus

Fluid mechanics includes fluid statics and dynamics, conservation of mass, momentum, and energy in incompressible flow & flow of a real fluid--including laminar and turbulent flow, dimensional analysis and similitude & the applications to engineering problems.

8. Learning objectives:

1. Introduce concepts, laws, observations, models of fluids at rest and in motion and understanding fluid behavior for engineering design and control of fluid system for hydraulic structures.
2. Develop competence with mass, energy and momentum for determining resultant forces on hydraulic structures.
3. Study of boundary layers and calculation of drag force for practical hydraulic problems.

9. Subject Outcomes:

1. Calculate static and dynamic forces on hydraulic structures.
2. Determine pressure in a closed conduit carrying fluids.
3. Determine unknown factors with the help of dimensional analysis.
4. To calculate the drag forces on a body in a flowing fluid as well as drag forces on a moving body in the fluid with the concept of boundary layer theory.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Fluid Properties and Hydrostatics Pressure and its measurement**

Density, Viscosity, Surface tension, compressibility, capillarity, vapour pressure and cavitations. Hydrostatic forces on plane, inclined and curved surfaces submerged in a fluid.
Buoyancy - Centre of buoyancy & metacentric.
Fluid pressure at a point, Pascal's law, measurement of pressure- Manometer and Piezometer, Pressure at a point in incompressible fluid.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Fluid Kinematics**

Introduction to Laminar and Turbulent flow Fluid Kinematics - Types of flows; Steady flow, Unsteady flow, Uniform and Non Uniform flow, Rotational flow, Irrotational flow, 1-D, 2-D, 3-D flows. Continuity equation, streamline and velocity potential lines, Euler and Bernoulli's equations and their applications, moment equation, momentum and energy correction factors, Impulse Momentum equation, Navier-Stokes-Equations and its applications.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Flow through pipes and other fixtures**

Flow through orifice, mouth piece, notches and weirs. Discharge measurement- venturimeter, orifice meter, pitot tube. Flow through pipes i.e. Laminar, Transition and Turbulent flow.
Losses in pipes- Laws of fluid friction, Darcy's equation, Chezy's formula, Manning's formula and Hazen- William's formula. Major and minor losses. Pipe network.

Unit – 4	**Number of lectures = 08**	**Title of the unit: Boundary layers, Dimensional analysis**

Boundary layers, Laminar flow and Turbulent flow, Boundary layer thickness, displacement and momentum thickness, boundary layer separation Hydraulic Machines- Introduction to centrifugal and reciprocating pumps, turbines.

Dimensional homogeneity, Raleigh and Buckingham π theorems, Model laws; distorted and undistorted models. Similitude-Types of similarities. Types of forces acting on moving fluid and dimension less numbers.

11. Books Recommended

Text Books

1. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines (2011), ISBN No. 978-81-318-0815-3 9th Publications, Laxmi Publication.

Reference Books

1. D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, Katson Publishing House.
2. V.L. Streeter, Fluid Mechanics, McGraw Hill Book Co.
3. K. Subramanian, Fluid Mechanics and hydraulic machines McGraw Hill Book Co.
4. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Fluid Mechanics Lab**	**L**	**T**		**P**	
3. Subject Code	13010308	0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus

Fluid mechanics includes fluid statics and dynamics, conservation of mass, momentum, and energy in incompressible flow & flow of a real fluid--including laminar and turbulent flow, dimensional analysis and similitude & the applications to engineering problems.

8. Learning objectives:

1. Introduce concepts, laws, observations, models of fluids at rest and in motion and understanding fluid behavior for engineering design and control of fluid system for hydraulic structures.
2. Develop competence with mass, energy and momentum for determining resultant forces on hydraulic structures.
3. Study of boundary layers and calculation of drag force for practical hydraulic problems.

9. Subject Outcomes:

1. Calculate static and dynamic forces on hydraulic structures.
2. Determine pressure in a closed conduit carrying fluids.
3. Determine unknown factors with the help of dimensional analysis.
4. To calculate the drag forces on a body in a flowing fluid as well as drag forces on a moving body in the fluid with the concept of boundary layer theory.

10. List of Experiments

Sr. No.	**Title**	**CO covered**
1	Conducting experiments to verify Bernoulli's theorem.	1
2	Determination of the Coefficient of discharge of given Venturi-meter.	2
3	Determination of the Coefficient of discharge of given Rectangular notch	2
4	Determination of the Coefficient of discharge of given V- notch.	2
5	Determination of head loss in pipes connected in series.	3
6	To study the performance characteristics of reciprocating pump	3
7	To study the performance characteristics of Centrifugal pump.	1,4
8	Determination of head loss in pipes connected in parallel.	1,4

1. Name of the Department –CIVIL ENGINEERING						
2. Subject Name	Engineering Mechanics	**L**	**T**		**P**	
3. Subject Code	13010304	3	0		0	
4. Type of Subject (use tick mark)		**EAS Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =0**	**Practical =0**			

7. Brief Syllabus

Introduction to Engineering Mechanics
Friction
Basic Structural Analysis
Centroid and Centre of Gravity.

8. Learning objectives:

1. Confidently tackle equilibrium equations, moments and inertia problems
2. Master calculator/computing basic skills to use to advantage in solving mechanics problems.
3. Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering

9. Subject Outcomes (COs):

1. Confidently tackle equilibrium equations, moments and inertia problems
2. Master calculator/computing basic skills to use to advantage in solving mechanics problems.
3. Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering

10. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Introduction to Engineering Mechanics**

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy Kinematics, Statics, Equations of Motion.

Unit – 2	**Number of lectures = 8**	**Friction**

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

Unit – 3	**Number of lectures = 8**	**Basic Structural Analysis**

Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Zero force members; Beams & types of beams; Frames & Machines.

Unit – 4	**Number of lectures = 9**	**Centroid and Centre of Gravity**

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text books:

1 Er. R.K Rajput (2011),ISBN No. 81/219/2594/0 Engineering Mechanics, 7th Edition, S Chand publications.

Reference Books:

1 F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.

2 R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

3 Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Engineering Geology**	**L**	**T**		**P**	
3. Subject Code	13010305	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures =33		**Tutorials =00**	**Practical =00**			

7. Brief Syllabus:

Engineering Geology is the application of the geological sciences to Civil Engineering practice for the purpose of recognizing the location, design, construction, operation and maintenance of engineering projects such as Dams, Barrages, Bridges, High rise buildings and other such important projects. Students will be able to know the details of rock formation and study of rock cycle. Students will be able to identify different minerals and find their properties. They will understand the various geological features e.g. folds and faults. They will be able to select geologically suitable sites for massive Civil Constructions work.

7. Learning objectives:

1. The overall objective of lecture portion of engineering geology is to demonstrate the importance of Geology in making engineering decisions specially site selection of engineering projects.
2. Introduce the fundamentals of engineering properties of earth materials for their use in civil Engineering constructions.
3. Develop quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.

8. Subject Outcomes:

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

1. Characterize and classify various minerals and rocks on the basis of their engineering properties.
2. Assess geological hazards and develop mitigation frameworks.
3. Use seismic and electrical methods to investigate subsurface and develop a native construction plan Incorporating all relevant aspects of geology**.**

9. Unit wise detailed content

Unit-1	**Number of lectures =08**	**Title of the unit: Minerals and Rocks**

Relevance and importance of Engineering Geology in Civil Engineering. Minerals - their physical properties, rock forming minerals, Physical and engineering properties of igneous, metaphoric and sedimentary rocks.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Interior Structure of earth**

Earth's interior is based on seismic models, Earth's geomagnetic field, Plate tectonics and continental drift theory, study of earth's geological structures – fold, faults and joints, Geological factors affecting Civil Engineering constructions, Geological maps- their uses and interpretation.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Weathering and Soils**

The atmosphere, Weather and climate, Ocean structure and composition, Rock decay and weathering. Soil origin and formation, classification and its engineering importance, Slope stability, rock and soil slope stability analysis.

Unit - 4	Number of lectures = 09	Title of the unit: Ground Water and Earth Processes

Characteristic of ground water, Global distribution of water, Hydro Geological Cycle, Darcy's Law, laboratory permeability tests, Types of aquifers, Water level fluctuations, Surface and subsurface geophysical methods, Groundwater contamination, Artificial recharge of groundwater, Seawater intrusion and harvesting of rainwater.

Resources, minerals, water & energy, Natural hazards, Brief description on cause and formation of flood, cyclone, volcano, earthquake, tsunami and landslides, Global warming and the greenhouse effect, Future of the Earth

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Text Book

1. S.K Garg, Physical and Engineering Geology (2012), 7th Edition ISBN No. 81-7409-032-0, Khanna Publications.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Engineering Geology Lab**	**L**	**T**		**P**	
3. Subject Code	13010309	0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus

Engineering Geology is the application of the geological sciences to Civil Engineering practice for the purpose of recognizing the location, design, construction, operation and maintenance of engineering projects such as Dams, Barrages, Bridges, High rise buildings and other such important projects. Students will be able to know the details of rock formation and study of rock cycle. Students will be able to identify different minerals and find their properties. They will understand the various geological features e.g. folds and faults. They will be able to select geologically suitable sites for massive Civil Constructions work..

8. Learning objectives:

1. The overall objective of lecture portion of engineering geology is to demonstrate the importance of

Geology in making engineering decisions specially site selection of engineering projects.

2. Introduce the fundamentals of engineering properties of earth materials for their use in civil Engineering constructions.

3. Develop quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.

9. Subject Outcomes:

1 On completion of this course, the students will be able to

1. Characterize and classify various minerals and rocks on the basis of their engineering properties.
2. Assess geological hazards and develop mitigation frameworks.
3. Use seismic and electrical methods to investigate subsurface and develop a native construction plan

Incorporating all relevant aspects of geology**.**

10. List of Experiments

Sr. No.	**Title**	**CO covered**
1	Identification of Igneous Rocks	1
2	Identification of Sedimentary Rocks	2
3	Identification of Metamorphic Rocks	2
4	Concept of Paleontology	2
5	Introduction to Topographic Maps	3
6	Groundwater Formation	3
7	Determination of Faults and Folds	1,4
8	Determination of Slips	1,4
9	Introduction to Tectonic Plates	

1. Name of the Department: Civil Engineering						
2. Subject Name	**COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB**	**L** **1**	**T** **0**		**P** **4**	
3. Subject Code	13010307					
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 0**	**Practical =20**			

Students will learn the details of STAAD - PRO software package and know the behavior of RCC and Steel structures. Students will understand the bending moment diagram, drawn in tension face and shear force diagram. Upon completion, students should be able to design different components of RCC and Steel structures

7. Learning objectives:

1. To teach the students to understand the details of STAAD – PRO software package.
2. To enable the students to know the behavior of RCC and Steel structures.
3. To enable the students to design different components of structures

8. Subject Outcomes (COs):

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

1. Understand the details of STAAD – PRO software package.
2. Know the behavior of RCC and Steel structures.
3. Know the bending moment diagram drawn in tension face and shear force diagram.
4. Design different components of structures.

9. LIST OF EXPERIMENTS:

1. Getting Started: Introduction to Autodesk AutoCAD 2D and 3D Modelling.
2. AutoCAD 2D: User – interface and Basic Commands.
3. Draw Commands – I.
4. Draw Commands – II.
5. Modify Commands.
6. Concept of Annotation and related terms.
7. Concept of Layers.
8. Concept of Blocks.
9. Useful Library AutoCAD Commands.
10. To draw a Basic Commercial Building Plan.
11. To draw a Residential Building Plan.
12. Introduction to AutoCAD 3D Modelling.

1. Name of the Department –CIVIL ENGINEERING						
2. Subject Name	**Indian Constitution**	**L**	**T**		**P**	
3. Subject Code	13010310	3	0		0	
4. Type of Subject (use tick mark)		**MC(√)**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			
7.Unit wise detailed content						
Unit-1	**Number of lectures = 8**	**Introduction and Basic Information about Indian Constitution**				
The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Fundamental Duties and its Scope and significance in Nation building						
Unit – 2	**Number of lectures = 8**	**Union Executive**				
Parliamentary System, Federal System, Centre-State Relations. 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.						
Unit – 3	**Number of lectures = 8**	**State Executive**				
State Executives – Governor , Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370.371,371J) for some States						
Unit – 4	**Number of lectures =9**	**Elections, Amendments**				
Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73, 74, 75, 86, and 91, 94, 95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements).						
8. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.						

SEMESTER IV

1. Name of the Department	**CIVIL ENGINEERING**					
2. Subject Name	**Concrete Technology**	**L**	**T**		**P**	
3. Subject Code	13010401	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Introduction to Civil Engineering	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Brief Syllabus: Concrete is one of the most vital materials used in construction. Concrete is made up of cement, coarse aggregate; fine aggregate, water and admixtures. The strength of concrete is directly depends upon the properties of these materials and their proportion in the concrete. In this course students will learn the various properties of concrete ingredients and various properties of concrete itself and their testing including non-destructive testing such as ultrasonic pulse velocity test, rebound hammer test etc. They will also learn the various mix design methods to design the concrete for different construction works.

8. Learning objectives:

1. To understand the properties of ingredients of concrete.
2. To study the behavior of concrete at its fresh and hardened state.
3. To study about the concrete design mix.
4. To know about the procedures in concrete at different stage.
5. To understand special concrete and their uses.

9. Subject Outcomes: On completion of this course, the students will be able to

1. To identify suitable materials to be used in the cement concrete by conducting various tests as per BIS code.
2. Test all the concrete materials as per BIS code.
3. Design the concrete mix using ACI and BIS code methods.
4. Determine the properties of fresh and hardened of concrete.
5. Design special concretes and their specific applications and use of admixtures.
6. Ensure quality control while testing/ sampling and acceptance criteria for pre and post construction work.
7. Use of non-destructive testing equipment.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction**
Concrete materials, Cement: Field and laboratory tests on cement, Types of cement and their uses, different tests for aggregates. Methods for manufacturing of cement- Wet and dry process. Hydration of cement, Bogue's compound		
Unit - 2	**Number of lectures = 08**	**Title of the unit: Admixtures**
Accelerating admixtures, Retarding admixtures, water reducing admixtures, Air entraining admixtures, colouring agent, Plasticizers. Batching, Mixing, Transportation, Placing of concrete, curing of Concrete		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Behavior of Concrete**
Strength of concrete, Shrinkage and temperature effects, creep of concrete, permeability of concrete, durability of concrete, Corrosion, Causes and effects, remedial measures, Thermal properties of concrete, Micro cracking of concrete.		

Unit – 4	Number of lectures = 08	Title of the unit: Mix Design and Special Concrete

Factors influencing mix proportion, Mix design by ACI method and I.S. code method, Design of high strength concrete.

Light-weight concrete, Fibre reinforced concrete, Polymer modified concrete, Ferro cement, Mass concrete, Ready-mix concrete, Self-compacting concrete, Quality control, Sampling and testing, Acceptance criteria.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1. Gambhir, M.L., Concrete Technology (2012) ISBN No. 978-00-07-015133,9th Edition, Tata McGraw Hill.

Reference books:-

1. Shetty, M.S., Concrete Technology, Theory & Practice, S.Chand and Co.
2. Santakumar A.R., Concrete Technology, Oxford University Press, New Delhi**.**
3. Nevile, Properties of Concrete, Longman Publishers.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Concrete Technology Lab**	**L**	**T**		**P**	
3. Subject Code	13010408	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Introduction to Civil Engineering	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus: Concrete is one of the most vital materials used in construction. Concrete is made up of cement, coarse aggregate; fine aggregate, water and admixtures. The strength of concrete is directly depends upon the properties of these materials and their proportion in the concrete. In this course students will learn the various properties of concrete ingredients and various properties of concrete itself and their testing including non-destructive testing such as ultrasonic pulse velocity test, rebound hammer test etc. They will also learn the various mix design methods to design the concrete for different construction works.

8. Learning objectives:

1. To understand the properties of ingredients of concrete.
2. To study the behavior of concrete at its fresh and hardened state.
3. To study about the concrete design mix.
4. To know about the procedures in concrete at different stage.
5. To understand special concrete and their uses.

9. Subject Outcomes: On completion of this course, the students will be able to

1. To identify suitable materials to be used in the cement concrete by conducting various tests as per BIS code.
2. Test all the concrete materials as per BIS code.
3. Design the concrete mix using ACI and BIS code methods.
4. Determine the properties of fresh and hardened of concrete.
5. Design special concretes and their specific applications and use of admixtures.
6. Use of non-destructive testing equipment.

10. Unit wise detailed content

List of Experiments

Sr. No.	**Title**	**CO covered**
1	Compressive Strength of Cement Cube (7.07 cm cubes)	1,2,3
2	Determine standard consistency test.	2
3	Determine Initial and Final setting time of cement	2
4	Determine soundness of cement	2
5	Workability by Compaction Factor, Slump Test.	2,4
6	Determination of Constituents of Hardened Mortar.	4
7	Mix Design by IS Code Method.	3
8	Compressive strength of Concrete cube (15 cm cubes)	2,4
9	Compressive strength of Concrete cylinder	2
10	To find workability by Slump Cone Test	4

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Structural Analysis**	**L**	**T**		**P**	
3. Subject Code	13010402	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Strength of Materials, Engg. Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus: Structural analysis is the determination of the effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, machinery, furniture, attire, soil strata, prostheses and biological tissue. Structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. The results of the analysis are used to verify a structure's fitness for use, often saving physical tests. Structural analysis is thus a key part of the engineering design of structures

8. Learning objectives:

1**.** To understand the methods of analysis.
2. To know the different techniques available for the analysis of structures.
3. To identify the best suitable method of analysis.

9. Subject Outcomes: On completion of this course, the students will be able to

1. Identify the method of analysis for determinate structures
2. Understand the importance of various methods of slop and deflections for determinate structures.
3. Use the influence line diagram.
4. Understand the methods of analysis for multi-storeyed frames

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Analysis of Indeterminate Structures**

Static determinacy and indeterminacy, Theorem of three moments, analysis of propped cantilevers, fixed & continuous beam, bending moment and shear force diagram, using slope deflection, moment distribution and Kani's Method.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Analysis of Arches**

Two hinged and three hinged parabolic arches, circular arches, cables, influence line for horizontal thrust and bending moment in arches
Stain Energy - Castigliano's theorem - calculation of deflection in statically determinate beams and trusses - Unit load methods - Williot Mohr's diagram.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Strain Energy Method and Methods for Analysis of Multi-storeyed Frames**

Strain energy method for analysis of indeterminate structures, beams, pin jointed and rigid jointed structures, temperature effect, bending moment and shear force diagram
Substitute frame method - portal method - cantilever method.

Unit - 4	**Number of lectures = 08**	**Title of the unit: Influence Line**

Influence line- influence lines for bending moment and shear force for beams, Muller Breslau's principle, Maxwell's reciprocal theorem, Maxwell Betti's theorem

11. Books Recommended

Text Books

1. R.C. Hibbler , Structural Analysis (2011) , Pearson Education

Reference Books

1. Jain,O.P.and Jain, B.K., "Theory &Analysisof Structures ". Vol.I& II Nem Chand brothers.
2. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill
3. Chukia Wang
4.Coates,R.C.,Coutie,M.G. & Kong, F.K., "Structural Analysis", English Language BookSociety& Nelson.

1. Name of the Department	**CIVIL ENGINEERING**					
2. Subject Name	**Structural Analysis Lab**	**L**	**T**		**P**	
3. Subject Code	13010409	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Strength of Materials, Engg. Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical =20**			

7. Brief Syllabus: Structural analysis is the determination of the effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, machinery, furniture, attire, soil strata, prostheses and biological tissue. Structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. The results of the analysis are used to verify a structure's fitness for use, often saving physical tests. Structural analysis is thus a key part of the engineering design of structures.

8. Learning objectives:

1. To understand the methods of analysis.
2. To know the different techniques available for the analysis of structures.
3. To identify the best suitable method of analysis.

9. Subject Outcomes: On completion of this course, the students will be able to

1. Identify the method of analysis for determinate structures
2. Understand the importance of various methods of slop and deflections for determinate structures.
3. Use the influence line diagram.
4. Understand the methods of analysis for multi-storeyed frames

10. Unit wise detailed content

List of Experiments

Sr. No.	**Title**	**CO covered**
1	Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.	1,2
2	To determine the Flexural Rigidity of a given beam.	1
3	To verify the Moment- area theorem for slope and deflection of a given beam.	2
4	Deflection of a fixed beam and influence line for reactions.	3
5	Deflection studies for a continuous beam and influence line for reactions.	3
6	Study of behavior of columns and struts with different end conditions.	1
7	Experiment on three hinged arch.	1
8	Experiment on two hinged arch.	1
9	Deflection of a statically determinate pin jointed truss	2

1. Name of the Department	**CIVIL ENGINEERING**					
2. Subject Name	**Surveying**	**L**	**T**		**P**	
3. Subject Code	13010403	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

Brief Syllabus: Surveying is the most useful and necessary part in Civil Engineering. Students will understand the use of Chains, Tapes, Compass, as well as optical surveying instruments such as Theodolite, Total Stations, Auto Levels and Electronic distance measuring machines. Students will also understand reduction of slope measurements to horizontal and vertical components, field data reduction and adjustment of a closed traverse.

7. Learning objectives:

1. To teach the students basics of surveying and expose different techniques of surveying.
2. To help the students to learn the field applicability of the different survey methods.
3. To teach students about types of errors encountered in different types of surveying.

8. Subject Outcomes:

1. Prepare Topographical maps & surveyed site plans for civil projects.
2. They will be able to transfer map/drawing/layout plan on the actual site of civil projects.
3. Carry out tachometry, geodetic surveying wherever situation demands.
4. Apply error adjustment to the recorded reading to get an accurate surveying output.

9. Unit wise detailed content

Unit-1	**Number of lectures = 9**	**Title of the unit: Plane Surveying and Levelling**

Introduction to plane surveying, conventional tape measurements, electronic distance measurement, Compass surveying, Fore and Back bearing, true and magnetic bearing, magnetic dip and declination, local attraction. Use of Dumpy level, Tilting level and Auto level. Temporary and Permanent adjustment of Dumpy level. Differential levelling, Longitudinal & Cross sectional levelling, refraction & curvature correction, Reciprocal levelling

Unit - 2	**Number of lectures = 8**	**Title of the unit: Theodolite and Contouring**

Theodolites– Temporary and Permanent adjustments, horizontal and vertical angle measurements, measurement of magnetic bearing. Electronic total station- Introduction and determination.
Contouring, basics of, characteristics of contours, contour gradient, plotting and use of contours.

Unit – 3	**Number of lectures = 8**	**Title of the unit: Plane Table surveying**

Introduction, different methods of plane table surveying, two and three point problems as well as mechanical and graphical method for orientation of plane table .Adjustment of closed traverse.

Unit - 4	**Number of lectures = 08**	**Title of the unit: Triangulation& Geodetic Surveying**

Triangulation, Figure of triangulation, indivisibility height of station and signals. Base line measurement and correction .Trigonometrically leveling- Simple cases of height and distance.
Geodetic observations- Correction of curvature and refraction, Axis signal correction.
Determination of difference in level.

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Books Recommended

Text Books

1. Punmia B.C, Surveying (2011), Volume 1, 2, 3 Sixteenth edition, ISBN No. 81-7008-853-4, Laxmi Publications.

Reference books

1. Subramanian R, Surveying and Levelling, Publication Oxford University Press.
2. Kanetkar T.P, Surveying and Levelling, Vol I, Pune.
3. Kanetkar T.P, Surveying and Levelling, Vol II, Pune.

1. Name of the Department		CIVIL ENGINEERING				
2. Subject Name	**Surveying Lab**	**L**	**T**		**P**	
3. Subject Code	13010410	0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**1. Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus: Surveying is the most useful and necessary part in Civil Engineering. Students will understand the use of Chains, Tapes, Compass, as well as optical surveying instruments such as Theodolite, Total Stations, Auto Levels and Electronic distance measuring machines. Students will also understand reduction of slope measurements to horizontal and vertical components, field data reduction and adjustment of a closed traverse.

8. Learning objectives:

1. To teach the students basics of surveying and expose different techniques of surveying.
2. To help the students to learn the field applicability of the different survey methods.
3. To teach students about types of errors encountered in different types of surveying.

9. Subject Outcomes:

1. Prepare Topographical maps & surveyed site plans for civil projects.
2. They will be able to transfer map/drawing/layout plan on the actual site of civil projects.
3. Carry out tachometry, geodetic surveying wherever situation demands.
4. Apply error adjustment to the recorded reading to get an accurate surveying output.

10. Unit wise detailed content

Sr. No.	Title	CO covered
1.	Chain Survey by perpendicular offsets.	1
2	Compass Survey- Traversing using surveyor and prismatic compass.	1
3	Theodolite Survey- Measurement of horizontal angles by method of repetition and reiteration.	2
4	Measurement of Vertical Angles and determination of Height of an Object	2
5	Plane Table Survey- Two and Three point problem (Lehman's method).	2
6	Levelling- Rise &Fall method	1
7	Levelling- Height of collimation method	1
8	Tacheometric survey- Determination of additive and multiplication constant, determination of horizontal distance and RL.	3
9	Contouring- To determine the contours for a given location.	2
10	Demonstration of Total station	3

1. Name of the Department- Civil Engineering Department						
2. Course Name	**Technical Report Writing**	**L**	**T**		**P**	
3. Course Code	13010406	**0**	**0**		**2**	
4. Type of Course (use tick mark)		**Core ()**	**PE ()**	**HSMC (✔)**	**OE ()**	
5. Pre-requisite (if any)	**Communication Skills**	**6. Frequency (use tick marks)**	Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 0**	**Practical = 28**			

8. Brief Syllabus

Introduction and Basics of Technical Writing

Tools for Technical Writing

Forms of technical Writing

Language Appropriateness

9. Learning objectives:

i) Clear understanding of role and purpose of technical writing

ii) Provide formats of various types of Technical writings

iii) Develop effective techniques of writing technical documents

10. Course Outcomes (Cos): On completion of this course, the students will be able to

i) Understand the importance of technical writing

ii) Develop documents for technical and non-technical audience

iii) Discern the requirement and use visual aids judiciously

11. Lab Component

Sr. No.	**Title**	**CO covered**
1	Introduction and Basics of Technical Writing	i
2	Tools for Technical Writing	ii, iii
3	Forms of technical Writing	i, ii
4	Language Appropriateness	ii

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Organizational Behaviour**	**L**	**T**		**P**	
3. Subject Code	13010407	3	0		0	
4. Type of Subject		**MC (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Survey	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

OB covers the core topics of motivation, leadership behavior and power, interpersonal communication, group structure and process, learning, attitude development and perception, change process, conflict, job design and work stress.

8. Learning objectives:

1) The primary objective of Organization behavior is achieving higher productivity and accomplishing the goals of the organization.

2) For that OB scientifically tries to understand the employee behavior within the organization and tries to control, improve, and develop it.

9. Subject Outcomes:

1) The main objective of Organizational Behavior is to understand the human interactions in an organization

2) Find what is driving it and influence it for getting better results in attaining business goal.

3) Organizational Culture. Leadership and Conflict Resolution. Understanding the Employees Better.

10. Unit wise detailed content

Unit-1	**Number of lectures =09**	**Title of the unit: Introduction to Organizational Behaviour**

Introduction to organization, organization and managers, manager' roles and skills, behaviour at work, introduction to organization behaviour, major behavioural science disciplines contributing to OB, challenges and opportunities managers have in applying OB concepts, OB model (including motivation models) and levels of OB model

Unit - 2	**Number of lectures = 08**	**Title of the unit: Individual behaviour**

Introduction to individual behaviour, values, attitudes, job satisfaction, personality, perception and individual decision making, learning, motivation at work, managing emotions and stress (Meaning-Definition Stress and job performance relationship Approaches to stress management (Coping with stress)

Unit - 3	**Number of lectures =08**	**Title of the unit: Interpersonal behaviour**

Interpersonal Behaviour, Johari Window, Transactional Analysis – ego states, types of transactions, life positions, applications of T.A., managerial interpersonal styles.

Unit – 4	**Number of lectures = 08**	**Title of the unit: Group behaviour**

Introduction to group behaviour, foundations of group behaviour, concept of group and group dynamics, types of groups, formal and informal groups, theories of group formation, group norms, group cohesiveness, group decision making, inter group behaviour, concept of team vs. group, types of teams, building and managing effective teams, leadership theories and styles, power and politics, conflict and negotiation.

10. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

11. Books Recommended

Text books

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi

Reference books

1. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi.
2. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay.
3. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete .
4. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co. Pvt.Ltd.
5. Rajagopalan, N, "Prestressed Concrete", Alpha Science

SEMESTER V

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Reinforced concrete Structure**	**L**	**T**		**P**	
3. Subject Code	13010501	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	BMC	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures =33		**Tutorials = 00**	**Practical**			

7. Brief Syllabus:

Students will learn the concept of working stress method and limit state method for various reinforced concrete sections. Students will also learn the concept of design of one way, two way and circular slabs, short column and long column, axially and eccentrically loaded columns. Students will understand the concept of footings and retaining wall design as well.

8. Learning objectives:

1. To teach the students about the design of reinforced concrete beam, column, slab, footing and retaining wall.
2. To enable the students to understand the various design philosophies based on both working stress and limit state methods.

9. Subject Outcomes:

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

1. Understand the behavior of structural members and the concept of RCC design.
2. Calculate the load carrying capacity of different types of RCC structural members for Civil Projects.
3. Design the safe RCC structural members keeping serviceability criteria in view.
4. Students will be made familiar with the BIS codes for structural design.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Design of Beam (Working Stress Method)**

Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular, T shaped beams in flexure.

Design of Sections in shear, bond and torsion, diagonal tension, shear reinforcement, development length, equivalent shear, Torsional reinforcement.

Unit - 2	**Number of lectures = 09**	**Title of the unit: Design of Beam (Limit State Method)**

Introduction to Limit state method, basic assumptions, design of singly and doubly reinforced rectangular, T shaped beams and inverted beam in flexure, minimum and maximum reinforcement requirement.

Design of Sections in shear, bond and torsion, diagonal tension, shear reinforcement, development length, equivalent shear, Torsional reinforcement.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Design of Slab**

Introduction to one-way and two-way slab, design of slab by working stress method and limit state method, design of circular slab supported on edges and with centrally supported slab. Design of canopy.

Unit – 4	Number of lectures = 08	Title of the unit: Deign of Column and Foundation

Design of short and slender columns by Limit State Method for axial load and combination of uniaxial and biaxial bending. Design of column with helical reinforcement, Introduction to types of foundations, design of isolated footing, continuous footing and combined footing. Design of RCC footing for walls. Isolated footing subjected to eccentric load. Introduction to type of retaining walls.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1 RCC Designs, B.C Punmia (2012),10th Edition, ISBN No. 978-81-318-0942-6, Laxmi Publications

Reference books

1. IS-456-2000.
2. SP-16(S&T)-1980, Design Aids for Reinforced Concrete to IS: 456, BIS, N.Delhi.
3. SP-34(S&T)-1987 Handbook on Concrete Reinforcement and Detailing`, BIS
4. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand &Bros.,Roorkee.
5. Reinforced Concrete, I.C.Syal&A,K,Goel, A.H,Wheeler&Co.Delhi.
6. Reinforced Concrete Design, S.N.Sinha, TMH Pub.,N.Delhi.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Reinforced Concrete Lab	**L**	**T**		**P**	
3. Subject Code	13010507	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Reinforced Concrete	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus:

To make the students capable of drawing the reinforcement and preparation of drawing of T beam, L beam sections, rectangular beam sections, different types of slabs, columns and footings.

8. Learning objectives:

1. To provide students detailing of R.C.C members.
2. To make the students aware of how to communicate the detailing of reinforcement in the structural members of RCC for the execution purpose.
3. To study drawings in field for the execution of Civil Projects .

9. Subject Outcomes:

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

1. Prepare the detailed drawing of different RCC members.
2. They will also be able to read the detailed drawing of any Civil Engineering projects when made project in charge.

10. List of Experiments

Sr. No.	Title	CO covered
1.	Reinforcement detailing of Rectangular RCC Beam.	1,3
2	Reinforcement detailing of T and L shaped RCC Beam.	1,2
3	Reinforcement detailing of One-way and Two-way RCC slab.	1,2
4	Reinforcement detailing of column and isolated RCC footing.	1,2
5	Reinforcement detailing of column and combined RCC footing.	1,3
6	Reinforcement detailing for vertical and horizontal in masonry work	3
7	Details of reinforcement for a RCC square and circular column with isolated square footing	1
8	Details of reinforcement in a simply supported RCC beam (singly reinforced and doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing	2,3
9	Details of reinforcement for a cantilever beam with given data regarding the size of the beam and the reinforcement	2
10	Details of reinforcement of the junction of a secondary beam with the main beam with the given data	1,3

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Water Treatment & Supply Systems	**L**	**T**		**P**	
3. Subject Code	13010502	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Chemistry	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Brief Syllabus:

Water supply and its treatment system are attached with the life cycle of every human being. To identify the problems associated with the treatment of the water and its supply it is essential to have the knowledge of this course. Students learn Effect of population dynamics on water demand, Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pre-treatment and treatment of raw water, Principles, functions and design of different treatment units and processes. Upon completion, students should be able to design and construct the water treatment plant for the single unit, residential area or for society along with knowledge of distribution of water and requirement of building plumbing.

8. Learning objectives:

1 Understand the basic principles and concepts of unit operations and processes involved in water treatment.
2. Understand the disinfection process in water treatment.
3. Understand the details of water supply systems.
4. To teach students pipe network design for the supply of water to the group of tenements.

9. Subject Outcomes:

On completion of this course, the students will be able to
1. Know the type of unit operations and processes involved in water treatment plants.
2. Understand unit operations and processes required for satisfactory treatment of water.
3. Know the design of unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.
4. Design water treatment units in a cost effective and sustainable way and to evaluate its performance to meet the desired health and environment related goals.
5. Design pipe network for water supply for residential and individual buildings

10. Unit wise detailed content

Unit-1	**Number of lectures =09**	**Title of the unit: Water Quality and Population estimation**

Water Quantity: Importance and necessity of water supply scheme. Water demands and its Variations. Estimation of total quantity of water requirement. Population forecasting. Selection of a source of water supply.Impurities in water and their sanitary significance. Physical and chemical properties of water, water quality standards.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Water Treatments Units and Disinfection System**

Water Treatment: Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation – plain and aided with coagulation. Filtration – mechanism involved types of filters, slow and rapid sand filtration units (features and design aspects), Disinfection principles and aeration. Other water treatment processes, purification processes in natural systems, water softening, removal

of taste and odour, advanced methods of water treatment, deflouridation, and dissolved solids removal.		
Unit – 3	**Number of lectures =08**	**Title of the unit: Water Conveyance System**
Conveyance of water, Intake structures, Rising and Gravity system, Dual systems, Pumping Systems and pumping stations, valves and appurtenances, pipe materials and pipe fitting, O&M and troubleshooting for conveyance system.		
Unit - 4	**Number of lectures = 08**	**Title of the unit: Water Distribution System**
Layout of Distribution system – Dead End system, Grid Iron system, Ring system, Radial system, their merits and demerits Distribution Reservoir- functions and determination of storage capacity, Water Distribution Network, analysis of distribution network, layout, capacity and pressure requirements, leak detection, Maintenance, Water supply in buildings and plumbing		
11. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.		
12. Books Recommended **Text books** 1. S.K Garg, Water supply Engineering (2010), 20th Edition, ISBN No. 81-7409-120-3, Khanna Publications.		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Water Treatment & Supply Systems Lab	**L**	**T**		**P**	
3. Subject Code	13010508	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Chemistry	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus:

Water supply and its treatment system are attached with the life cycle of every human being. To identify the problems associated with the treatment of the water and its supply it is essential to have the knowledge of this course. Students learn Effect of population dynamics on water demand, Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pre-treatment and treatment of raw water, Principles, functions and design of different treatment units and processes. Upon completion, students should be able to design and construct the water treatment plant for the single unit, residential area or for society along with knowledge of distribution of water and requirement of building plumbing.

8. Learning objectives:

1 Understand the basic principles and concepts of unit operations and processes involved in water treatment.
2. Understand the disinfection process in water treatment.
3. Understand the details of water supply systems.
4. To teach students pipe network design for the supply of water to the group of tenements.

9. Subject Outcomes:

On completion of this course, the students will be able to
1. Know the type of unit operations and processes involved in water treatment plants.
2. Understand unit operations and processes required for satisfactory treatment of water.
3. Know the design of unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.
4. Design water treatment units in a cost effective and sustainable way and to evaluate its performance to meet the desired health and environment related goals.
5. Design pipe network for water supply for residential and individual buildings

10. List of Experiments

Sr. No.	**Title**	**CO covered**
1.	To determine the pH of a given water sample.	1,3
2	To determine the total solids, suspended solids, dissolved solids and volatile solids in wastewater.	1,2
3	To determine the turbidity and specific conductivity of the given water samples.	1,2
4	To determine the Alkalinity of given water sample.	1,2
5	To determine total hardness, permanent hardness and temporary hardness for given water sample.	1,3

6	To determine amount of sulphates in a given sample.	3
7	To determine the optimum dosage of coagulant for turbidity removal of a given water sample.	3,4
8	Determination of BOD	2
9	Determination of COD	3
10	To determine amount of Fluorides in a given sample.	4

<table>
<tr><td colspan="8">1. Name of the Department CIVIL ENGINEERING</td></tr>
<tr><td>2. Subject Name</td><td colspan="2">Soil Mechanics</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td>3. Subject Code</td><td colspan="2">13010503</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Subject</td><td>Core (√)</td><td colspan="2">PE()</td><td colspan="2">OE()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td colspan="2">Frequency (use tick marks)</td><td>Even (√)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">6. Total Number of Lectures, Tutorials, Practical</td></tr>
<tr><td colspan="3">Lectures = 33</td><td colspan="2">Tutorials = 00</td><td colspan="3">Practical = 00</td></tr>
<tr><td colspan="8">7. Learning objectives:
1. To impart the fundamental concepts of soil mechanics and study of various classification of soil.
2. To understand and calculate the bearing capacity of substrata for the foundation of various Civil Projects.
3. To know the importance of index properties like grain size, consistency limits, soil classification.
4. To understand the concept of compaction and consolidation of soil.</td></tr>
<tr><td colspan="8">8. Subject Outcomes: On completion of this course, the students will be able to
1. Give an engineering classification of a given soil.
2. Understand the principle of effective stress, and then calculate stresses that influence soil behavior.
3. Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement.
4. Specify soil compaction requirements.
5. To arrive at safe bearing capacity for the design of substructure for Civil Projects</td></tr>
<tr><td colspan="8">9. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 09</td><td colspan="5">Title of the unit:
Weight volume relations and Index properties</td></tr>
<tr><td colspan="8">Distribution of soil in India, Soil - Types, 3-phase diagram, Weight-volume relations, Classification, Index properties (Atterberg’slimits), Theory of compaction, Importance of geotechnical engineering.</td></tr>
<tr><td>Unit – 2</td><td colspan="2">Number of lectures = 08</td><td colspan="5">Title of the unit:
Soil water and Permeability</td></tr>
<tr><td colspan="8">Soil water, Effective and neutral stresses, Flow of water through soils, Permeability, Darcy’s law, Seepage and flow-nets, Quick sand conditions.</td></tr>
<tr><td>Unit – 3</td><td colspan="2">Number of lectures = 08</td><td colspan="5">Title of the unit:
Stress distribution in soils</td></tr>
<tr><td colspan="8">Vertical pressure distribution, Boussinesq’s equation for point load and uniformly distributed loads of different shapes, Newark’s influence chart, Westergaard’s equation, Isobar diagram, Pressure bulb, Contact pressure, Earth Pressures Theories.</td></tr>
<tr><td>Unit – 4</td><td colspan="2">Number of lectures = 08</td><td colspan="5">Title of the unit:
Compressibility and Consolidation</td></tr>
<tr><td colspan="8">Compressibility e-log p curve Pre-consolidation pressure, Primary consolidation, Taraghi’s consolidation theory, Laboratory consolidation test, Determination of C_v by Taylor’s and Casagrande’s methods. Introduction to secondary consolidation.</td></tr>
</table>

11. Books Recommended

Text Books

1. Dr. K.R. Arora , Soil Mechanics and Foundation Engineering(2011), ISBN No. 81-8014-112-8, Seventh Edition, Standard Publishers Distributors, Delhi.

Reference Books

1. Gopal Ranjan, A.S.R Rao, Basic and Applied Soil Mechanics, New Age International.
2. William Powrie, Soil Mechanics: Concepts and Applications, Spon Press.
3. Karl Terzaghi, Soil Mechanics in Engineering Practice, Warren Press.
4. B.C. Punmia, Ashok Kr. Jain, Soil Mechanics and Foundations, Laxmi Publications.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Soil Mechanics Lab**	**L**	**T**		**P**	
3. Subject Code	13010509	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Engineering Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Learning objectives:

1. To impart the fundamental concepts of soil mechanics and study of various classification of soil.
2. To understand and calculate the bearing capacity of substrata for the foundation of various Civil Projects.
3. To know the importance of index properties like grain size, consistency limits, soil classification.
4. To understand the concept of compaction and consolidation of soil.

8. Subject Outcomes: On completion of this course, the students will be able to

1. Give an engineering classification of a given soil.
2. Understand the principle of effective stress, and then calculate stresses that influence soil behavior.
3. Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement.
4. Specify soil compaction requirements.
5. To arrive at safe bearing capacity for the design of substructure for Civil Projects

9. Unit wise detailed content

10. List of Experiments

Sr. No	**Title**	**CO covered**
1	Sieve Analysis	1
2	Hydrometer Analysis	2
3	Liquid & Plastic Limit Tests	2
4	Shrinkage Limit Test	3
5	Relative Density	3
6	In Situ Density – Core cutter & Sand Replacement	4
7	Permeability Test	4
8	Direct Shear Test	4

SEMESTER VI

1. Name of the Department		CIVIL ENGINEERING				
2. Subject Name	**Estimation & Costing**	**L**	**T**		**P**	
3. Subject Code	13010601	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Learning objectives:

1. To teach the students quantity survey for the preparation of preliminary and detailed estimates.
2. To teach the students cost analysis of individual item above for the estimation purpose.
3. To make the students aware of those factors that affect the cost of construction work and to analyz the influences that effect change in these factors.
4. To inculcate habit of systematic recording of all those statistics which are required to maintai stocks in trade.

8. Subject Outcomes: On completion of this course, the students will be able to

1. Forecast the approximate cost of the projects through preliminary and detailed estimates.
2. Analyze the rates of individual items for the preparation of the estimates.
3. To record measurements of the finished products for the calculation of length, area, volume fo payment purpose.
4. Prepare schedule of quantities required to be attached with the tender documents.

9. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Estimate**

Principle of estimation, units, item work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two room building, multi storey buildings, with different sections of walls ,foundation, floors and roofs, R.B and R.C.C works, Plastering, white washing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, dams, barrages, Hilly roads etc.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Specification of Works:**

Necessity of specification types of specification, general specification, specification of bricks, cement, sand, water, lime, reinforcement, detailed specification for earthwork, cement, concrete, brickwork, flooring,D.P.C, R.C.C, cement plastering, white and color washing, distempering, painting.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Rate analysis**

Purpose, importance and requirements of rate analysis, units of measurement preparation of rate analysis. Procedure of rate analysis for items: Earth work, concrete works, R.C.C works, reinforce brick work, plastering, painting, finishing (white washing ,distempering).

Unit – 4	**Number of lectures = 08**	**Title of the unit: Public Works Account, Billing and valuation**

Tender and acceptance of tender, Earnest money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.

Billing: maintenance of muster role, preparation of pay bill, measurement of work for payment of contractors.

Different types of payment: first & final, running advance and final payment.

Valuation: Purpose of valuation, principles of valuation depreciation, sinking fund, salvage& scrap value, valuation of a building: cost method, rental –return method.

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books

1. Dutta BN, Estimating &costing(2013), 27th Edition, ISBN No. 978-81-7476-729-5, UBS Publications

Reference Books

1. Chakraborty, Estimate costing &specification in Civil Engineering.
2. Kohli & Kohli, Atext book on estimating &costing (Civil) with drawings Ambala Ramesh Publications
2. Rangwala SC Estimating &Costing, Anand Charotar Book Stall.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Estimation & Costing Lab**	**L**	**T**		**P**	
3. Subject Code	13010607	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Survey	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Learning objectives:

5. To teach the students quantity survey for the preparation of preliminary and detailed estimates.
6. To teach the students cost analysis of individual item above for the estimation purpose.
7. To make the students aware of those factors that affect the cost of construction work and to analyz the influences that effect change in these factors.
8. To inculcate habit of systematic recording of all those statistics which are required to mainta stocks in trade.

8. Subject Outcomes: On completion of this course, the students will be able to

1. Forecast the approximate cost of the projects through preliminary and detailed estimates.
2. Analyze the rates of individual items for the preparation of the estimates.
3. To record measurements of the finished products for the calculation of length, area, volume fo payment purpose.
4. Prepare schedule of quantities required to be attached with the tender documents.

9. Unit wise detailed content

Sr. No.	Title	CO covered
1	One room estimation long wall short wall method	2
2	One room estimation Centre line method	2
3	Two room estimation long wall short wall method	2
4	Two room estimation Centre line method	2
5	Doors and windows provisions in estimation	2
6	Estimation for foundation of a multistory structure	2,3
7	Analysis of rate for brick work	2,3
8	Analysis of rate for plaster work	2,3
10	Estimate quantity of reinforcement	1,2
11	Preparation for appropriate estimate for road project	1,3
12	Estimating cost of building cost of building on plinth area method	3

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Design of Steel Structures-I**	**L**	**T**		**P**	
3. Subject Code	13010602	4	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Structural Analysis	**Frequency (use tick marks)**	Even(√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures 33		**Tutorials =00**	**Practical = 00**			
7. Brief Syllabus: Study of BIS Codes *i.e.* IS: 800-1984, IS: 800-2007 related to design of steel structures. Study of design of different types of connections, simple and built up beams, laterally supported and unsupported beams. The subject imparts knowledge of design beams and columns under combined stresses. Design simple and built up beams and columns						
8. Learning objectives: 1. To teach students loading and load combinations for the design of steel structures. 2. To make the students familiar with the concepts of steel design starting with riveted, welded and bolted connections and eccentric connections based on IS:800-1984 and IS:800-2007. 3. To teach the students design of tension, compression members and flexural members based on IS: 800-2007. 4. To teach students beam-column design as a whole for uniaxial and biaxial loading along with elastic theory of buckling of beams and columns.						
9. Subject Outcomes: On completion of this course, the student will be able to 1. Calculate load required on structure for the design of steel structure members. 2. Design different type of joints and connections. 3. Design of tension, compression and flexural members of the steel structures. 4. Design beam-columns as a whole for different steel structural frame.						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 9**	**Title of the unit:** **Introduction**				
Properties of structural steel, Rolled steel sections as per IS specifications, factor of safety. Limit state design of Connections: welded and bolted connections, design of fillet and butt weld, eccentric connections, efficiency of joints, high tension bolts.						
Unit - 2	**Number of lectures = 8**	**Title of the unit:** **Tension Member & Compression Member based on IS:800-2007**				
Net Sectional Area, Permissible Stress, Design of Axially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending. Column: Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, And Slenderness Ratio. Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns, Design of column splice						
Unit - 3	**Number of lectures = 8**	**Title of the unit:** **Design of Beams, Column Bases and Grillage foundation**				
Introduction, beam type, section classification, lateral stability of beam, lateral torsional buckling of symmetrical section, design strength of beam (Laterally supported and unsupported), shear strength and deflection, web buckling and web crippling. Design of slab base and gusset base and grillage						

foundation along with its connection with column.		
Unit - 4	**Number of lectures = 08**	**Title of the unit: Design of Gantry Girder**
Gantry Girder: Introduction, loading consideration, maximum load effect, selection of gantry girder, design of gantry girder		

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

1 **Text Books**

1. Design of Steel Structures by N. Subramanian (2012),ISBN No. 978-0-19-567681-5, 8th edition Oxford Publication.

Reference Books

1. Vajrani V. N., Ratwani M. M. and Mehra H. Design and Analysis of Steel Structures, Oscar Publications.
2. Syal I. C. Design of Steel Structures, Standard Publishers Distributors, New Delhi Ramchandra, Non Linear Analysis of Steel Structures, Standard Publishers Distributors.
3. IS: 800-2007 & Steel Table.

4. Design of Steel Structures by Arya and Ajmani, Nem Chand Brothers Roorkee.

5. Ramachandra, Design of Steel structures, Vol. I & Vol. II, Standard Publishers Distributors,

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Highway Engineering	**L**	**T**		**P**	
3. Subject Code	13010603	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Brief Syllabus:

Highway Engineering is a prominent aspect of surface transport. Highway engineering deals with planning, design, construction, operation and maintenance of all types of roads. During the course, the students will learn about the highway related tests on Soil, Bitumen and Aggregate. Students will also get familiar with the test on Modified Binder and modern techniques of highway construction along with use of modern highway construction materials. Course shall also contain design of Highway Engineering.

8. Learning objectives:

1. To impart the knowledge in Highway Geometrics, materials, construction methods and design of different type of pavements along with design of base course and sub–base course.

9. Subject Outcomes:

1. Design various geometric elements of highways.
2. Understand the various types of materials used in highway construction along with conducting specified test on the materials as per BSI code for their suitability.
3. Perform structural design of flexible and rigid pavements.
   Know various highway constructions techniques and its maintenance

10. Unit wise detailed content

Unit-1	**Number of lectures =09**	**Title of the unit: Highway planning and Highway Geometrics**

Introduction to Transportation Engineering and modes of Transportation, Types of engineering surveys for highway alignment.

Functional Classification of highways, criteria of alignment selection, design elements and controls, Cross sectional elements; Stopping, Overtaking, Decision and Headlight Sight Distance studies, Geometric design of horizontal and vertical alignment; Horizontal curve design; Super Elevation, Extra widening, Transition curves; Set back distance; Vertical curves design, design of highways/expressways.

Unit – 2	**Number of lectures =08**	**Title of the unit: Pavement material**

Pavement materials – soil, aggregate, bitumen (including modified one), cement and unconventional materials- shell and block; Pavement material testing and specification. Methodology of construction and construction specification, methodology of construction and construction specialization, geometric design facilitate for non- motorized traffic (bi-cycle/pedestrian)

Unit - 3	**Number of lectures = 08**	**Title of the unit: Pavement design**

Pavement classification – flexible and rigid , Pavement components, Traffic load survey; Single and

multiple axle loads; Equivalent standard axle load; Load equivalency factor; Load transfer through wheel.		
Unit - 4	**Number of lectures = 08**	**Title of the unit: Pavement analysis**
Lateral distribution of wheel load; WMM, WBM Pavement design philosophy; Factors influencing the pavement design (external, climatic, vehicular loading); Flexible pavement design – Marshall Method.		
11. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.		
12. Books Recommended **Text books** 1. S.K. Khanna, C.E.G. Justo & A. Veeragavan (2014),10th Edition, ISBN No. 978-81-85-240-72-05, Highway Engineering, Nem Chand and Bros **Reference books** 1. S.C. Rangwala, Highway Engineering. 2. Roger L. Brockenbrough, Highway Engineering Handbook		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Highway Engineering Lab**	**L**	**T**		**P**	
3. Subject Code	13010608	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical = 20**			

7. Brief Syllabus:

Highway Engineering is a prominent aspect of surface transport. Highway engineering deals with planning, design, construction, operation and maintenance of all types of roads. During the course, the students will learn about the highway related tests on Soil, Bitumen and Aggregate. Students will also get familiar with the test on Modified Binder and modern techniques of highway construction along with use of modern highway construction materials. Course shall also contain design of Highway Engineering.

8. Learning objectives:

1. To impart the knowledge in Highway Geometrics, materials, construction methods and design of different type of pavements along with design of base course and sub–base course

9. Subject Outcomes:

1. Design various geometric elements of highways.
2. Understand the various type of materials used in highway construction along with conducting specified test on the materials as per BSI code for their suitability.
3. Perform structural design of flexible and rigid pavements.

Know various highway constructions techniques and its maintenance

10. Unit wise detailed content

Sr. No.	Title	CO covered
1	Aggregate Impact Test.	2
2	Los-Angeles Abrasion Test on Aggregates.	2
3	Dorry's Abrasion Test on Aggregates.	2
4	Deval Attrition Test on Aggregates.	2
5	Crushing Strength Test on Aggregates	2
6	Penetration Test on Bitumen	2,3
7	Ductility Test on Bitumen.	2,3
8	Viscosity Test on Bituminous Material. Softening Point Test on Bitumen.	2,3
10	Flash and Fire Point Test on Bitumen	2,3
11	Flakiness and elongation test	2
12	Marshal Stability test	2,3
13	C B R Value test.	2,3

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Energy Efficient Buildings**	**L**	**T**		**P**	
3. Subject Code	13010703	3	0		0	
4. Type of Subject		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	NA	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			
7. Brief Syllabus: Sustainability, need and concept, challenges, Environment act and protocols, Global, regional and local environment issues, Natural resources and their pollution, Carbon credits, Zero waste concept ISO 14000, Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Technology and sustainable development, Sustainable urbanization, Industrial Ecology						
8. Learning objectives: 1) To have an increased awareness among students on issues in areas of sustainability. 2) To understand the role of engineering and technology in sustainable development.						
9. Subject Outcomes: 1) Able to understand the different type of environmental pollution problems and their sustainable solutions. 2) Able to work in the area of sustainable for research and education.						
10. Unit wise detailed content						
Unit-1	**Number of lectures =09**	**Title of the unit: Introduction**				
Sustainability- Need and concept of sustainability, Social, environment and economic sustainable concepts, sustainable development Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM).						
Unit - 2	**Number of lectures = 08**	**Title of the unit: Basic concepts of sustainable habitat**				
Green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainable cities, Sustainable transport.						
Unit - 3	**Number of lectures =08**	**Title of the unit: Energy sources**				
Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy.						
Unit – 4	**Number of lectures = 08**	**Title of the unit: Green Engineering**				
Green Engineering, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.						

10. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

11. Books Recommended

Text books

1. • Environment Impact Assessment Guidelines, Notification of Government of India, 2006

Reference books

Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.

• Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning

• Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

1 Name of the Department		**CIVIL ENGINEERING**				
2 Subject Name	**Building Information Modeling Lab**	**L**	**T**		**P**	
3 Subject Code	13010606	0	0		4	
4Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials =00**	**Practical =24**			

Brief Syllabus: Introduction to Building Information Modeling (BIM);; Creating Sets, Building Elements, BIM and Clash Detection; BIM and Construction Cost Estimating and Scheduling;: consent of instructor**.**

7Learning objectives:

Upon completion of the course, the student will have:

1.An ability to apply knowledge of mathematics, science, and engineering

2.An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

3.An ability to identify, formulate, and solve engineering problems

8 Subject Outcomes:

1. An ability to apply knowledge of mathematics, science, and engineering •

2.An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

3.Aan ability to identify, formulate, and solve engineering problems

4.An understanding of professional and ethical responsibility

5. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

9Unit wise detailed content

EXPERIMENTAL DESIGN VIA BIM

1) Create a Steel Beam
2) Discussions of the Roles and Impacts of BIM in the Design,
3) Construction Engineering and Management,
4) Structural Systems, and MEP Systems;
5) Future of Building Information Modeling. Prerequisite
6) Infrastructure Engineering, and Facility Management; Revit Architecture, Structure, and MEP
7) Create a Steel Polybeam
8) Create a Steel Curved Beam
9) Create a Steel Curved Beam,
10) Create a Steel round contour plate,

1 Name of the Department		**CIVIL ENGINEERING**				
2 Subject Name	**Highway Design Lab**	**L**	**T**		**P**	
3 Subject Code	13010609	0	0		2	
4Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials =00**	**Practical =24**			

Brief Syllabus:

This course of MX Road aims to help you excel various features of the software, such as Interoperable Database that means creation and annotation of 3D project models. It will also help you to learn digital terrain model creation and integration with Google Earth.

7Learning objectives:

- It assures that project is engineered which is very critical for the 3D model
- It allows users to share information across various teams, locations, and discipline in consideration to security and precision
- Enables design-time visualization to view the design on the fly and save money by avoiding software and staff requirement

8 Subject Outcomes:

- It assures that project is engineered which is very critical for the 3D model
- It allows users to share information across various teams, locations, and discipline in consideration to security and precision
- Enables design-time visualization to view the design on the fly and save money by avoiding software and staff requirement

9Unit wise detailed content

EXPERIMENTAL DESIGN VIA MX-ROAD

1.Workspaces and User Interface

2. Viewing Existing Ground Terrain
3. Define Horizontal Geometry
4. Define Vertical Geometry
5. Define Roadway Corridor Model
6. Model Intersection with a Civil Cell
7. Delivering the Civil Model

SEMESTER VII

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Irrigation Engineering**	**L**	**T**		**P**	
3. Subject Code	13010701	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Engineering Hydrology	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical = 00**			

7. Brief Syllabus:

In this course, the students will know the importance of irrigation system in India and water requirement of crops. They will also know the hydraulic design of various irrigation structures such as weir, barrage, cross drainage works, dams, silt ejector and excluder, earth dam, canal falls. They will know the various components of head works and head regulator.

8. Learning objectives:

1. To get the exposure about the use of water for the purpose of irrigation work in India.
2. They will know to plan and design the diversion head works, head regulator, canal system and other important features to be used in irrigation projects.
3. To understand the concept and design of water storage, flood control and river training work.
4. To have clear idea about different kind of energy dissipaters and desilting & overflow arrangements.

9. Subject Outcomes:

1. To calculate water requirement related to crops for different seasons in India.
2. Do hydraulic design of different components of irrigation projects.
3. They will learn different types of water storage works.
4. They will also learn to calculate and design flood control devices.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Water Requirements for Crops**

Irrigation requirements in India: Scope, Soil moisture & Plant growth, crop water requirements, Irrigation Scheduling, Irrigation efficiencies, Duty-Delta-base period & relation between them, Surface & subsurface irrigation method, Irrigation water Quality.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Diversion head works**

Introduction, layout of diversion headwork and its component, khosla's theory and concept of flow net, safe exit gradient, hydraulic design of weir on Bligh's theory and design of modern barrage on khosla'stheory. Necessity& functioning of silt excluder & silt extractor.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Cross Drainage Work & Canal Falls**

Classification and selection of cross drainage work, hydraulic design aspects of aqueduct and syphon aqueduct.

Canal falls: Necessity and classification of canal falls, hydraulic design of Sarda type and a Straight Glacis fall.

Unit - 4	**Number of lectures = 08**	**Title of the unit: Storage Head Works, Spillway and Energy Dissipation**

Necessity and classification of Dams, Selection of site of Dam.

Gravity Dam: Introduction, Forces acting on Dam, Stability criterion, Elementary profile of dam, Drainage gallery, Hydraulic design of gravity dam.

Earth Dam: Introduction, design principle, seepage throughout dam, seepage line, control of seepage, and design of filter.

Necessity and classification of Spillway, essential requirements of spillways capacity and their suitability, Hydraulic design of Ogee spillway.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1. Irrigation Engineering and Hydraulic Structures (2011) 24th edition, ISBN No. 81-7409-047-9, S.K. Garg, Khanna Publications.

Referance books

1. Viessmen, Jr. & Lewis, Introduction to Hydrology, PHI Learning Private Ltd.
2. Agarwal, V.C. Groundwater Hydrology. PHI Learning Private Ltd.
3. Larry W. Mays, Water Resources Engineering. Wiley Publications.
4. Subramanya, K., Engineering Hydrology, Tata McGraw-Hill.

1. Name of the Department		**CIVIL ENGINEERING**				
2.Subject Name	**Geotechnology**	**L**	**T**		**P**	
3. Subject Code	13010702	3	0		0	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Soil Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Learning objectives:

1. To understand the design aspects of foundation.
2. To evaluate the stress developed in the soil medium.
3. To understand the framework of soil investigation.

8. Subject Outcomes: Comprehend and utilize the geotechnical literature to establish the framework for foundation design.

1. Plan and implement a site investigation program including subsurface exploration to evaluate soil/structure behavior and to obtain the necessary design parameters.
2. Carry out slope stability analysis for various fills and slopes.
3. Determine allowable bearing pressures and load carrying capabilities of different foundation systems.

9. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Failure Envelope and Earth Pressure**

Mohr's-Columb, Tresca and Von Mises theories. Earth Pressure- Active and Passive state of earth pressure and pressure at rest. Rankines and Columb wedge theory. Earth pressure computation for practical cases.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Slope Stability**

Failure of finite and infinite slopes – Swedish circle method, Friction Circle method, Taylors stability number and stability curves, Factor of safety, slope stability of earth dams, introduction to Bishop's method.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Shallow Foundation and Deep Foundation**

Bearing capacity- Minimum depth of foundation, Failure theories, Meyerhof's analysis, different equations for bearing capacity, effect of water table on bearing capacity. IS code method for computing bearing capacity.

Shallow Foundations: Safe bearing capacity, Settlement of footings - immediate and time dependent settlement, permissible limits, differential settlement.

Deep Foundations: Classification and selection of piles, static and dynamic formulae for single pile capacity, efficiency and capacity of pile groups, settlement of pile groups, load test on piles as per BIS codes. Classification and selection of under reamed pile.

Unit – 4	**Number of lectures = 08**	**Title of the unit: Site Investigation and Soil Exploration**

Objective of site investigation, reconnaissance, detailed site investigation, methods of exploration, geophysical methods, seismic refraction survey. Depth of exploration, selection of foundation, plate load test, standard penetration test.

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Books Recommended

Text Books

1. Dr. K.R. Arora , Soil Mechanics and Foundation Engineering(2011), ISBN No. 81-8014-112-8, Seventh Edition, Standard Publishers Distributors, Delhi .

Reference Books

1. Shashi K. Gulhati&Manoj Datta, Geotechnical Engineering, Tata McGraw Hill Ltd.
2. Donald P Coduto, William A. Kitch, Man-chu Ronald Yeung, Geotechnical Engineering: Principles and Practice, Pearson Education.
3. Joseph E. Bowles, Foundation Analysis and Design, McGraw-Hill, New York.
4. Arun Kr. Jain, & B.C. Punmia, Ashok Kr. Jain, Soil Mechanics and Foundations, Laxmi Publications.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Geotechnology Lab**	**L**	**T**		**P**	
3. Subject Code	13010708	0	0		2	
4. Type of Subject		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Soil Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 00		**Tutorials = 00**	**Practical =20**			

7. Learning objectives:

1. To understand the design aspects of foundation.
2. To evaluate the stress developed in the soil medium.
3. To understand the framework of soil investigation.

8. Subject Outcomes:

1. Comprehend and utilize the geotechnical literature to establish the framework for foundation design.
2. Plan and implement a site investigation program including subsurface exploration to evaluate soil/structure behavior and to obtain the necessary design parameters.
3. Carry out slope stability analysis for various fills and slopes.
4. Determine allowable bearing pressures and load carrying capabilities of different foundation systems.

9. Unit wise detailed content

Sr. No.	**Title**	**CO covered**
1	Standard Procter Test	1,2
2	Consolidation Test	3
3	Hydrometer Test	1,3
4	Plate Load Test	2
5	Tri-axial test	3
6	Direct Shear Test	3
7	Unconfined Compression Test	2
8	CBR Test	1,2

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Energy Efficient Building**	**L**	**T**		**P**	
3. Subject Code	13010703	3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear. Energy conservation methods will be emphasized from Civil Engineering perspective. The knowledge acquired lays a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

8. Learning objectives:

To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.

9. Subject Outcomes:

Upon successful completion of the course, the students will be able to:

1. List and generally explain the main sources of energy and their primary applications nationally and internationally.
2. Understand effect of using these sources on the environment and climate
3. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
4. List and describe the primary renewable energy resources and technologies.
5. To quantify energy demands and make comparisons among energy uses, resources, and technologies.

10. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit: Introduction to Energy Science**

Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

Unit - 2	**Number of lectures = 11**	**Title of the unit: Energy Sources**

Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Unit - 3	**Number of lectures = 10**	**Title of the unit: Energy & Environment**

Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.

Unit - 4	**Number of lectures = 05**	**Title of the unit :Engineering for Energy conservation**

Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Book

1.Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press

Reference books

1. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press

2. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam.

1 Name of the Department		**CIVIL ENGINEERING**				
2 Subject Name	**Waterways design Lab**	**L**	**T**		**P**	
3 Subject Code	13010707	0	0		4	
4Type of Subject (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials =00**	**Practical =24**			

Brief Syllabus: Modeling Software for Design and Analysis of Sanitary Sewers

7Learning objectives:

Ideal for system design and the rehabilitation of sanitary sewers, Open Flows Sewer CAD will help you invest your capital improvement funds wisely with a wealth of easy-to-use and powerful modeling capabilities for building and preparing your sewer models effectively.

Open Flows Water GEMS provides you with a comprehensive yet easy-to-use decision-support tool for water distribution networks. The software helps improve your knowledge of how infrastructure behaves as a system, how it reacts to operational strategies, and how it should grow as population and demands increase.

Subject Outcomes:

Ideal for system design and the rehabilitation of sanitary sewers, Open Flows Sewer CAD will help you invest your capital improvement funds wisely with a wealth of easy-to-use and powerful modeling capabilities for building and preparing your sewer models effectively**.**

Open Flows Water GEMS provides you with a comprehensive yet easy-to-use decision-support tool for water distribution networks. The software helps improve your knowledge of how infrastructure behaves as a system, how it reacts to operational strategies, and how it should grow as population and demands increase.

9Unit wise detailed content

1) Design sanitary sewers
2) Allocate and estimate sanitary loads
3) Build and manage hydraulic models
4) Simulate gravity and pressure hydraulics
5) Design of optimal water distribution system using watergems.
6) Building a Water Distribution Network Hydraulic Model by Using Water GEMS
7) Assess fire flow capacity
8) Analyze pipe and valve criticality
9) Develop flushing plans
10) Identify water loss

Program Elective-I

S. No.	Subject	Subject Code
1	Air and Noise Pollution	13010412
2	Hydrology	13010413
3	Ground Improvement Techniques	13010413
4	Construction Planning and Management	13010414
5	Composite materials	13010411

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Composite Materials**	**L**	**T**		**P**	
3. Subject Code	13010415	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem (√)	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7.Brief Syllabus:

Introduction to Composite Materials Constituents, Material forms Processing, Applications Definition –Need – General Characteristics, and Applications. Fibers – Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices**.**

8. Learning objectives:

1. Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
2.Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products

9. Subject Outcomes:

1. Able to identify the suitable composition of concrete composites
2. Ability to analyze problems on micromechanical behaviour of laminates
3. Able to bring solutions to existing problems using composite materials

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Fiber Reinforced Concrete**

Properties of Constituent Materials, Mix Proportions, Mixing and Casting Procedures, Properties of Freshly mixed FRC, Mechanics and properties of Fiber Reinforced concrete, Composite Material approach, Application of fiber reinforced concrete.

Unit - 2	**Number of lectures = 09**	**Title of the unit: Fly Ash Concrete**

Classification of Indian Fly ash, Properties of Fly ash, Reaction Mechanism, Proportioning of Fly ash concretes, Properties of Fly ash concrete in fresh and hardened state, Durability of fly ash concrete.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Polymer Concrete**

Terminology used in polymer concrete, Properties of constituent materials, Polymer impregnated concrete, Polymer modified concrete, Properties and applications of polymer concrete and polymer impregnated concrete. Ferro cement: Constituent materials and their properties, Mechanical properties of Ferro cement, Construction techniques and application of Ferro cement.

Unit - 4	**Number of lectures = 09**	**Title of the unit: High Performance Concrete**

Materials for high performance concrete, Supplementary cementing materials, Properties and durability of high performance concrete, Introduction to silica fume concrete, Properties and applications of silica fume concrete. Folded plates -Introduction, types of folded plates, their assumptions and behaviours

11. Books Recommended

Text Books

Concrete, its Properties and Microstructure by P.K. Mehta, and P.J. M. Monterio

References

1. Ferro cement by B.K .Paul, and R.P. Pama

2. Fibre Reinforced Concrete by Bentur and Mindess

3. Fly ashin Concrete by Malhotra and Ramezanianpour

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Air and Noise Pollution**	**L**	**T**		**P**	
3. Subject Code	13010411	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem (√)	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

Increased air and noise pollution is the common impact of industrialization lead to the several dangerous and untreatable impacts on human beings. Students learn about air pollutants, particulates and gaseous pollutants, effects of air pollution on human beings, elements of atmosphere and dispersion of pollutants, meteorological factors, principles and design of air pollution control measures, air quality monitoring, air pollution control measures, sources of noise pollution, environmental and industrial noise and effects of noise pollution.

8. Learning objectives:

1. To understand the aspects of atmospheric pollution and its flow.
2. To know about the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality
3. To understand the use and application of air quality models for the identification of plume flow.

9. Subject Outcomes:

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

1. The main chemical components and reactions occur in the atmosphere and examine the factors responsible for perturbing this.
2. The Implementation of the methods for monitoring and modeling spatial and temporal patterns of pollution
3. The air pollution issues at a range spatial scales and how these are relaxed.
4. The environmental impacts of atmospheric pollutants and assess their concentration.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Sources and Effects of Air Pollution**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Transport & Control of Air Pollution**

Elements of atmosphere and dispersion of pollutants – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutions – Gaussian dispersion models – Applications

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment, gaseous pollutant control by adsorption & absorption, condensation, combustion – Pollution control for specific major industries

Unit - 3	**Number of lectures = 08**	**Title of the unit: Air Quality Management**

Air quality standards – Air quality monitoring – Air pollution control eff orts – Zoning – Town

planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment – Methods.

Unit - 4	Number of lectures = 09	Title of the unit :Noise Pollution & Control

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution- fundamentals of sound generation - propagation, sound measurement - sound level meters – types, components, Noise prevention & control measures, environmental and industrial noise - noise control legislation.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1 M N Rao& H V N Rao (2007), Air Pollution, Tata McGraw-Hill Publishing Company, 26th reprint, New Delhi.

Referance books

1. Singal, S.P. (2000), Noise Pollution and Control, First Edition, Narosa Publishing House, New Delhi.

2. Rao C.S. (2006) Environmental Pollution Control Engineering, 2nd edition, New Age International,New Delhi.

3. William L.Heumann (1997), Industrial Air Pollution Control Systems, McGraw Hill Professional, New York.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Hydrology**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures 33		**Tutorials = 00**	**Practical = 00**			

7. Learning objectives:

1. To provide knowledge to students regarding occurrence of rainfall, storage of water, estimation of Flood.
2. The students shall learn about ground water permeability and transmissibility and yield of water From well.

8. Subject Outcomes: On completion of this course, the students will be able to

1. The students shall learn to estimate rainfall and perform hydrograph analysis.
2. Extract maximum amount of water from around aquifers after locating them.
3. Perform calculation for flood routing for various irrigation projects.

9. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction and Runoff**

Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.

Types & forms of precipitation, rainfall measurements, interpretation of rainfall data. Missing rain fall data, Runoff, runoff cycle, infiltration indices, Hydrograph analysis, Module hydrograph, applications. Time Series Analysis

Unit – 2	**Number of lectures = 08**	**Title of the unit: Evaporation, Transpiration and Infiltration**

Evaporation Process: Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control.

Transpiration Process: Evapo-transpiration and its measurement, Penman`s equation and potential evapo-transpiration.

Infiltration Process: Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Ground Water Hydrology**

Ground water-Aquifers, Permeability & transmissibility- steady flow towards a well in confined & water table aquifer-Dupits&Theims equation - measurement of yield of an open well - Tube well & infiltration gallaries. Interference among wells-well losses, comparison of well and flow irrigation.

Unit – 4	**Number of lectures = 08**	**Title of the unit: Flood Routing**

Introduction to flood routing and its importance for the construction of hydraulic reservoirs. Hydrologic routing and hydraulic routing. Methods of flood routing- Step by step method, trial and error method.

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Books Recommended

Text Books

1. Engineering Hydrology**,** K subramaniya (2014), 4th Edition, ISBN No. 978-1-25902997-4, Tata McGraw Hill.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Ground Improvement Techniques**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical =00**			
7. Brief Syllabus: This course covers the improvement of subsurface flow and transport, emphasizing the role of groundwater in the hydrologic cycle, the relation of groundwater flow to geologic structure, and the management of contaminated groundwater.						
8. Learning objectives: • To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques. • To bring out concepts of reinforced earth. • Applications of geotextiles in various civil engineering projects.						
9. Subject Outcomes: • Will gain competence in properly devising alternative solutions to difficult and earth construction problems and in evaluating their effectiveness before, during and after construction. • A study of the many different approaches to the ground modification broadens the mind of any engineer and inspires creativity and innovation in Geotechnical construction and related fields.						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 08**	**Title of the unit: Introduction**				
Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground Improvement techniques based on soil condition.						
Unit - 2	**Number of lectures = 08**	**Title of the unit: Drainage and dewatering**				
Drainage techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases Only).						
Unit - 3	**Number of lectures = 08**	**Title of the unit: Insitu treatment of cohesion less and cohesive soils**				
Insitu densification of cohesion less and consolidation of cohesive soils -Dynamic compaction and consolidation – Vibrofloation – Sand pile compaction – Preloading with sand drains and fabric drains – Stone columns – Lime piles – Installation techniques only – relative merits of various Methods and their limitations.						
Unit - 4	**Number of lectures = 09**	**Title of the unit: Earthreinforcement and Grout Techniques**				

Concept of reinforcement – Types of reinforcement material – Applications of reinforced earth-use of Geotextiles for filtration, drainage and separation in road and other works
Types of grouts – Grouting equipment and machinery – Injection methods – Grout monitoring
Stabilisation with cement, lime and chemicals – Stabilisation of expansive soils

11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.

Reference books

1. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
2. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
3. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002
4. Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
5. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Resource Management and Control in Construction**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4.Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical -00**			
7. Brief Syllabus: Effective construction resources management process is a key to success of a construction project. Nowadays, successful management of construction resources has to be based on and updated information and processed utilizing a well-designed construction resources management system.						
8. Learning objectives: 1. To study and evaluate the resources - material, equipment, labour and time 2. To plan and manage the resources studied above using various tools and techniques like allocation, levelling critical path measurement.						
9. Subject Outcomes: On completion of the course, the student is expected to be able to 1. Calculate necessary resource requirements throughout a construction project 2. Analyze construction documents for planning and management of construction processes 3. Apply basic techniques for construction layout and control 4. Understand construction project control processes						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction to Resources**				
Introduction to resources, Characteristics of resources-Types of resources, manpower, Equipment, Material, Money, Time - Tools for measurement of resources.						
Unit - 2	**Number of lectures = 08**	**Title of the unit: Resource Planning**				
Resource Planning- Planning for material, Labour, time and cost-Resources Utilization, material, Labour, time and cost - Procurement- inventory control.						
Unit - 3	**Number of lectures = 08**	**Title of the unit: Material, Equipment and Labour**				
Material: identification of materials, quantity of material, sources, Transportation, Delivery and Distribution- purchase management-store management. Equipment: types of equipment used in construction, Planning and selection of equipment, equipment maintenance and replacements of an equipment. Labour: Introduction to Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour, labour productivity						
Unit - 4	**Number of lectures = 08**	**Title of the unit: Time Management and Resource Allocation**				
Time Management- planning and scheduling - Managing time on the project forecasting the future, Critical path measuring the changes and their effects. Cost control- objectives of cost, time and quality, Cash flows and cost control, Time-cost trade off.						

Resource allocation- resource levelling, resource smoothening- - examples of resource list, Resource allocation graph, Resource loading- Computer application in resource management -Value Management

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Glenn, A. Sea's and Reichard, H Clough, "Construction Project Management", John Wiley and Sons, Inc, 2009.

Referance books

1. Harvey, A. Levine, "Project Management using Micro Computers", Obsome McGraw Hill C.A. Publishing Co., Inc. 2008.
2. James, A., Adrain, "Quantitative Methods In Construction Management", American Elsevier Publishing Co., Inc., 2003.
3. Andrew, D. Szilagg, "Hand Book of Engineering Management", 2002.

Program Elective-II

S. No.	Subjects	Subject Code
1	Advance Structure Analysis	13010510
2	Solid waste management	13010511
3	Hydropower	13010512
4	Advanced Surveying	13010513
5	Quantitative technique in construction management	13010514

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Advanced Structural Analysis**	**L**	**T**		**P**	
3. Subject Code	13010510	3	0		0	
4. Type of Subject			**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Strength of Materials, Engg. Mechanics	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus: Structural analysis is the determination of the effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, machinery, furniture, attire, soil strata, prostheses and biological tissue. Structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. The results of the analysis are used to verify a structure's fitness for use, often saving physical tests. Structural analysis is thus a key part of the engineering design of structures

8. Learning objectives:

1. To understand the methods of analysis.
2. To know the different techniques available for the analysis of structures.
3. To identify the best suitable method of analysis.

9. Subject Outcomes: On completion of this course, the students will be able to

1. Identify the method of analysis for determinate structures
2. Understand the importance of various methods of slop and deflections for determinate structures.
3. Use the influence line diagram.
4. Understand the methods of analysis for multi-storeyed frames

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Method of Consistent deformations**

Analysis of beams frames and trusses with internal and external redundancy(Simple problems with maximum two redundants) Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems)

Unit - 2	**Number of lectures = 08**	**Title of the unit: Cables**

Analysis of forces in cables under concentrated and uniformly distributed loads - Anchor Cables

Unit - 3	**Number of lectures = 08**	**Title of the unit: Influence Lines for Indeterminate Structures**

Muller-Breslau's Principle, Steps for obtaining I.L for Reactions and Internal Forces in Propped Cantilever Beam and Continuous Beam, Qualitative I.L.D for Rigid Jointed Structures Having Higher Statically Indeterminacy

Unit - 4	**Number of lectures = 08**	**Title of the unit: Matrix Methods**

Types of skeletal structures, Internal forces and deformations. Introduction and applications of stiffness method to analyze beams, Trusses and plane frames by system approach.

11. Books Recommended

Text Books

1. R.C. Hibbler , Structural Analysis (2011) , Pearson Education

Reference Books

1. Jain,O.P.and Jain, B.K., “Theory &Analysisof Structures ”. Vol.I& II Nem Chand brothers.
2. Wilbur and Norris, “Elementary Structural Analysis”, Tata McGraw Hill
3. Chukia Wang
4.Coates,R.C.,Coutie,M.G. & Kong, F.K., “Structural Analysis”, English Language BookSociety& Nelson.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Solid Waste management**	**L**	**T**		**P**	
3. Subject Code	13010511	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials =**	**Practical**			

7. Brief Syllabus:

Solid waste management, the collecting, treating and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector borne disease, that is, disease spread by rodents and insects. The tasks of solid waste management present complex technical challenges. They also pose a wide variety of administrative, economic and social problems that must be managed and solved.

8. Learning objectives:

1.To gain insight into collection, transfer and transport of municipal solid waste
2.Understand the design and operation of municipal solid waste landfill
3. Understand the design and operation of resource recovery facility.

9. Subject Outcomes:

At the end of the course ,the student will be able to:-
1.Understand solid waste and its composition
2. Understand various processes involved in solid waste collection, segregation and transportation.
3.Design solid waste disposal facility

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Municipal Solid Waste Management**

Definition of solid waste–waste generation–major, sources and types of solid waste – sampling and characterization – Determination of composition of MSW–storage and handling of solid waste – Future changes in waste composition.

Unit - 2	**Number of lectures = 09**	**Title of the unit: Collection and transportation of Solid Waste**

Waste collection systems, analysis of collection system–alternative techniques for collection system. Need for transfer operation, transport means and methods, transfer station types and design requirements

Need for transfer operation, transport means and methods, transfer station types and design requirements

Unit - 3	**Number of lectures = 08**	**Title of the unit: Process of Solid Waste and Energy recovery**

Unit operations for separation and processing, Materials Recovery facilities, Waste transformation through combustion and aerobic composting, anaerobic methods for materials recovery and treatment – Energy recovery – Incinerators

Unit - 4	**Number of lectures = 09**	**Title of the unit: Disposal of Solid Wastes**

Land farming, Landfills**:** Design and operation including: site selection, Geo-environmental investigations, engineered sites, liners and covers, leachate control and treatment, gas recovery and control, including utilization of recovered gas (energy), and landfill monitoring and reclamation, Requirements and technical solution, designated waste landfill remediation– Integrated waste management facilities. Economics of the on-site /offsite waste management options.

11. Books Recommended

Text Books

George Techobanoglous et al," Integrated Solid Waste Management ", McGraw-Hill Publication, 1993

References

1. Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous, McGraw Hill Publication
2. Bagchi, A., Design, Construction, and Monitoring of Landfills,(2ndEd). Wiley Interscience,
3. 1994. ISBN: 0-471-30681-9.
4. Sharma, H.D., and Lewis, S.P., Waste Containment Systems, Waste Stabilization, and Landfills: Design and Evaluation. Wiley Interscience, 1994.ISBN: 0471575334.

1. Name of the Department	**CIVIL ENGINEERING**					
2. Subject Name	**Open Channel Flow**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5.Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6. Total Number of Lectures, Tutorials, Practical		
Lectures = 33	**Tutorials =00**	**Practical=00**

7. Brief Syllabus:

In this course, student will learn about open channel hydraulics: Pipe Flow and Free Surface Flow, Continuity Equation, Energy in Free Surface Flow, Basic Momentum Equation, Velocity Distribution, Occurrence, Critical Depth in Trapezoidal & Circular Channels, Hydraulic Exponent for Critical Flow, Critical Flow Depth Computations, Derivation of Uniform Flow Equations, Resistance in Open Channel Hydraulics, History of Uniform Flow Velocity and Resistance Factor, Integration of Differential Equation, Improved Euler Method, Fourth-order Runga-Kutta Method, Classification of Jumps, Momentum Equation, General HydraulicJumpEquation,EnergylossintheJump,TurbulentCharacteristicsoftheJump.

8. Learning objectives:

1. To provide knowledge about various types of flows and properties in open channels.
2. To provide knowledge in detail about gradually varied flow, rapidly varied flow and spatially varied flow.

9. Subject Outcomes:

Student will be able to

1. Know the various types of flows in open channels.
2. Determine velocity distribution across and along the channel and hydraulic jumps.
3. Design the channel sections, drains and jumps for various hydraulic and hydrologic projects.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction**

Introduction, Pipe Flow and Free Surface Flow, Continuity Equation, Energy in Free Surface Flow, Basic Momentum Equation, Velocity Distribution, Velocity Measurement and Distribution, Velocity-area Method, Radio-active tracer technique for Measurement of River Discharges, Errors in Depth Measurement in High Velocity Flows, Secondary Current and Spiral Flow, Energy and Momentum Coefficients-Derivation and Coefficients for Different Velocity Distributions, Comparison between Momentum and Energy Equation, Pressure Distribution, Specific Energy Equations for Rectangular Channels, Application of Specific Energy, Specific Force.

Unit - 2	**Number of lectures = 09**	**Title of the unit: Critical Flow**

Characteristics of Critical Flow, Occurrence, Critical Depth in Trapezoidal & Circular Channels, Hydraulic Exponent for Critical Flow, Critical Flow Depth Computations, Flow Measurement, Measuring Flumes, Critical Depth Flumes, Weirs-Introduction, Types of Control Structures, Proportional weirs, Flow Over weirs, Polygonal weirs, Special types of weirs, Broad Crested weirs, Different types of Broad Crested weirs, Bear Trap weir, Flow below a Sluice Gate, Brink Depth, Modern Measurements of Flow Measurements, Outlets & Modules,

Errors in Measurements, International Standards for Flow Measurement in Open Channel.		
Unit - 3	**Number of lectures = 08**	**Title of the unit: Uniform Flow**
Concept of Uniform Flow, Derivation of Uniform Flow Equations, Resistance in Open Channel Hydraulics, History of Uniform Flow Velocity and Resistance Factor, Friction, Ganguillet and Kutter Formula, Conveyance, Section Factor for Uniform Flow Computation, Hydraulic Exponent for Uniform Flow Computation, Maximum Discharge, Classification of bed Slope, Solution of Manning Equation by Newton Raphson Method, Slope-area Method, Normal & Critical Slopes		
Unit - 4	**Number of lectures = 07**	**Title of the unit: Gradually Varied Flow**
Introduction, Dynamic Equation for Steady Gradually Varied Flow, Classification of Gradually Varied Flow Profiles, Real Life Cases of Water Surface Profiles, Sketching of Composite Water Surface Profiles, Computation of Gradually Varied Flow, Integra-tionofDifferentialEquation,ImprovedEulerMethod,Fourth-orderRunga-KuttaMethod.		
11. Brief Description of self-learning / E-learning component		
12. Books Recommended **Text Books** 1. Subramanya,K.,(2008) Flow in Open Channels,3rd Edition, ISBN No. 978-132-449-6,TataMcGraw-Hill **Referance books** 1. V.T.Chow (2009), Open Channel Hydraulics, Blackburn Press. 2. Asawa,G.L.,(2010), Fluid Flowing Pipes and Channels, CBS Publishers. 3. Chanson, H.(2004),The Hydraulics of Open Channel Flow: An Introduction, Elsevier Scientific. 4. M. Hanif Chaudhry (2007), Open Channel Flow, Springer. 5. Henderson, F.M., (1966) Open Channel Flow, PHI.		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Advanced Surveying**	**L**	**T**		**P**	
3. Subject Code	13010513	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	**Frequency (use tick marks)**	Even ()	Odd (√)	**Frequency (use tick marks)**	Even ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

Brief Syllabus: Surveying is the most useful and necessary part in Civil Engineering. Students will understand the use of Chains, Tapes, Compass, as well as optical surveying instruments such as Theodolite, Total Stations, Auto Levels and Electronic distance measuring machines. Students will also understand reduction of slope measurements to horizontal and vertical components, field data reduction and adjustment of a closed traverse.

12. Learning objectives:

1. To teach the students basics of surveying and expose different techniques of surveying.
2. To help the students to learn the field applicability of the different survey methods.
3. To teach students about types of errors encountered in different types of surveying.

13. Subject Outcomes:

1. Prepare Topographical maps & surveyed site plans for civil projects.
2. They will be able to transfer map/drawing/layout plan on the actual site of civil projects.
3. Carry out tachometry, geodetic surveying wherever situation demands.
4. Apply error adjustment to the recorded reading to get an accurate surveying output.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Curves:**

Introduction, theory and setting out methods of simple circular curve, elements of a compound and reverse curves, transition curve, types of transition curve, combined curve, types of vertical curves.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Global Positioning System**

Maps & their numbering, Map projection and co-ordinate system, Geo referencing and datums, Basic concepts of GPS

Unit - 3	**Number of lectures = 08**	**Title of the unit: Geographical Information System & Remote Sensing**

Introduction, Definitions, Basic Concepts, history and evolution, Components, Need, Scope, interdisciplinary relations, applications areas, and overview of GIS. GIS data: spatial and non-spatial, spatial data model: raster, vector,

Physics of remote sensing, Characteristics of electro-magnetic radiation; Interactions between matter and electro-magnetic radiation; energy interaction in the atmosphere; energy interactions with the earth's surface spectral reflectance curves. Types of remote sensing

Unit - 4	**Number of lectures = 08**	**Title of the unit: Arial Photogrammetry**

Definition and terms, history of photogrammetry, concepts, principles and types of photogrammetry, types of aerial photographs vertical photographs, tilted photographs, aerial cameras, displacements and their corrections

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. 1. Punmia B.C, Surveying (2011), Volume 1, 2, 3 Sixteenth edition, ISBN No. 81-7008-853-4, Laxmi Publications.

Reference books

1. Subramanian R, Surveying and Levelling, Publication Oxford University Press.
2. Kanetkar T.P, Surveying and Levelling, Vol I, Pune.
3. Kanetkar T.P, Surveying and Levelling, Vol II, Pune

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Quantitative Techniques in Construction Management**	**L**	**T**		**P**	
3. Subject Code	13010514	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	**Frequency (use tick marks)**	Even ()	Odd (√)	**Frequency (use tick marks)**	Even ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

This Course will introduce theoretical and practical aspects of construction management techniques to achieve project goals. & possess organizational and leadership capabilities for effective management of construction projects

8. Learning objectives:

11. To review the basics of Optimization principles
2. To study the optimization techniques and simulation of models
3. To apply the concepts studied to inventory, scheduling and other related problems

9. Subject Outcomes:

On completion of this course the students will be able to know operations research, production management, and financial management and cost concepts.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction To Operations Research**

Introduction to Operations research-Linear programming-Graphical and Simplex Methods-Duality and Post-Optimality Analysis- Dynamic programming- Capital Budgeting problem, Reliability improvement problem, Shortest path method

Unit - 2	**Number of lectures = 08**	**Title of the unit: Optimization Techniques**

Integer Programming- Branch and bound techniques-Transportation Problems -Least cost method, North west corner cell method, Vogel's approximation method, U-V method- Work Assignment Problems.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Inventory Management**

Application to Production Scheduling-Single machine scheduling, Flow Shop Scheduling, Job shop Scheduling -Inventory control, Economic order quantity (EOQ), Quantity Discounts, Safety Stock.

Unit - 4	**Number of lectures = 08**	**Title of the unit: Optimization Theory and Cost Concepts**

Replacement Theory - Decision Theory-Decision Rules-Decision making under conditions of certainty, risk and uncertainty - Decision trees-Utility Theory- Bayes theory

Cost concepts-Break-even -Analysis-Pricing techniques- Simulation Models Game Theory applications

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Vohra, N.D. “Quantitative Techniques in Management ", Tata McGraw Hill Co., Ltd, New Delhi, 2000.

Referance books

1. Frank Harrison, E., “The Managerial Decision Making Process ", Houghton MiffinCo.Boston
2. Varshney, R.L. and Maheswari, K.L., “Managerial Economics ", Sultan Chand, 2005.

Program Elective-III

S. No.	Subjects	Subject Code
1	Pre-stressed concrete structure	13010515
2	Environment impact assessment	13010516
3	Hydrology	13010517
4	Urban transportation planning	13010518
5	Management of quality and safety in construction	13010519

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Pre-Stressed Concrete**	**L**	**T**		**P**	
3. Subject Code	13010515	3	0		0	
4. Type of Subject		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Survey	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

This course will cover the basic prestressed concrete design. Principles of prestressing, constituent material, loading and allowable stresses, working and ultimate stress analysis and design, shear and torsion, deflections, prestress losses, continuous beams, composite beams, and compression members.

8. Learning objectives:

1) Be able to perform analysis and design of prestressed concrete members and connections.
1) Understand the general mechanical behaviour of prestressed concrete.
2) Analyze and design prestressed concrete flexural members.
3) Analyze transfer and development length as well as prestress losses.
4) Analyze and design simple connections of prestressed concrete members

9. Subject Outcomes:

At the end of this course the student shall have a knowledge of methods of prestressing, advantages of prestressing concrete, the losses involved and the design methods forprestressed concrete elements under codal provisions.

10. Unit wise detailed content

Unit-1	**Number of lectures =09**	**Title of the unit: Introduction – Theory And Behaviour**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections -Losses of prestress – Estimation of crack width

Unit - 2	**Number of lectures = 08**	**Title of the unit: Design Concepts**

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications

Unit - 3	**Number of lectures =08**	**Title of the unit: Circular Prestressing and Composite Construction**

Design of prestressed concrete tanks, Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

Unit – 4	**Number of lectures = 08**	**Title of the unit:Pre-Stressed Concrete Bridges**

General aspects – pretension prestressed bridge decks – Post tensioned prestressed bridge decks–Principles of design only.

10. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

11. Books Recommended

Text books

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi

Reference books

1. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi.
2. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay.
3. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete .
4. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co. Pvt.Ltd.
5. Rajagopalan, N, "Prestressed Concrete", Alpha Science

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Environment Impact Assessment	**L**	**T**		**P**	
3. Subject Code	13010516	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7. Brief Syllabus:

Environmental Impact Assessments (EIA) provides a tool that assists in the anticipation and minimization of development's negative effects. Undertaken in the early stages of project planning and design, EIA helps shape development in a manner that best suits the local environment and is most responsive to human needs.

8. Learning objectives:

The objective of EIA is

1.to identify, predict and evaluate the economic, environmental and social impact of development activities

2. to provide information on the environmental consequences for decision making and (iii) to promote environmentally sound and sustainable development.

9. Subject Outcomes:

1. Students will be able to learn the concept and methodology of EIA.
2. Students will be able to implement the various EIA techniques
3. Students will be able to impacts knowledge of Socio-economic impact assessment

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Introduction**

Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. Eia processscreening – scoping - setting – analysis – mitigation

Unit - 2	**Number of lectures = 09**	**Title of the unit: Components and methods for EA**

Matrices – Networks – Checklists – Connections and combinations of processes – Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Socio-economic impact assessment**

Definition of social impact assessment. Social impact assessment model and the planning process. Rationale and measurement for SIA variables. Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition - neighborhood and community impacts. Selecting, testing and understanding significant social impacts. Mitigation and enhancement in social assessment. Environmental costing of projects

Unit - 4	**Number of lectures = 09**	**Title of the unit: Environmental management plan:**

Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment.

11. Books Recommended

Text Books

1.Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey, 2003.

References

1. World Bank –Source book on EIA
2. Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science, London, 1999.
3. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Water Resources Engineering**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

Water resource engineering is a subject which deals with Evaporation, Condensation and Precipitation of water on the earth surface and is known as hydrologic cycle. It is a study of surface and surface flow & study of under-ground water. It is study of rainfall, runoff, flood along with imparting knowledge of flood routing for irrigation projects

8. Learning objectives:

1. To provide knowledge to students regarding occurrence of rainfall, storage of water, estimation of Flood.
2. The students shall learn about ground water permeability and transmissibility and yield of water From well.

9. Subject Outcomes:

At the end of the course, students must be in a position to:

1. Understand the interaction among various processes in the hydrologic cycle.
2. Apply the application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering
3. Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures

10. Unit wise detailed content

Unit - 1	**Number of lectures = 08**	**Title of the unit**: Surface Runoff

Hydrologic Cycle. Water Budget Equation, Hydrologic system Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph,

Unit - 2	**Number of lectures = 08**	**Title of the unit: Sediment Transportation**

Suspended and Bed load and its estimation Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels

Unit - 3	**Number of lectures = 08**	**Title of the unit: Regulation and control of canal system**

Purpose, Types of canal regulation works and their functional aspects Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge

Unit - 4	Number of lectures = 09	Title of the unit: Ground Water Hydrology
Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries		
11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.		
12. Books Recommended **Text Books** 1. Irrigation Engg. and Hydraulic Structures by S.K. Garg,(2008), 7th Edition, ISBN No. 978-98-561-5, Khanna Publishers. **Referance books** 1. Water Resources Engg. By Larry W. Mays, John Wiley India 2. Water resources Engg. By Wurbs and James, John wiley India 3. Water Resources Engg. By R. K. Linsley, McGraw Hill 4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Urban Transportation Planning**	**L**	**T**		**P**	
3. Subject Code	13010518	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			
7. Brief Syllabus:						
8. Learning objectives:						
9. Subject Outcomes: I. Students will be able to plan the process of urban transportation, able to collect data and analyze it. II. Students will be able to generate Trip analysis III Students will be able to understand various design of transport networks						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 07**	**Title of the unit: Urban Transportation Problem Travel Demand**				
Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach. Travel Demand: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.						
Unit - 2	**Number of lectures = 09**	**Title of the unit: Data Collection And Inventories**				
Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.						
Unit - 3	**Number of lectures = 08**	**Title of the unit: Trip Generation and Distribution**				
UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates. Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models. By- pass Trips.						
Unit - 4	**Number of lectures = 09**	**Title of the unit: Mode Choice and Traffic Assignment**				
Mode Choice Behaviour, Competing Modes, Mode Split Curves, Models and Probabilistic Approaches. Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or- Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment, Diversion Curves.						
11. Books Recommended **Text Books** Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd						

References

1. Introduction to Urban System Planning - B.G.Hutchinson; Mc Graw Hill.
2. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Quality management and safety management system in construction**	**L**	**T**		**P**	
3. Subject Code	13010519	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem (√)	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7. Brief Syllabus:

The fundamental reason for the course is to impart knowledge and skill for the construction students to achieve success in quality management system (QMS) by understanding and evaluating quality management principles as a formalized system that has documents, processes, procedures, and authorities, responsibilities and for achieving quality policies and objectives

8. Learning objectives:

1) Understand and evaluate the definitions and objectives of quality management principles in construction sector and factors influencing construction such as quality plans and quality circle

2) Understand and evaluate authorities and responsibilities of QMS and Quality Management Guidelines.

9. Subject Outcomes:

I. . Understand and evaluate quality management principles and best practices in construction. Students must understand environmental impact assessment (EIA)for construction projects towards quality; Students must understand social impact assessment (EIA) for construction projects towards quality;

2. Understand and evaluate safety management principles in construction;

3. Understand and analyse quality circle (QC) concepts for possible implementation to solve construction productivity and quality problems entitled "How to manage productivity quality?

4. Good basic practices for quality system and progress for quality assurance and quality improvement for construction companies;

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Quality management**
Introduction – Definitions and objectives – Factors influencing construction quality – Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles		
Unit - 2	**Number of lectures = 09**	**Title of the unit: Quality planning**
Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures -Processes and products – Total QA / QC programme and cost implication.		
Unit - 3	**Number of lectures = 08**	**Title of the unit: Quality assurance and quality improvement techniques**
Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and failure mode analysis		

Unit - 4	Number of lectures = 09	Title of the unit: Safety management systems
Fundamental of safety management, construction safety, safety in scaffolding and working platform, welding and handling, excavation work, concreting and cementing work. Building construction, TAC and NBC rules, High rise building. Evolution of modern safety concept- Safety policy - Safety Organization. Safety survey, safety inspection, safety sampling, Safety Audit		
11. Books Recommended **Text Books** Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd **References** 1. Introduction to Urban System Planning - B.G.Hutchinson; Mc Graw Hill. 2. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers		

Program Elective-IV

S. No.	Subjects	Subject Code
1	Bridge engineering	13010610
2	Natural Disaster Mitigation and management	13010611
3	Urban water resources management	13010612
4	Architecture and Town Planning	13010613
5	Construction economics and financial management	13010614

1. Name of the Department	**CIVIL ENGINEERING**					
2. Subject Name	**Bridge Engineering**	**L**	**T**		**P**	
3. Subject Code	13010610	3	0		0	
4. Type of Subject (use tick mark)			**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =0**	**Practical =0**			

7. Brief Syllabus:

Introduction to history of bridge-building, including types of bridges, aesthetics, and materials for modern bridges; Loadings on bridges including standard truck and lane loading, impact loads, longitudinal and centrifugal forces, wind and seismic loads, thermal loads; Serviceability criteria including deflection and fatigue; Design of reinforced concrete bridges, slab bridges, concrete slab with steel stringer bridges, T-beam or plate girder bridges, box girder bridges, and prestressed concrete bridges; Bridge maintenance including inspection and rehabilitation.

8. Learning objectives:

1. To discuss basic definitions, types, and components of bridges.
2. To discuss sub-surface investigations required for bridge construction.
3. To understand standard specification for bride design.
4. To perform design of various slab type reinforced concrete bridges.
5. To perform design of bridges sub-structures, bearings and joints.
6. To have knowledge of quality control and maintenance aspects of bridges.

9. Subject Outcomes:

Upon successful completion of this course, it is expected that students will be able to:

1. Relate different design philosophies of the highway and railway bridges.
2. Understand the structural behavior of different components of a reinforced concrete and steel bridge.
3. Analyze and design different components of a highway and railway bridge, to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction and its sustainability under loads standardized by Indian Road Congress (IRC) and Indian Railway Standard Code of Practice for Bridges respectively and submit the designs in complete and concise manner.
4. Use the techniques, skills, and modern engineering tools and software necessary for design and detailing.
5. Analyze and interpret the results using analytical tools and further plan, design and detail different bridges using relevant and upcoming BIS standards.
6. Interact and manage work with professionals of diverse background and talent.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Concrete Bridges**

Introduction-Types of Bridges-Economic span length-Types of loading-Dead load live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements

Unit – 2	**Number of lectures =**	**Title of the unit: Solid slab Bridges and Girder Bridges**

	09	
Introduction-Method of Analysis and Design Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy		
Unit – 3	**Number of lectures = 08**	**Title of the unit:** **Pre-Stressed Concrete Bridges**
Basic principles-General Design requirements-Mild steel reinforcement in prestessed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams Composite Section-Propped-Design of Propped Composite Section-Unproped composite section-Two stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.		
Unit – 4	**Number of lectures = 08**	**Title of the unit :Analysis of Bridge Decks**
Harmonic analysis and folded plate theory-Grillage analogy- Finite strip method and FEM. Sub-structure of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers- Abutments- Design loads for Abutments		

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Victor (2012) "Essentials of Bridge Engineering"7th Edition, ISBN No. 978-043-89-98, Oxford, New Delhi, India

Referance books

1. Standard Specifications and Code of Practice for Railway Bridges a. Indian railway Standard Code of Practice for the Design of Steel or Wrought Iron Bridges carrying Rail, Road or Pedestrian Traffic, Govt. Of India, Ministry of Railways, 1962 b. Indian railway Standard Code of Practice for Reinforced Concrete Construction, Govt. Of India, Ministry of Railways, 1962.
2. I.S: 875-1987 Part 1 and 12 - Code of Practice for Design loads for Buildings and Structures, BIS, New Delhi, India.
3. I.S: 1893 2002- Indian Standard Code of Practice for Structural Safety of Structures, BIS, New Delhi, India.
4. S.P.:34- Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi, India.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Natural Disaster Mitigation and Management**	**L**	**T**		**P**	
3. Subject Code	13010611	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

With the increases in the numbers of interventions by the human beings with the natural processes and by the implication on load on the environment, natural disasters are common in the today's world. Students learn natural disasters around the world and risk assessment, disaster mitigation, preparedness, response and recovery, earthquake, geological, geo-morphological aspects, landslides, severe weather & tornadoes, cyclones, floods and droughts. Upon completion, students should be able to Map, conduct modeling, risk analysis and loss estimation, natural disaster risk analysis and apply prevention and mitigation measures to reduce the impacts.

8. Learning objectives:

1. To understand the aspects of atmospheric pollution and its flow.
2. To know about the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality
3. To understand the use and application of air quality models for the identification of plume flow.

9. Subject Outcomes:

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

1. The types of natural and environmental disasters and its causes.
2. About organizational and Administrative strategies for managing disasters.
3. About the early warning systems, monitoring of disasters effect and necessity of rehabilitation.
4. About the engineering and non-engineering controls of mitigating various natural disasters.
5. Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Natural Disasters – Overview**
Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics – Environmental Change and Degradation - Climate Change - Global warming – Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery- comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs		
Unit - 2	**Number of lectures = 08**	**Title of the unit: Plate Tectonics& Earthquakes**
Introduction and Review - Natural Disasters -Principles, Elements, and Systems - Geological- Geo-morphological aspects, - Earthquake- Geology, Seismology, Characteristics and dimensions– Landslides- Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc- Tsunami - Nature and characteristics		
Unit - 3	**Number of lectures = 08**	**Title of the unit: Critical climate system aspects and Processes**

Oceanic, Atmospheric and Hydrologic cycles - Severe Weather & Tornadoes , Cyclones, Floods and Droughts - Global Patterns -Mitigation & Preparation – Drought – Famine- nature & dimensions – Drought Assessment & Monitoring.

Unit - 4	**Number of lectures = 08**	**Title of the unit:** **Natural hazards Assessment and Communication Administrative mechanisms**

Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of
Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination – Mobile Communications etc.
Social organizations – Education and Training – Establishment of capacity building among various stakeholders – Government - Educational institutions – Use of Multi-media knowledge products for self-education

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1. Edward A Keller, Robert H Blodgett (2007), Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, Pearson Prentice Hall, 2nd Edition. ISBN: 9781583242728

Referance books

1. Edward Bryant (2005), Natural Hazards, Cambridge University Press, New York. ISBN: 978-0521537438
2. Robert L Kovach Earth's Fury (1995), An Introduction to Natural Hazards and Disasters, Prentice Hall.
3. Davi Alexander (1993), Natural Disasters, Routledge. ISBN: 9781857280937

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Urban Water Resources Management**	**L**	**T**		**P**	
3. Subject Code	13010612	3	0		0	
4. Type of Subject		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)		**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =00**	**Practical = 00**			

7. Brief Syllabus

Student will study the ways in which water availability and use are matched, and seek to develop alternative land use and water allocation policies, including legal and institutional arrangements from the local watershed to the basin scale and beyond.

8. Learning objectives:

1. To introduce the concepts of urbanization and its impact on the natural water cycle
2. The student is exposed to the use the urban storm water models for better storm water management.
3. Students also exposed for the preparation of urban storm water master plan and different types of operation and maintenance.

9. Subject Outcomes:

At the completion of the course the student should be able to

1. Apply appropriate management techniques for planning, operating and maintaining the different components of urban and drainage system.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Urban Hydrologic Cycle**

Water in the urban eco-system – Urban Water Resources – Major problems – Urban hydrological cycle – Storm water management objectives and limitations – Storm water policies – Feasibility consideration

Unit - 2	**Number of lectures = 08**	**Title of the unit: Urban Water Resources Management Models**

Types of models – Physically based – conceptual or unit hydrograph based – Urban surface runoff models – Management models for flow rate and volume control rate – Quality models.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Urban Storm Water Management & Master Plans**

Storm water management practices (Structural and Non-structural Management measures) – Detention and retention concepts – Modelling concept – Types of storage – Magnitude of storage – Hydraulic analysis and design guidelines – Flow and storage capacity of urban components – Temple tanks.

Planning and organizational aspects – Inter dependency of planning and implementation of goals and measures – Socio – economic financial aspects – Potential costs and benefit measures – Measures of urban drainage and flood control benefits – Effective urban water user organizations.

Unit – 4	**Number of lectures = 08**	**Title of the unit: Operation And Maintenance**

General approaches to operations and maintenance – Complexity of operations and need for diagnostic analysis – Operation and maintenance in urban water system – Maintenance Management System – Inventories and conditions assessment – Social awareness and involvement.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1. Geiger, W.F., Marsalek, F., and Zuidena, F.C., (Ed), manual on drainage in urbanized areas – Vol.1 and Vol.II, UNESCO.

Reference Books

1.Neil S. Grigg., Urban Water Infrastructure Planning, Management and Operations, John Wiley and Sons

2. Hengeveld, H. and C. De Voch.t (Ed)., Role of Water in Urban Ecology

3. Martin, P. Wanelista and Yousef, A. Yousef., Storm Water Management, John Wiley and son

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Road Safety Engineering**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7.Brief Syllabus:

Road Safety Engineering is an introductory curriculum developed to provide a fundamental understanding of road safety as a discipline and address the needs of traffic and safety engineers, injury prevention specialists, highway safety practitioners, law enforcement, transportation planners, and others who may be engaged in road safety policy, planning, research and program design, implementation and evaluation.

8. Learning objectives:

1. This module on the fundamental of traffic engg. & some of the statistics methods to analysis the traffic safety.
2. The accident interrogations 7 risk involved with measures to identity the causes are dealt.
3. The role of road safety in planning the urban infrastructures design is discussed.
4. The various traffic management systems for safety & safety improvement strategies are dealt.

9. Subject Outcomes:

1. Students will be able to analyze the Accident Investigations and Risk Management.
2. Students will be able to plan road safety and Geometric Design of Roads.
3. Students will be able to prepare Road Safety Audits process

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Accident Investigations and Risk Management**
Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction		
Unit - 2	**Number of lectures = 09**	**Title of the unit: Road Safety in Planning And Geometric Design**
Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Designand Protective Devices, Post Accident Care		
Unit - 3	**Number of lectures = 08**	**Title of the unit: Role of Urban infrastructure design in safety**
Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety		
Unit - 4	**Number of lectures = 09**	**Title of the unit: Traffic Management Systems for Saf ety**

Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.		
11. Books Recommended **Text Books** 1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers 2. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India. **References** 1. Transportation Engineering – An Introduction, C.Jotin khisty, B. Kent Lall 2. Fundamentals of Traffic Engineering, Richardo G Sigua 3. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson		

1. Name of the Department		CIVIL ENGINEERING				
2. Subject Name	**Construction Economics And Financial Management**	**L**	**T**		**P**	
3. Subject Code	13010614	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =0**	**Practical =0**			

7. Brief Syllabus:

For any construction project to be successful, it must be technically sound and the resulting benefits must exceed the cost associated with the project. This course basically aims at describing various aspects of engineering economics. The field of construction economics and finance deals with the systematic evaluation of cost and benefit associated with different projects.

8. Learning objectives:

1. To study the elements of construction economics
2. To study the need for financial management and means of achieving the same
3. To study a few accounting methods
4. To study the elements of lending to the contractors

9. Subject Outcomes:

At the completion of the course the student will be able to

1. Understand of the impact of economic factors on the management of a construction firm.
2. Apply management and economic theory to the analysis of a broad range of actual construction management problems.
3. Understand latest developments in research, in the fields of construction economics and management.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Advances in Civil Engineering**

Role of civil engineering in industrial development - Advances in civil engineering and engineering economics - Support matters of economy as related to engineering Market demand and supply- choice of technology and quality control and quality production - Audit in economic, Law of returns governing production.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Material Selection**

Construction development in housing, transport and other infrastructures – Economics of ecology, environment, energy resources, local material selection, form and functional designs –Construction workers - Urban problems - Poverty - Migration -Unemployment - Pollution.

Unit - 3	**Number of lectures = 09**	**Title of the unit: Need for Financial Management**

The need for financial management - Types of financing - Short term borrowing - Long term borrowing –Leasing - Equity financing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement - Ratio analysis - Investment and financing decision – Financial control Job control and centralized

management		
Unit - 4	**Number of lectures = 08**	**Title of the unit: Overview of Cash Basis Accounting**
General overview - Cash basis of accounting - Accrual basis of accounting - Percentage - Completion method - Completed contract method - Accounting for tax reporting purposes and financial reporting purposes.		
11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.		
12. Books Recommended **Text Books** 1. Warneer Z, Hirsch, "Urban Economics", Macmillan, New York, 2003. **Referance books** 1. Prasanna Chandra, "Project Management ", TMH, 2007. 2. Kwaku A, Tenah and joseM.Guevara, "Fundamental of Construction Management and organisation ", Prentice - Hall of India, 2005. 3. K KChitkara, "Construction Project Management", Tata McGraw Hill.2008.		

Program Elective-V

S. No.	Subjects	Subject Code
1	Design of Steel Structure-II	13010709
2	Climate Change	13010710
3	Analysis and design of hydraulic structures.	13010711
4	Traffic engineering	13010712
5	Resource management and control in construction	13010713

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Design of Steel Structures-II**	**L**	**T**		**P**	
3. Subject Code	13010709	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			
7. Brief Syllabus: This course contains the design of flexural members, liquid storage structures, stacks etc. This course also contains the design of different structural members made up of Light Gauge Steel and Aluminum. Along with that this course is also provided with the plastic design and design of industrial structures. This is advanced level study for the design of steel structures						
8. Learning objectives: 1. Design light gauge & aluminum structures too. 2. Use relevant BIS for above structural design.						
9. Subject Outcomes: On completion of this course, the students will be able to 1. Design complicated structures like plate girder, gantry girder, Industrial structures, tanks and slabs. **2.** Design steel structures on plastic theory where ever possible.						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 08**	**Title of the unit: Plate Girder**				
Introduction, general consideration, distribution of stresses, web panel subjected to combined bending and shear, design of plate girder using IS:800-2007, behaviour of longitudinally stiffened plate, welding of girder components						
Unit – 2	**Number of lectures = 08**	**Title of the unit: Industrial Structures**				
Introduction, Roof and side coverings, Design loads, purlins, end bearings, general framing of industrial buildings, bracings. Gantry Girder: Introduction, loading consideration, maximum load effect, selection of gantry girder, design of gantry girder.						
Unit – 3	**Number of lectures = 09**	**Title of the unit: Steel Tanks and Stack**				
Introduction, Classification of steel tank, Wind load on tank and stack, Earthquake force on tank and stack, Design of Pressed steel tank with staging, Design consideration for steel stack.						
Unit – 4	**Number of lectures = 08**	**Title of the unit :Plastic Design**				
Introduction, Stress strain curve, Strength of tensile and compression members, bending of rectangular section, theory of plastic bending, calculation of plastic moment, plastic hinge and mechanism, strength of redundant structures, ultimate load analysis fundamentals; Static method and Mechanism method, Distributed loading, load factor, effect of axial forces on plastic moment, lateral buckling, design of columns, design of connections.						

11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Design of Steel Structures by N. Subramanian(2012), 8th Edition ,ISBN No. 978-0-19-57681-5 Oxford University Press

Referance books

1. BIS: 800-1984, B IS:800-200, BSI:1079-1973, BIS:801-1975.
2. Bowles, J.E. 1980, Structural Steel Design, McGraw Hill publication.
3. Chen W.F. and S.E. Kim1997, Steel Design Using Advanced Analysis, CRS Press

1. Name of the Department: Civil Engineering Department						
2. Course Name	**Climate Change**	**L**	**T**		**P**	
3. Course Code	13010710	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✔)**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	**Even ()**	**Odd (✔)**	**Either Sem (✔)**	**Every Sem ()**
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures =33		**Tutorials =0**	**Practical =0**			

8. Brief Syllabus

Atmospheric processes play important roles in shaping the Earth's energy and water cycles. With the help of numerical models, observations and theories, GFDL scientists conduct cutting-edge research to advance the fundamental understanding of atmospheric processes in governing climate variability and change, with the goal of developing more accurate representations of them in climate models. This work makes it possible to quantify the key characteristics of natural and anthropogenic perturbations to the climate system (such as greenhouse gases, aerosols, land use, volcanoes and solar radiation), and to elucidate the mechanisms through which these perturbations influence global and regional climate.

9. Learning objectives:

1. The evolution of the earth's atmosphere
2. Characteristics of the terrestrial atmosphere
3. Homogeneous and heterogeneous processes in the atmosphere
4. A basic understanding of the recent advances made in the understanding of the atmospheric processes leading to climate change

10. Course Outcomes (COs):

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

1. First acquire a basic understanding of the evolution of the earth's atmosphere
2. Thereafter, learn about the structure and composition of the various atmospheric layers
3. Gain a basic grounding on atmospheric chemical cycles
4. Understand how atmospheric chemical processes are linked to the dynamics
5. Finally, gain an insightful understanding of the physico-chemical processes leading to climate change

11. Unit wise detailed content

Unit-1	**Number of lectures**	**Title of the unit: Introduction to Atmosphere & Radiation**

Origins of the Earth's Atmosphere. Layers of the Atmosphere. Earth–Atmosphere System. Solar and Terrestrial Radiation. Absorption of Radiation by gases. Solar variability and the

Earth's Energy Balance. A simple model to estimate Green House Effect.		
Unit - 2	**Number of lectures**	**Title of the unit: Conceptual Models**
The ideal Gas law, Atmospheric Composition, Hydrostatic balance, Derivation of the Potential Temperature, States of stability of the Atmosphere, Parcel Concepts. General Circulation and Geostrophic flows. Quantification of dry and moist adiabatic Lapse Rates. Cloud Formation		
Unit - 3	**Number of lectures**	**Title of the unit: Environmental Phenomenon**
Atmospheric Chemical Reactions. Chemical Kinetics, Bimolecular Reactions, Photodissociation. Stratospheric Ozone, Chapman Chemistry, Catalytic Cycles, Homogeneous and Heterogeneous pathways for Ozone destruction. The Antarctic Ozone Hole.		
Unit - 4	**Number of lectures**	**Title of the unit: Analytics of Pollutants**
Atmospheric Aerosol: Aerosol size distributions. Continental and Maritime Aerosol. Homogeneous and heterogeneous nucleation. Condensation, Coagulation, Evaporation. Sedimentation and dry deposition. Formation of Cloud droplets. Auto-conversion and Precipitation.		
12. Books Recommended (1 Books+ 2 References)		
1. Introduction to Environmental Engineering and Science. Gilbert M. Masters. Prentice-Hall of India. 2005. 2. Inter-governmental Panel on Climate Change: The Third Assessment Report (2007). Cambridge University Press. 3. Plus, Journal Articles from J. Geophys. Res., Climate Change, Geophysical Res. Letts. Etc. 4. Michael S.		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Analysis and design of hydraulic structure**	**L**	**T**		**P**	
3. Subject Code	13010711	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 33		**Tutorials =**	**Practical**			

7. Brief Syllabus:

Hydraulic machines are machinery and tools that use liquid fluid power to do simple work, operated by the use of hydraulics, where a liquid is the powering medium. A hydraulic system uses an incompressible liquid as its fluid, rather than a compressible gas.

8. Learning objectives:

This course imparts the knowledge of open channel flow basic and different fluid power systems which are used in industries and hydropower plants.

9. Subject Outcomes:

1. Develop understanding about fluid action in open channel flow
2. Ability to select hydraulic turbines for hydropower plants
3. Identify the application of fluid in open channel flow and hydraulic machines

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Types of Head works**

Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient

Regulation Works: Falls, Classification, and Introduction to design principle of falls, Design of Sarda type and straight glacis tall. Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars.

Unit – 2	**Number of lectures = 09**	**Title of the unit: Flood routing**

Types, methods of reservoir routing, channel routing by Muskingham Method. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Gravity dams**

Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.

Unit – 4	**Number of lectures = 08**	**Title of the unit : Hydro-Electric Power**

Assessment of potential especially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse

11. Books Recommended

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India

References

2. Water resources Engg. By Wurbs and James, John wiley India 3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia&Pande B.B. Lal

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Traffic Engineering**	**L**	**T**		**P**	
3. Subject Code	13010712	3	0		2	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33	**Tutorials =**		**Practical**			

7. Brief Syllabus:

Traffic engineering and its management are the most important now a days. Its necessity followed by the traffic studies and its regulation. The most important is its management. Students will also study about the pavement design principles and pavement design of flexible and rigid pavement

8. Learning objectives:

1. To teach the concepts of traffic studies, traffic facilities and their regulations and management.
2. To understand the methods for efficient management of traffic in urban roads.

9. Subject Outcomes:

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

1. Perform traffic studies.
2. Know importance of traffic management.
3. Identify the specification of traffic facilities.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Traffic Studies**

Road user and Vehicle Characteristics - Traffic Studies -Traffic volume and composition - speed, Headway - Concentration and Delay & Flow principles - Capacity and level of service.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Traffic Facilities**

Types and General layout of at-grade and grade separated intersections, Design at grade intersection, principle of design, signalized/unsignalised intersection, Design of interchange, types of interchange , selection criteria of interchange, Auxiliary lanes, acceleration and deceleration lanes, entry and exit ramps.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Traffic Regulations and Management**

Traffic signs and markings - Parking practices - Traffic management measures.

Unit – 4	**Number of lectures = 08**	**Title of the unit: General Principle, Flexible and Rigid Pavement Design**

Factors affecting pavements stability–equivalent single wheel load–vehicle, soil, traffic & Climatic factors-stress distribution in different conditions - CBR method of design - AASHTO method & Burmister design method

Stresses in concrete pavement – IRC method – design of steel reinforcements – Function of joints, design of joints in concrete pavements - Joint Fillers and sealant

11.Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. 1Kadiyali.L.R(2008),Traffic Engineering and Transportation Planning, Khanna Publishers.

Referance books

1. Khisty.C.J.,and Lall.B.K., (2003) "Transportation Engineering", Indian Edition, Prentice-Hall of India.
2. Garber. Nicholas J., and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Architecture and Town Planning**	**L**	**T**		**P**	
3. Subject Code	13010613	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 00**	**Practical =00**			

7. Brief Syllabus:

Design of multifunctional complex of buildings in the urban context. Issues related to the growing problems of urban areas in third world countries and their future developments shall be explored. Emphasis on the design with relation to the contextual environment, traffic and planning controls and impact analysis. An understanding of the architectural implications of such developmental scheme should lead to insight in the formulation of political and administrative policies for the development of the physical environment.

8. Learning objectives:

1. To provide Town Planning inputs to architectural design.
2. To acquaint the student with the various responsibilities of an architect and understand the technicality of the profession.
3. To conceptualize and coordinate designs, addressing social, cultural, environmental and technological aspects of architecture

9. Subject Outcomes:

By the end of the course students will be able to

1. Understand fundamentals of architecture & town planning and its principles.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Elements of Design**

Line direction. Shape, size, texture, value and colour, balance, scale and proportion. Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions.

Unit - 2	**Number of lectures = 08**	**Title of the unit: Origin of Modern Architecture**

Definition and concept of modern architecture, various pioneers of modern architecture.

Unit - 3	**Number of lectures = 08**	**Title of the unit: Town Planning and New Concepts**

Definition and meaning, age of planning, scope and motives of planning, brief history of town planning – its origin and growth, historically development of town planning in ancient valley civilizations.

Garden city movement, Linear city and concentric city concepts, Neighborhood

Radiant city to present day planning

Unit - 4	**Number of lectures = 08**	**Title of the unit : Planning Principles**

Types of town and their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages. Planning Practice and Techniques: Zoning – its definition, procedure and districts, height and bulk zoning

11. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

12. Books Recommended

Text Books

1. Cherry, Gordon,"Urban Planning Problems",Board Hill, London,1974.

Referance books

1. Jon Lang,"A concise history of Modern Architecture in India",Permanent Black Publishers,New York,1998.
2. Taurus Parke,"A City with view Florence", I.B.Taurus Publishers, New York, 1994.

Program Elective-VI

S. No.	Subjects	Subject Code
1	Earthquake Engineering	13010714
2	Waste water treatment	13010715
3	Ground water engineering	13010716
4	Railways, Tunnel and Airport Engineering	13010717
5	Construction methods and equipments	13010718

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	Earthquake Engineering	**L**	**T**		**P**	
3. Subject Code	13010714	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7.Brief Syllabus:

Earthquakes performance of structures in past earthquakes. Philosophy of earthquake resistant design and concept of ductility, Short and long period structures, Concept of spectrum, Static force calculations. Effect of soils and liquefaction, Remedial measures, Construction of earth structures.

8. Learning objectives:

1. The students will get a diverse knowledge of earthquake engineering practices applied to real life problems
2. The students will learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects.

9. Subject Outcomes:

1. Students will be able to Understand the causes, nature, effect , consequences and effects of an earthquake on buildings and about the various seismic zones of India and about past Indian Earthquakes.
2. Students will be able explain importance of structural dynamics and earthquake exactions in civil engineering in practice
3.Students will be able to understand the concept of building earthquake resistant using base isolation and seismic dampers

10. Unit wise detailed content

Unit-1	**Number of lectures = 07**	**Title of the unit: Introduction**

Causes of Earthquakes, Basic Terminologies, Magnitude & Intensity and elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves, Seismic intensity, Richter scale, Tsunami. Seismic zoning maps of India and comparison study, Response spectra.

Unit - 2	**Number of lectures = 09**	**Title of the unit: Earthquake effects on the structures**

Classification of loads, Seismic methods of Analysis, Seismic design methods,. Seismic damages during past earthquakes and effects of irregularities and building architecture on the performance of RC structures

Unit - 3	**Number of lectures = 08**	**Title of the unit: Theory of vibration**

Introduction to theory of Vibration, Sources of Vibrations, Types of Vibrations. Lateral load analysis and design of two- storied masonry buildings. Ductility Requirements, types of ductility, factors affecting ductility. IS code provisions

Unit - 4	**Number of lectures = 09**	**Title of the unit: Seismic retrofitting**

Sources of weakness in RC framed buildings, Classification of retrofitting techniques, Conventional and non-conventional methods, Comparative study of various methods and case studies, failure modes of masonry structures and repairing techniques.

11. Books Recommended

Text Books

P.AgarwalandM.ShrikhandeEarthquakeResistantDesignofStructures, Prentice Hall Publications

2.IS:1893- Indian Standard Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.

References

1.IS:3935-Repair and Seismic Strengthening of Buildings-Guidelines,1993

2.IS:4326-Earthquake Resistance Design and Construction of Buildings — Code of Practice, 1993

3.IS:13828— Improving Earthquake Resistance of Low Strength MasonryBu

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Waste Water Treatment**	**L**	**T**		**P**	
3. Subject Code	.3010715	3	0		0	
4. Type of Subject		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Water Treatment & Supply Systems	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =00**	**Practical = 00**			

7. Brief Syllabus

Proper treatment of wastewater reduces health risks to humans and animals and prevents surface and groundwater contamination. Inadequate treatment of wastewater allows bacteria, viruses, and other disease-causing pathogens to enter groundwater and surface water. This course provides an overview of type of units operations and processes involved in wastewater treatment and disposal including design of primary and secondary treatment units. On completion of this course students will be able to identify the need for primary and secondary treatment of wastewater in a cost-effective and sustainable way. The students will also learn the importance of wastewater treatment to protect water resources.

7. Learning objectives:

1. To teach students the basic principles and concepts of unit operations and processes involved in Wastewater treatment.
2. To develop student's skill in the basic design of unit operations and processes involved in Wastewater treatment.
3. To develop a student's skill in evaluating the performance of wastewater treatment plants.

8. Subject Outcomes: On completion of this course, the students will be able to

1. Demonstrate an ability to recognize the type of unit operations and processes involved in Wastewater treatment plants.
2. Demonstrate an ability to choose the appropriate unit operations and processes required for Satisfactory treatment of wastewater.
3. Demonstrate an ability to design individual unit operation or process appropriate to the situation By applying physical chemical, biological and engineering principles.
4. Demonstrate ability in design of wastewater treatments units in a cost effective and sustainable Way and evaluate its performance to meet the desired health and environment related goals.
5. Recognize the importance of wastewater treatment to protect the water resources.

9. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Wastewater Treatment**

Physical, chemical and biological principles involved in wastewater treatment and designing of unit-operations and processes. Permissible Standards for wastewater disposal.
Objectives-Unit operations and processes-Principles, functions and design of screens, Grit chamber, sedimentation tank, Aeration tank

Unit – 2	**Number of lectures = 08**	**Title of the unit: Secondary Treatment**

Secondary Treatment-Activated Sludge Process and Trickling filters; other treatment methods-Stabilization Ponds and Septic Tanks-Advances in Sewage Treatment.

Unit - 3	**Number of**	**Title of the unit:**

	lectures = 09	**Sewage Disposal and Sludge Management**
Methods-Dilution-Self-purify cation of surface water bodies-Oxygen Sag Curve-Land disposal-Sewage Farming-Deep well injection- Soil dispersion system-Thickening-Sludge digestion-Bio-gas recovery, drying beds-Conditioning and Dewatering-Sludge disposal. Introduction to solid waste management, landfills and EIA.		
Unit – 4	**Number of lectures = 08**	**Title of the unit: : Waste Disposal System**
Wastewater Treatment-Typical layouts-Screens-Grit Chamber-Sedimentation tanks-Trickling filter-Activated Sludge, sludge Digester-Septic tanks-Soil Dispersion System-Waste Stabilization pond.		

10. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT e-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

11. Books Recommended

Text Books

1. Garg S.K, Environmental Engineering-Sewage Disposal (2010)8th Edition,ISBN No. 978-81-765-076, Khanna Publishers.

Reference Books

1. 1 Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering, Tata McGraw-Hill Education.
2. Hammer & Hammer Jr., Water and Wastewater Technology.
3. Rakesh Kumar, R.N.Singh, Municipal Water and Wastewater Treatment, Teri Press.
4. Dr.P.N.Modi, Sewage Treatment Disposal and Wastewater Engineering.
5. Shyam. R.Asolekar, Soli. J.Arceivala, Wastewater Treatment for Pollution Control and Reuse, Tata McGraw- Hill Education.

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Ground Water Engineering**	**L**	**T**		**P**	
3. Subject Code	13010716	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			

7. Brief Syllabus:

This course covers fundamentals of subsurface flow and transport, emphasizing the role of groundwater in the hydrologic cycle, the relation of groundwater flow to geologic structure, and the management of contaminated groundwater. Introduction and definitions, groundwater storage and supply, Darcy's Law and its limitation, Dupuit approximation, steady and unsteady flows in confined and unconfined aquifers, radial flow towards wells, storage coefficient and safe yield in a water-table aquifer, design of wells, methods of drilling and construction, development of maintenance of wells

8. Learning objectives:

1. To educate on ground water movement analysis & predictions.
2. To understand the concept to increase ground water potential.
3. To identify the sources of the ground water.

9. Subject Outcomes:

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

1. Identify the ground water flow & prediction.
2. Implement the Methods of improving the ground water potential.
3. Manage the ground water sources.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Occurrence and Movement of Groundwater**

Introduction to Hydrologic cycle – Origin and Age of groundwater, classification of groundwater, aquifer - water table - Darcy's Law, Coefficient of Transmissibility and storage - Flow rates and equation.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Well Hydraulics**

Geophysical methods, study of radial flow - well flow, Multiple well system - characteristic well losses, open well, tube well, well depth, well screen - head losses through the screen gravel packing and formation stabilization

Unit – 3	**Number of lectures = 08**	**Title of the unit: Analysis and Evaluation of Pumping Test**

Definition of terms - static water level, pumping level, drawdown – residual, drawdown pumping rate -automatic water level recorder- time drawdown analysis - distance drawdown analysis, Jacob's methods, pumping test methods.

Unit – 4	**Number of lectures = 09**	**Title of the unit: Pollution of Groundwater, Groundwater Assessment and Budgeting**

Injection methods-monitoring: - Cement lime, Lime-flyash and chemical stabilization, Deep mixing techniques.

Hydrological equilibrium - rain gauge network, runoff procedure for conducting infiltration test –

artificial recharge, rainwater harvesting – calculation of groundwater storage capacity and groundwater potential.

11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Raghunath H.M. (2007), Groundwater, Third Edition, ISBN No. 978-81-224-1904-7, New Age International

Referance books

1. David Keith Todd (2005), Groundwater Hydrology, Third Edition, John Wiley & Sons
2. Abdel-Aziz ismailkashef (2008), Groundwater Engineering, McGraw-Hill International Editions, Newyork

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Railway, Tunnel and Airport Engineering**	**L**	**T**		**P**	
3. Subject Code	13010717	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials = 0**	**Practical =00**			

7. Brief Syllabus:

This course imparts the student's knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics.

8. Learning objectives:

To develop the understanding of Railway, Tunnel and Airport Engineering.

9. Subject Outcomes:

Upon completion of the study of the subject, the student should be able to

1. Appreciate the importance of railways to the development of a country
2. Know the different types of railway tracks; railway fastenings & maintenance of tracks.
3. Understand the functions of stations, yards, points and crossings and the method of signaling and interlocking.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Railway Planning and Design**

Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS - Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments) - Permanent Way, its Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks -Sleepers – Functions, Materials, Density – Functions, Materials, Ballast less Tracks - Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves.

Unit – 2	**Number of lectures = 09**	**Title of the unit: Tunnels**

Introduction: Definition of tunnels, Advantages and disadvantages of tunnels, Tunnel Surveying, Size and shape of tunnels, Construction of tunnels, Tunnel lining, Ventilation of the tunnels, Drainage of tunnels

Unit – 3	**Number of lectures = 10**	**Title of the unit: Airport Planning And Design**

Role of Air Transport, Components of Airports - Airport Planning – Air traffic potential, Site Selection, Design of Components, Evaluation and Institutional arrangements Runway Design Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage - Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage - Airport Zoning - Clear Zone,

Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways, Railways and building etc		
Unit – 4	**Number of lectures = 05**	**Title of the unit:** Urban mass transportation systems:
Urban transit problems, travel demand, types of transit systems, public, private, para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination**.**		
11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.		
12. Books Recommended **Text Books** 1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998. **Referance books** 1. Rangwala, Railway Engineering, Charotar Publishing House, 1995. 2. Rangwala, Airport Engineering, Charotar Publishing House, 1996. 3. Oza.H.P. and Oza.G.H., "A course in Docks &Harbour Engineering". Charotar Publishing Co.1976. 4. J.S. Mundrey, "A course in Railway Track Engineering". Tata McGraw Hill, 2000. 5. Dr.Purushothama Raj "Railways,airports and Harbour Engineering".sri Shankar puplishers		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Construction methods and equipments**	**L**	**T**		**P**	
3. Subject Code	13010718	3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
6 .Total Number of Lectures, Tutorials, Practical						
Lectures = 33		**Tutorials =**	**Practical**			
7. Brief Syllabus: To impart knowledge on various equipment related to different types and stages of construction of civil engineering structures						
8. Learning objectives: To impart knowledge on various equipment related to different types and stages of construction of civil engineering structures.						
9. Subject Outcomes: The learner will be able to know the different equipment required for handling different materials						
10. Unit wise detailed content						
Unit-1	**Number of lectures = 07**	**Title of the unit: Introduction**				
Selection of equipment-factors effecting-relative advantages and disadvantages-technical and economic aspects.						
Unit - 2	**Number of lectures = 09**	**Title of the unit: Construction engineering fundamentals**				
Construction engineering fundamentals-analysis of production outputs and costs						
Unit - 3	**Number of lectures = 08**	**Title of the unit: Equipments**				
Characteristics and performance of equipment for earth moving. Study of performance of equipment used for concrete construction including batching and mixing units-equipment used for tunneling.						
Unit - 4	**Number of lectures = 09**	**Title of the unit: Transport equipments**				
Erection and material transport equipments- their performance advantages-pile driving-dewatering.						

11. Books Recommended

Text Books

- Peurifoy,R.L., Ledbetter. W.B and schexnayder, C, construction planning and equipment methods, 5th Edition, McGraw Hill, Singapore, 1995.

References

- Sharma S. C. Construction equipment and management, khanna publishers, New Delhi, 2011.

1Name of the Department		**CIVIL ENGINEERING**				
2 Subject Name	**BIM**	**L**	**T**		**P**	
3 Subject Code		0	0		2	
4Type of Subject (use tick mark)		**Core (√)**	**PE ()**		**OE()**	
5Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials =00**	**Practical =14**			
Brief Syllabus: .						
7Learning objectives:						
8 Subject Outcomes:						
9Unit wise detailed content						
EXPERIMENTAL DESIGN VIA MX-ROAD						
1) Introduction to the BIM Course (Revit / Walls and Curtain Walls).						
2) Software Tools (Revit / Floors, Roofs, and Ceilings)						
3) Term Project Description (Revit / Stairs, Ramps, and Railing)						
4) BIM and Project Delivery (Revit / Adding Families Revit / Modifying Families)						
5) BIM and Sustainability (Revit / Schematic Design Revit / Rooms and Color Fill Plans)						
6) BIM and Cost Estimating / 4D Simulation (Navisworks / Scheduling Navisworks / Clash Detection Revit / Estimating.						
7) BIM and Infrastructure (Revit / Workflow and site modeling Revit / Repetition in Revit)						

1. Name of the Department –CIVIL ENGINEERING						
2. Subject Name	**Constitution Of India**	**L**	**T**		**P**	
3. Subject Code	13010310	3	0		0	
4. Type of Subject (use tick mark)		**MC (√)**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()
1. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 00**	**Practical =00**			
2. . Unit wise detailed content						
Unit-1	**Number of lectures = 8**	**Introduction and Basic Information about Indian Constitution**				
The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Fundamental Duties and its Scope and significance in Nation building						
Unit – 2	**Number of lectures = 8**	**Union Executive**				
Parliamentary System, Federal System, Centre-State Relations. 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.						
Unit – 3	**Number of lectures = 8**	**State Executive**				
State Executives – Governor , Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370.371,371J) for some States						
Unit – 4	**Number of lectures =9**	**Elections, Amendments**				
Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73, 74, 75, 86, and 91, 94, 95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements).						
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.						

2. Name of the Department- Centre for languages and Communication						
3. Course Name	**FL- German language-I**	**L**	**T**		**P**	
4. Course Code	**13010416**	**3**	**0**		**0**	
5. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (√)**	
6. Pre-requisite (if any)		**7. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem ()	Every Sem ()
8. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			
9. Course Description						
Basic communication in simple German, Simple conversational phrases, formation of simple sentences, negative sentences, interrogative sentences, simple vocabulary related to house, family, common objects, simple prepositions and conjugation of verbs.						
1. Learning objectives: The students will be: 1.Familiar with the basic level of German Language 2.Able to understand communication in German language 3.Can read simple sentences of day to day Life						
10. Course Outcomes (COs):						
Upon successful completion of this course students will:						
i) Understanding of the pronunciation of German words.						
ii) Introduce them.						
iii) Able to write effectively						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 08**	**Title of the unit: Getting to know people**				
Getting to know people Alphabet Vocabulary Introduction						
Unit – 2	**Number of lectures = 08**	**Title of the unit: Arrival**				
Arrival Pronouns and Verbs Question formation						
Unit – 3	**Number of lectures = 08**	**Title of the unit: Seeing the Sights**				
Seeing the Sights Finding your way on foot How do I get to…. How to point out something Verbs Again (Grammar)						
Unit – 4	**Number of lectures = 10**	**Title of the unit: Public Transportation**				
Public Transportation						

What to say to the conductor
Some contractions
More action Verbs
On Nouns and Articles (grammar)

All about Time and Numbers

What time is it ?
Ordinal Numbers
Our Travel plans
Grammar

Countries and Languages

I am …….
I am travelling to...
Lost in the way.

12. Brief Description of self-learning / E-learning component

- Learngermanwtihjenny.com
- Learngermanwithanja.com
- Smartergerman.com
- Lingoda.com

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/general

13. Books Recommended

Text book

Barron's German (Learn Deutsch) The Fast and Fun Way. Third Edition by Paul and Heywood Wald, coordinating Editor. 2004

Reference Books

Deutsch als Fremd Sprache A1 by Dengler, Rusch, Schmitz and Sieber. Klett Langenscheidt, Munchen. Published by Goyal Publishers

Lernziel Deutsch: Deutsch alsFremdsprache by Wolfgang Hieber. 2007. Max HueberVerlag (Max Hueber Publication) Munchen

German Elementary Grammar by Kars

1. Name of the Department- Centre for languages and Communication						
2. Course Name	**FL- German language-II**	**L**	**T**		**P**	
3. Course Code	**13010615**	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Course Description

Can understand sentences and commonly used expressions associated with topics directly related to his/her direct circumstances (e.g., personal information or information about his/her family, shopping, work, immediate surrounding). Can make him/ herself understood in simple, routine situations dealing with a simple and direct exchange of information on familiar and common topics. Can describe his/her background and education, immediate surroundings and other things associated with immediate needs in a simple way

2. Learning objectives:

The students will be:

1. Enabled to write/frame simple sentences in day to day Life.
2. Able to understand communication in German language
3. Able to speak simple sentences of day to day Life

9. Course Outcomes (COs):

Upon successful completion of this course students will:

iv) Understand simple German conversation.

v) Write German language easily.

vi) Able to speak simple sentences.

10. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Cars and Vans**

Cars and Vans

Road signs
At the Car Rental Office
Essential phrases for Drivers
Road signs
At the service station
The Car
Essential Expressions about your car
Grammar :
The Imperative
Modal Verbs

Unit – 2	**Number of lectures = 08**	**Title of the unit: At the Grocery store**

At the Grocery store

How do you say
Grammar :
More important Verbs

Unit – 3	Number of lectures = 08	Title of the unit: Weather / Season
Weather / Season How is the weather If today is Tues day , then…. Grammar… Adjective		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Airplanes and Trains**
Airplanes and Trains The Plane Asking for something All Aboard Grammar : Reflexive Pronouns Direct Object Pronouns **Ordering Food** Meals / Food Breakfast The Table The main Meal , The Noon meal To give and take		
11. Brief Description of self-learning / E-learning component ➢ Learngermanwtihjenny.com ➢ Learngermanwithanja.com ➢ Smartergerman.com ➢ Lingoda.com The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/general		
12. Books Recommended		
Text book Barron's German (Learn Deutsch) The Fast and Fun Way. Third Edition by Paul and Heywood Wald, coordinating Editor. 2004		
Reference Books Deutsch als Fremd Sprache A1 by Dengler, Rusch, Schmitz and Sieber. Klett Langenscheidt, Munchen. Published by Goyal Publishers		
Lernziel Deutsch: Deutsch alsFremdsprache by Wolfgang Hieber. 2007. Max HueberVerlag (Max Hueber Publication) Munchen		
German Elementary Grammar by Kars		

1. Name of the Department- Mechanical Engineering						
2. Course Name	**The Recent Trends in Automotive Technology**	**L**	**T**		**P**	
3. Course Code	13010418	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE ()**		**OE (✓)**	
5. Pre-requisite (if any)	**IC Engines, Automobile Engineering**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
This course provides students a synopsis of latest trends in automotive industry used in evaluation of world. This includes understanding the basic principles of various hybrid and electric vehicles with importance, applications and limitations.						
9. Learning objectives: **i)** Understand the suspension, brakes and safety **ii)** Understand the vehicle operation and control **iii)** Understand the Electric and Hybrid Vehicles						
10. Course Outcomes (COs):						
i) Know the Hybrid, Battery and Magnetic track Vehicle						
ii) Describe the computer control in automotive						
iii) Describe the working of vehicle for safe ad fast travel						
iv) Know the latest trend in Automotive Industry.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 09**	**Title of the unit: Future of Automotive Industry**				
Challenges and Concepts for the 21st century, crucial issues facing the industry and approaches to meet these challenges. Fuel Cell Technology for Vehicles: What is fuel cell, Type of fuel cell, Advantages of fuel cell? current state of the technology, potential and challenges, advantages and disadvantages of hydrogen fuel.						
Unit – 2	**Number of lectures = 08**	**Title of the unit: Electrical and Hybrid Vehicles**				
Types of hybrid systems, Objective and Advantages of hybrid systems. Current status, Future developments and Prospects of Hybrid Vehicles. Starts stop operation, Power Assist, Regenerative Braking, Advanced lead acid batteries, alkaline batteries, and Lithium batteries, Development of new energy storage systems, Deep discharge and rapid charging ultra-capacitors.						
Unit – 3	**Number of lectures = 08**	**Title of the unit: Safety Equipments**				
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety. EBD, ABS, Electronic Braking, Traction and Stability control.						
Unit – 4	**Number of**	**Title of the unit: Collision Warning and**				

	lectures = 10	**Avoidance, Comfort and Convenience Systems**
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions. Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system		
Unit – 5	**Number of lectures = 08**	**Title of the unit: Latest Engine Technology Features and 42 Volt Systems**
Advances in diesel engine technology. Direct fuel injection Gasoline engine, Diesel particulate emission control, Throttling by wire. Variable Valve Timing, Method used to affect variable Valve Timing, Electromagnetic Valves, and Cam less engine actuation. 42 VOLT SYSTEM: Need, benefits, potentials and challenges, Technology Implications for the Automotive Industry, Technological revolution that will occur as a result of the adoption of 42-volt systems.		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.		
13. Books Recommended		
i) Advanced Vehicle Technologies by Heinz Heisler-SAE International Publication. 2. 3.		
ii) Electric and Hybrid Electric vehicles by Ronald K. Jurgen.- SAE International Publication		
iii) Electronic Braking, Traction and Stability control-SAE Hardbound papers.		
iv) Electronics steering and suspension systems- SAE Hardbound papers.		
v) 42-Volt system by Daniel J. Holt- SAE International Publication		
vi) Diesel Particulate Emission by J.H. Johnson- SAE Hardbound papers.		
vii) Fuel Cell Technologies for vehicles by Richard Stobart- SAE Hardbound papers.		

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Nano Technology and Surface Engineering**	**L**	**T**		**P**	
2. Course Code	13010419	3	0		0	
3. Type of Course (use tick mark)		**Core ()**	**PE (✔)**		**OE ()**	
4. Prerequisite (if any)	**MET**	**5. Frequency (use tick marks)**	Even ()	Odd (✔)	Either Sem ()	Every Sem ()
6. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures =36		**Tutorials = 0**	**Practical = 0**			
7. Course Description						
Surface engineering is a sub-discipline of Materials Science and Materials Engineering which deals with the surface of a solid and its modifications. The primary goal of Surface Engineering of nanomaterials is to modify the properties of surface to improve its electrical and thermal properties, and to improve the compatibility of nanomaterials with some matrix when they are used as reinforcing fillers in composites for high performance applications. The course should give a basic introduction to chemical and physical principles in the synthesis of inorganic nanostructured materials. In addition, basic principles of finite size effects will be covered. The course will also cover different methods for synthesis and characterization of different nanostructures and nanostructured bulk materials.						
8. Learning objectives: **i)** To understand the basic concepts of Nanotechnology. **ii)** To enhance the knowledge of nano material. **iii)** To allowing students to get familiarized with classical surface treatments						

9. Course Outcomes (COs):

i) Use Nanomaterials for various industrial applications.

ii) Qualitatively describe how the nanoparticle size can affect the morphology, crystal structure, reactivity, and electrical properties.

iii) Describe various surface coating technologies and their application in industry

10. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit: Introduction to Surface Engineering**

Tribology & its classification, Friction tribology, Wear & corrosion, Lubrication, Effect of tribology on surface of nanomaterials. Conventional surface engineering, Types of surface modifications, Physical modifications, Chemical modifications, Applications of surface engineering towards nanomaterials.

Unit – 2	**Number of lectures = 08**	**Title of the unit: Nano coatings**

Deposition and surface modification methods, Physical vapor deposition, Chemical vapor deposition, Advanced surface, modification practices, Advantages of deposition for surface modification.

Synthesis, processing and characterization of nano-structured coatings, Functional coatings, Advanced coating practices, Characterization of nano-coatings, Applications of nano-coatings.

Unit – 3	**Number of lectures = 10**	**Title of the unit: Surface Engineering of Nano materials**

Need of advanced methods for surface and coating testing's, Size dependency in nanostructures of nano-coatings, Size effect in electrochemical properties of nanostructured coatings, Size effect in mechanical properties of nanostructured coatings, Size effect in physical and other properties of nanostructured coatings. Thin films for surface engineering of nanomaterials, Sputtering techniques, Evaporation processes, Thin film deposition through gas phase techniques, Liquid phase techniques.

Unit – 4	**Number of lectures = 8**	**Title of the unit: Microencapsulation**

Processes, Microencapsulation: Kinetics of release, Plating of nanocomposite coatings, Advantages of microencapsulation over other conventional methods. Current trends in surface modification of nanomaterials, Modified Nanomaterials: In-use for consumer products, Main problems in synthesis

of modified nanomaterials

11. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

12. Books Recommended

Text Books:

i) Nanomaterials and Surface Engineering, Edited by Jamal Takadoum, John Wiley & Sons, Inc., USA.

Reference Books:

i) Introduction to Tribology byu Bharat Bhusan, John Wiley & Sons, USA.

ii) Nanocoatings: Size Effect in Nanostructured Films By Mahmood Aliofkhazrae, Springer-Verlag, USA.

iii) Handbook of thin film deposition processes and techniques Edited by Krishna Seshan, William Andrew Publishing Norwich, New York, U.S.A.

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Supply Chain and Logistic Management**	**L**	**T**		**P**	
3. Course Code	13010616	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE (✓)**		**OE ()**	
5. Pre-requisite (if any)	**IEM**	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This is a course in supply chain management (SCM), a term which denotes the integration of key business processes from end user through original suppliers for the purpose of adding value for the firm, its key supply chain members, to include customers and other stakeholders. This course presents a framework for SCM that requires cross-functional integration of key business processes within the firm and across the network of firms that comprise the supply chain.

9. Learning objectives:

i) An understanding of the primary differences between logistics and supply chain management.

ii) An understanding of the individual processes of supply chain management and their interrelationships within individual companies and across the supply chain.

iii) An understanding of the management components of supply chain management.

iv) An understanding of the tools and techniques useful in implementing supply chain management.

v) Knowledge about the professional opportunities in supply chain management.

10. Course Outcomes (COs):

i) Explore opportunities for cost reduction through Supply Chain efficiency.

ii) Understand how optimization can improve revenue streams.

11. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Logistic Managements**

Introduction, Logistics system design, Demand planning, Multiple channel distribution, Multi-echelon system, Model development, Concept of warehousing, Methods of storage, Primary and secondary transportation, Logistics information system, Logistics costing

Unit – 2	Number of lectures = 09	Title of the unit: Supply Chain Management
Understanding the Supply Chain, Process view, Decision phases and importance of supply chain, Supply chain management and logistics, supply chain and the value chain, Competitive advantage, supply chain and competitive performance, changing competitive environment, Supply Chain drivers and obstacle		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Matching supply and demand**
The lead-time gap, Improving the visibility of demand, supply chain fulcrum, forecast for capacity, execute against demand, Demand management and aggregate planning, Collaborative planning, forecasting and replenishment.		
Unit – 4	**Number of lectures = 11**	**Title of the unit: Strategic Management**
Creating the responsive supply chain Product 'push' versus demand 'pull' The Japanese philosophy, Foundations of agility, Route map to responsiveness. Strategic lead-time management: Time-based competition, Lead-time concepts, Logistics pipeline management. Planning and managing inventories in a supply chain: managing economies of scale in supply chain cycle inventory, managing uncertainty in supply chain, determining optimal level of product availability.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

i) Chopra, S. and Meindl, P. "Supply Chain Management", Prentice Hall, 6th Edition, 2016, ISBN: 0133800202

Reference Books:

i) Christopher, M. Logistics & Supply Chain Management, FT Prentice Hall, 5th Edition, 2016, ISBN: 1292083794.

ii) John T. Mentzer, J. T. Supply Chain Management, illustrated edition, SAGE Publications (2001), 1st Edition, ISBN: 1412918057

iii) Michael H. Hugos, M. H. Essentials of Supply Chain Management, John Wiley, (2011), 3rd Edition, ISBN: 0470942185

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Hydrogen and Fuel Cells**	**L**	**T**		**P**	
3. Course Code	13010617	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE (✔)**		**OE ()**	
5. Pre-requisite (if any)	**IC Engines, Automobile Engineering**	**6. Frequency (use tick marks)**	Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
This course provides students a brief overview on Hydrogen and Fuel cells. This includes understanding the newest energy variants. Also give overview how to store and utilize these energies.						
9. Learning objectives: **i)** The objective of the course is to provide comprehensive and logical knowledge of hydrogen production, storage and utilization. In addition, provides an understanding of various fuel cell technologies						
10. Course Outcomes (COs):						
i) Evaluate the performance of fuel cells under different operating conditions.						
ii) Select and defend appropriate fuel cell technology for a given application.						
iii) Design and develop suitable hydrogen storage system to be used along with fuel cell system.						
iv) Minimize environmental hazards associated with the use of hydrogen storage and fuel cell technology.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 08**	**Title of the unit: Introduction of hydrogen energy systems**				
Properties of hydrogen as fuel, Hydrogen pathways introduction-current uses, general introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and hydrogen production plants.						
Unit – 2	**Number of lectures = 08**	**Title of the unit: Hydrogen production processes**				

Thermal-Steam reformation, thermo chemical water splitting, gasification-pyrolysis, nuclear thermal catalytic and partial oxidation methods. Electrochemical-Electrolysis, photo electro chemical, Biological-Anaerobic digestion, fermentation micro-organism, PM based electrolyzer.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Hydrogen Storage and utilization**

Physical and chemical properties, general storage methods, compressed storage-composite cylinders, glass micro sphere storage, zeolites, metal hydride storage, chemical hydride storage and cryogenic storage, carbon-based materials for hydrogen storage.

Overview of hydrogen utilization, IC Engines, gas turbines, hydrogen burners, power plant, domestic cooking gas, marine applications, hydrogen dual fuel engines.

Unit – 4	**Number of lectures = 12**	**Title of the unit: Fuel cells and Its applications.**

History – principle - working - thermodynamics and kinetics of fuel cell process – performance evaluation of fuel cell – comparison on battery Vs fuel cell, Types of fuel cells – AFC, PAFC, SOFC, MCFC, DMFC, PEMFC, microbial fuel cells, relative merits and demerits.

Fuel cell usage for domestic power systems, large scale power generation, Automobile, Space, economic and environmental analysis on usage of hydrogen and fuel cell. Future trends in fuel cells, portable fuel cells, laptops, mobiles, submarines.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

i) Sorenson B, Hydrogen and Fuel Cells: Emerging Technologies and Applications, Bent Sorenson, Academic Press (2005), ISBN:0126552819.

Reference Books:

i) Hordeski MF, Alternative Fuels: The Future of Hydrogen, CRC Press, 3rd Edition, 2013, ISBN: 9781466580244.

ii) Busby RL, Hydrogen and Fuel Cells: A Comprehensive Guide, Penn Well Books, American Edition, (2005), ISBN: 1593700431.

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Industrial Safety Engineering**	**L**	**T**		**P**	
3. Course Code	13010520	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE (✓)**		**OE ()**	
5. Pre-requisite (if any)	**Workshop Technology**	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This course provides students a brief overview on Industrial Safety. This includes understanding the safety precautions in various manufacturing processes. Also give overview on safety in finishing and testing.

9. Learning objectives:

- **i)** Possess a mastery of Health safety and environment knowledge and safety management skills, to reach higher levels in their profession.
- **ii)** Effectively communicate information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities.
- **iii)** Competent safety Engineer rendering professional expertise to the industrial and societal needs at national and global level subject to legal requirements.

10. Course Outcomes (COs): On completion of the course,

- **i)** Apply knowledge of Mathematics, Science, Engineering fundamentals and an engineering specialization for hazard identification, risk assessment and control of occupational hazards. b.
- **ii)** Design, Establish, Implement maintain and continually improve an occupation health and management system to improve safety.
- **iii)** Conduct investigations on unwanted incidents using root cause analysis and generate corrective and preventive action to prevent recurrence and occurrence of such incidents.

iv) Design complex man machine systems using human factors engineering tools so as to achieve comfort, worker satisfaction, efficiency, error free and safe workplace environment.

v) Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings so as to provide practical solutions to safety problems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Safety in metal working and wood working machines**

General safety rules-turning machines-boring machines-milling, planning and grinding machines-general safety principles-safety in the use of sawing machines-wood working equipment's. CNC machines-need for selection and care of cutting tools – preventive maintenance, periodical checks for safe operation – associated hazards and prevention.

Unit – 2	**Number of lectures = 09**	**Title of the unit: Principles of Machine Guarding**

Guarding during maintenance-Zero Mechanical State (ZMS) – Definition – Policy for ZMS – guarding of hazards point of operation, protective devices-machine guarding-types-fixed guard-interlock guard-automatic guard-trip guard-electron eye-positional control guard-fixed guard fencing. Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawing-shearing- presses-forge hammer-flywheels-shafts-couplings-gears sprockets wheels and chains- pulleys and belts-authorized entry to hazardous installations-benefits of good guarding systems.

Unit – 3	**Number of lectures = 09**	**Title of the unit: Safety in Welding and Gas Cutting**

Gas welding and oxygen cutting-resistances welding, arc welding and cutting-common hazards-personal protective equipment-training-safety precautions in brazing, soldering and metalizing – explosive welding – selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety-storage and handling of gas cylinders.

Unit – 4	**Number of lectures = 10**	**Title of the unit: Safety in Finishing, Inspection and Testing**

Safety in grinding-heat treatment operations-electro plating-paint shops-sand and shot blasting-safety in inspection and testing-dynamic balancing- hydro testing -valves- boiler drums and headers-pressure vessels, air leak test- steam testing-safety in radiography- personal monitoring devices-radiation hazards – engineering and administrative controls, Indian Boilers Regulation. Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E- Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

i) Safety Management by John V. Grimaldi and Rollin H. Simonds, All India Travelers Book seller, New Delhi, 5th Edition. ISBN: 0939874989

Reference Books:

i) "Occupational safety Manual" BHEL, Trichy, 1988.

ii) "Accident Prevention Manual" – NSC, Chicago, 1982.

iii) Indian Boiler acts and Regulations, Government of India

iv) Safety in the use of wood working machines, HMSO, UK 1992.

v) Health and Safety in welding and Allied Processes, welding Institute, UK, High Tech. Publishing Ltd., London, 2002 5th Edition. ISBN: 9781855735385

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Plant Layout and Material Handling**	**L**	**T**		**P**	
3. Course Code	13010521	**3**	**0**		**0**	
4.Type of Course (use tick mark)		**Core ()**	**PE (✔)**		**OE ()**	
5.Pre-requisite (if any)		**6.Frequency (use tick marks)**	Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7.Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

7. Course Description

Introduction to Plant Layout and Material Handling Objectives and Functions of Plant Layout and Material Handling Introduction to Layout and its Importance Types of layouts Selection and specifications of layouts Implementation and follow up of layouts Introduction to CORELAP, ALDEP and CRAFT, CORELAP and ALDEP concepts Introduction to Group Layout and Fixed Position Layout Quadratic assignment model. Branch and bound method Introduction to Material Handling Relationship of material handling to plant layout Methods to minimize cost of material handling Ergonomics of Material Handling equipment.

8. Learning objectives

i) Plan, analyze and design to improve manufacturing and services facilities.
ii) Explore equipment requirements for a specific process.
iii) Summarize the benefit of an efficient material handling system.
iv) Understand what effect process layout has on the material handling system.
v) Apply the techniques to evaluate and design material handling and storage systems.
vi) Visualize plant layout and material handling in industries.

10.Course Outcomes (COs):

i) Understand proper material handling engineering techniques regarding hoisting and conveying equipment.

ii) Understand toxic hazards of materials being handled, such as chemicals, dusts and poisons		
11.Unit wise detailed content		
Unit-1	**Number of lectures = 11**	**Title of the unit: Introduction and Workstations**
Introduction Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas. Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.		
Unit – 2	**Number of lectures = 08**	**Title of the unit: Layout construction techniques**
Systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic. Material Handling: Material handling principles; material handling equipment and material handling systems.		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Computerized Layout and Analytical Methods**
ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. Warehouse operations: function, storage operations. Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems, Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.		
Unit – 4	**Number of lectures = 09**	**Title of the unit: Assessment and Evaluation**
Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.		
12.Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/ Journal papers; Patents in the respective field.		
13. Books Recommended		

Text Book:
i) Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers, Khanna Publishers; Third edition, 2000, ISBN: 8174093192
Reference Books:
i) Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons, 3rd Edition, ISBN: 0471071714.
ii) Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall. Latest Edition, ISBN: 0130134759
iii) Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India, 2nd Edition, ISBN: 0132992310
iv) Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers, Latest Edition, 2017, ISBN: 8186321780

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Lean enterprise & Advanced Manufacturing Technologies**	**L**	**T**		**P**	
3. Course Code		**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE (✔)**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✔)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This is a course based on lean thinking, enterprise process re-engineering, and digital manufacturing are becoming more prevalent in the work place, engineering and science professionals need to be prepared to address the enterprise as a holistic system of technologies, decision-making processes, and cultural components. The objective of this course to graduates with experience in manufacturing, engineering, design, or business who wish to develop their manufacturing expertise. This course is deal for wishing to transfer smoothly and effectively to a career in the manufacturing sector and of industry.

9. Learning objectives:

i) The student can identify different areas of Engineering manufacturing.
ii) Can find the applications of all the areas in day to day life.
iii) To develop lean thinking and, enterprise process re-engineering concept.

10. Course Outcomes (COs):

i) To develop lean thinking and, enterprise process re-engineering concept.
ii) To explain advanced production techniques methods for different applications.
iii) To Explain Plastic Processing methods for different applications.
iv) To Classify Press tools and apply it in various engineering applications.

11. Unit wise detailed content

Unit-1	**Number of lectures = 08**	**Title of the unit: Introduction & Jidoka Concept (Automation with A Human Touch)**

The mass production system – Origin of lean production system, Necessity, Lean revolution in Toyota – Systems and systems thinking – Basic image of lean.
Production Customer focuses Muda (waste). Poka concept – Poka-Yoke (mistake proofing) systems – Inspection systems and zone control – Types and use of Poke-Yoke systems – Implementation of Jidoka.

Unit – 2	Number of lectures = 08	Title of the unit: Stability of Lean System & Just In Time
Standards in the lean system, 5S system, Total Productive Maintenance standardized work, Elements of standardized work, Charts to define standardized work, Man power reduction, Overall efficiency, and standardized work and Kaizen &layouts. Principles of JIT – JIT system – Kanban – Kanban rules – Expanded role of conveyance – Production leveling – Pull systems – Value stream mapping.		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Introduction to Plastics Processing**
Plastics Processing Introduction – Processing of plastics – Injection moulding – Compression moulding – Transfer moulding – Extruding – Casting – Calendaring, machining and welding – fabrication methods. Applications of Plastics. Shear action in die cutting operation – punch and die clearance and angular clearance, centre of pressure, cutting forces. Press working operations: blanking, piercing and forming, lancing, cutting-off and parting, notching, shaving, trimming, embossing, beading and curling, bulging, twisting, coining, swaging, hole flanging or extruding – line sketches and meaning of terms.		
Unit – 4	**Number of lectures = 11**	**Title of the unit: Press Tools Introduction**
Press Tools Introduction – Types of Presses – hand, power, gap, inclinable, adjustable, horn, straight side, and pillar presses. Constructional details of a power press -Press size. Press Tools – Punch and die – Die Accessories – Stops, Pilots, strippers, Knockouts, pressure pads. Shear action in die cutting operation – punch and die clearance and angular clearance, centre of pressure, cutting forces.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

i) Manufacturing Technology - Vol.1 Paperback by P.N Rae,ISBN-**10 :** 9353160502,**Publisher** McGraw Hill Education (24 July 2018)

Reference Books:

i) Lean Manufacturing: Tools, Techniques, and How to Use Them (Resource Management) Hardcover – 28 September 2000 by William M Feld, **ISBN-13 :** 978-1574442977.

ii) Industrial Engineering & Operations management by S.K.Sharma & Savita Sharma,Kataria publishers ISBN: 1412918057

iii)	Handbook of Engineering Management- Edited by Dennis Lock, Butterwork & Heinemanky Ltd., ISBN: 0470942185
iv)	Lean Manufacturing and Tools Paperback by Shorya Sharma, ISBN-**13 :** 978-1647831806, **Publisher :** Notion Press (18 December 2019)

<table>
<tr><td colspan="8">1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING</td></tr>
<tr><td>2. Subject Name</td><td colspan="2">Signal & Systems</td><td>L – 3</td><td colspan="2">T – 0</td><td colspan="2">P -0</td></tr>
<tr><td>3.Course Code</td><td colspan="2">13010420</td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (√)</td><td colspan="2">PE()</td><td colspan="2">OE()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Engineering Mathematics-II</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (√)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical</td></tr>
<tr><td colspan="3">Lectures = 42</td><td>Tutorials =0</td><td colspan="4">Practical =0</td></tr>
<tr><td colspan="8">8. Course Description
This subject is about the mathematical representation of signals and systems. The most important representations we introduce involve the frequency domain – a different way of looking at signals and systems, and a complement to the time-domain viewpoint. Indeed engineers and scientists often think of signals in terms of frequency content, and systems in terms of their effect on the frequency content of the input signal.</td></tr>
<tr><td colspan="8">9. Course objectives: The students will learn and understand
1. Determination of system response for a signal.
2. Fourier and Z transform techniques as tool for signal analysis</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs): On completion of this course, the students will be able to
1. Demonstrate an understanding of the relation among the transfer function, convolution, and the impulse response, by explaining the relationship, and using the relationship to solve forced response problems.
2. Demonstrate an understanding of the relationship between the stability and causality of systems and the region of convergence of their Laplace transforms, by correctly explaining the relationship, and using the relationship to determine the stability and causality of systems.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 12</td><td colspan="5">Introduction to Signals &Systems</td></tr>
<tr><td colspan="8">Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables)</td></tr>
<tr><td>Unit – 2</td><td colspan="2">Number of lectures = 10</td><td colspan="5">Laplace-Transform (LT) and Z-transform</td></tr>
<tr><td colspan="8">One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC), One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping</td></tr>
<tr><td>Unit – 3</td><td colspan="2">Number of lectures = 10</td><td colspan="5">Fourier Transforms (FT)</td></tr>
<tr><td colspan="8">Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval’s theorem, Inverse FT, relation between LT and FT,</td></tr>
</table>

Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.		
Unit – 4	**Number of lectures = 10**	**Linear Time Invariant**
Continuous Time Systems: Linear Time invariant Systems and their properties. Differential equation & Block diagram representation, Impulse response, Convolution integral, Frequency response (Transfer Function), Fourier transforms analysis. Discrete Time System: Difference equations, Block diagram representation, Impulse response, Convolution sum, MATLAB tutorials.		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/		
13. Books Recommended **Text Books:** 1. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New DelhIi.		

1. Name of the Department – Electronics And Communication Engineering						
2. Subject Name	**Digital Electronics & Computer Organization**	**L** – 3	**T – 0**		**P -0**	
3.Course Code	13010421					
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Knowledge of Basic Algebra, Basic Electronics**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 38		**Tutorials =0**	**Practical =0**			

8. Course Description

The course covers basic of logic expression, Reduction techniques of Boolean expression. Knowledge of digital systems design based on combinational and sequential logic is also imparted. This course further teaches about PLD, Memories and Logic Families.

9. Course objectives:

1. Understanding the different number systems used in computerized system and codes used to represent the digits and arithmetic operation using each number system and codes.
2. Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

10. Course Outcomes (COs):

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

1. Verify and analyze the input/output data of each logic gate and circuits such as adders, counters.
2. Apply the digital circuit design concept in developing basic component of computer organization, projects or experiments.

11. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Number System and Boolean algebra**

Review of number system, Boolean algebra: De-Morgan's theorem, PI & EPI, Expression minimization using K-maps & Quine McCluskey method, Introduction to Logic Gates and their combinations.

Unit – 2	**Number of lectures = 10**	**Combinational & Sequential Circuits**

Combinational Circuits: Design of adder/subtractors, Comparators, code converters, encoders/decoders, multiplexers/de-multiplexers, Function realization.

Sequential Circuits: Latches and Flip flops - SR, D, JK and T. Design of Counters and shift registers.

Unit – 3	**Number of lectures = 10**	**Synchronous & Asynchronous Sequential Circuits**

Finite State Machine, Mealy/Moore Machines.

Analysis & design of Synchronous sequential circuits, Analysis & design of Asynchronous sequential machines.

Unit – 4	**Number of lectures = 10**	**Programmable Devices & Logic Families**

Memories: ROM, RAM, PROM, EPROM, Cache Memories, And PLA, PLD, And FPGA, digital logic families: TTL, ECL, CMOS.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Mano, Morris. "Digital logic." Computer Design. Englewood Cliffs Prentice-Hall (1979).

Reference Books

1. Floyd, Thomas L. Digital Fundamentals, 10/e. Pearson Education India, 1986.
2. Malvino, Albert Paul and Donald P. Leach. Digital principles and applications. McGraw-Hill, 1986.
3. Jain, Rajendra Prasad. Modern Digital Electronics 3. Tata McGraw-Hill Education, 2003.

. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING						
2. Subject Name	**Real time Embedded System**	**L** – 3	**T – 0**		**P -0**	
3.Course Code	13010522					
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Embedded System**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 42		**Tutorials =0**	**Practical =0**			

8. Course Description

Introduces microcontrollers and embedded processors. Gives knowledge of embedded system programming. Students can independently design and develop a hardware platform encompassing a microcontroller and peripherals.

9. Course objectives: The students will learn and understand

1. The basic concepts of Embedded Systems
2. The applications of embedded systems involving real-time programming of microcontrollers.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. To learn the basic concepts of Embedded Systems
2. To gain an understanding of applications of embedded systems involving real-time programming of microcontrollers.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**PIC Microcontroller**

Architecture - Features – Resets –Memory Organizations: Program Memory, Data Memory – Instruction Set – simple programs. Interrupts –I/O Ports –Timers- CCP Modules- Master Synchronous serial Port (MSSP)- USART –ADC- I2C

Unit – 2	**Number of lectures = 10**	**Embedded Processors**

ARM processor- processor and memory organization, Data operations, Flow of Control, CPU Bus configuration, ARM Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example: Alarm Clock.

Unit – 3	**Number of lectures = 10**	**Embedded Programming**

Programming in Assembly Language (ALP) Vs. High level language – C program elements, Macros and Functions – Use of pointers – NULL pointers – use of function calls – multiple function calls in a cyclic order in the main function pointers – Function queues and interrupt service Routines queues pointers – Concepts of Embedded programming in C++ - Object oriented programming – Embedded programming in C++, C program compilers – Cross compiler – optimization of memory codes.

Unit – 4	**Number of lectures = 10**	**Real Time Operating Systems**

Operating system services –I/O subsystems – Network operating systems –Interrupt Routines in RTOS Environment – RTOS Task scheduling models, Interrupt – Performance Metric in Scheduling Models –IEEE standard POSIX functions for standardization of RTOS and inter-task communication functions–List of Basic functions in a Preemptive scheduler – Fifteen point strategy for synchronization between processors, ISRs, OS Functions and Tasks – OS security issues- Mobile OS**.**

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Raj Kamal , Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill, New Delhi, 2003.*ISBN* 0-07-049470-3

Reference Books

1. Frank Vahid and Tony Givargi Embedded System Design: A Unified Hardware/Software Introduction's, John Wiley & Sons, 2000.
2. John B Peatman, Design with PIC Microcontrollers, Prentice Hall of India, 2007ISBN=0130462136

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Sensor and Architecture interfacing**	**L**	**T**		**P**	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical =00**			

8. Brief Syllabus

This course deals with the different type of sensors, transducers and their interfacing with microcontrollers. This also describes their role to know the domain status. It also deals with the process to further processing of sensing elements.

9. Learning objectives:

1. Educate students to understand the functioning of different types of sensors & their role in order to sense various parameters.
2. To utilize the status of different signal parameters in the real time application to control the working.

10. Course Outcomes (COs):

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

1. Explain static and dynamic characteristics and operating principle of Inductive, capacitive, magnetic, piezo electric, radiation, electro chemical sensors.
2. Illustrate the importance of standard of calibration
3. Select suitable sensor for a given automobile, aeronautics, machine tools and manufacturing application

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**

Definition, Measurement Techniques, Classification of errors, Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors, Classification of sensors, calibration techniques.

Resistance, Inductance and Capacitance Transducers: Potentiometer, strain gauges, optical encoders, LVDT, RVDT, Synchro, Microsyn,

Applications: Pressure, position, angle and acceleration. Capacitance circuitry, Feedback type condenser microphone , frequency modulating oscillator circuit, Dynamic capacitance variation, A.C. Bridge for Amplitude Modulation, Applications: Proximity, microphone, pressure, displacement

Unit – 2	**Number of lectures =12**	**Piezoelectric & Magnetic Sensors**

Piezoelectric Materials and properties, Modes of deformation, Multi-morphs, Environmental effects, Applications: Accelerometer, ultrasonic. Magnetic Sensors, types, principle, requirement and advantages: Magneto resistive, Hall Effect – Eddy current.

Radiation and Electro Chemical Sensors: Photo conductive cell, photo voltaic, Photo resistive, Fiber optic sensors, Ray and Nuclear radiation sensors, Electro chemical sensors: Electrochemical cell, Polarization, sensor Electrodes and electro-ceramics in Gas Media.

Unit – 3	**Number of lectures = 10**	**Modern Sensors**

Film sensors, micro-scale sensors, Particle measuring systems, Vibration Sensors, SMART sensors, Machine Vision, Multi-sensor systems

Applications of Sensors: Applications and case studies of Sensors in Automobile Engineering, Aeronautics, Machine tools and Manufacturing processes.

Unit – 4	**Number of lectures = 08**	**Applications and architecture interfacing**

Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, opto isolator stepper motor and DC motor.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

1. Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., 2005.

Reference Book:

2. Renganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2003.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Electrical Measurements and Instrumentation**	**L**	**T**		**P**	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Basic Electrical and Electronics Engineering	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 38		**Tutorials = 00**	**Practical =**			

8. Brief Syllabus

This course deals with the basics of Electrical and Electronic measuring instruments used in laboratory and industry. In the process they learn different type of instruments like PMMC, Moving Iron, Electrodynamometer which includes voltmeter, ammeter, wattmeter, energy meter, power factor meter, frequency meter, Q meter, etc. Students will also learn about different AC and DC bridges to obtain various electrical parameters. Display devices which include DVM, CRO, and DSO etc are also learnt to analyze electrical signals in the course.

9. Learning objectives:

1. To know the necessity of different measuring instruments and their design principle.
2. To understand the working principle of different measuring instruments and technical solutions to handle different errors.
3. To learn the architecture and working principle of advanced measuring instrument and their applications.

10. Course Outcomes:

On completion of this course, the students will be able to:

1. Learn units, dimensions, standards and errors and basics of different types of measuring instruments to measure different electrical quantities
2. Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments.

11. Unit wise detailed content

Unit-1	**Number of lectures = 13**	**Philosophy of Measurement & Analog Measurement of Electrical Quantities**
Unit & dimensions, standards, Errors, Characteristics of Instruments and measurement system, basics of statistical analysis. PMMC instrument, DC ammeter, DC voltmeter, Ohm meter, Moving Iron instrument, Electrodynamics Wattmeter, errors and remedies, Three Phase Wattmeter, Power in three phase system, Energy meter.		
Unit – 2	**Number of lectures = 05**	**Measurement: Instrument Transformer**
Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.		
Unit - 3	**Number of lectures = 08**	**Measurement of Parameters**
Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges- Wheatstone, Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Wagner Earthling device, Q Meter.		
Unit - 4	**Number of lectures = 08**	**AC Potentiometer & Magnetic Measurement**

Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. Ballistic Galvanometer, Flux meter. **Digital Measurement:** Concept of digital measurement, Digital voltmeter, Frequency meter, Power Analyzer and Harmonics Analyzer, Electronic, Multimeter. DSO and its applications.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.

Reference Books

1. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons.

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science and Engineering</td></tr>
<tr><td>2. Course Name</td><td colspan="2">Internet of things</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td>3. Course Code</td><td colspan="2"></td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE()</td><td>OE (✓)</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Knowledge of Mobile Computing</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd ()</td><td>Either Sem (✓)</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 42</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">The Internet of Things (IoT) is everywhere. It provides advanced data collection, connectivity, and analysis of information collected by computers everywhere—taking the concepts of Machine-to-Machine communication farther than ever before.</td></tr>
<tr><td colspan="8">9. Learning objectives:
i) Vision and Introduction to IoT.
ii) Understand IoT Market perspective.
iii) Data and Knowledge Management and use of Devices in IoT Technology.
iv) Understand State of the Art – IoT Architecture.
v) Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">On completion of this course, the students will be able to</td></tr>
<tr><td colspan="8">i) Understand the vision of IoT from a global context.</td></tr>
<tr><td colspan="8">ii) Determine the Market perspective of IoT.</td></tr>
<tr><td colspan="8">iii) Use of Devices, Gateways and Data Management in IoT.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 09</td><td colspan="5">Title of the unit: Introduction to IOT</td></tr>
<tr><td colspan="8">Vision and Introduction to IoT, M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.</td></tr>
<tr><td>Unit – 2</td><td colspan="2">Number of lectures = 08</td><td colspan="5">Title of the unit: Understand IoT Market perspective</td></tr>
<tr><td colspan="8">M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.
M2M to IoT- An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.</td></tr>
<tr><td>Unit – 3</td><td colspan="2">Number of lectures = 08</td><td colspan="5">Title of the unit: Devices in IOT</td></tr>
<tr><td colspan="8">Data and Knowledge Management and use of Devices in IoT Technology, M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business</td></tr>
</table>

processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management Understand State of the Art – IoT Architecture. 10 IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model

Unit – 4	**Number of lectures = 10**	**Title of the unit: Real World IoT Design**

Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

i) Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2018.

ii) Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.

iii) Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

1. Name of the Department- Computer Science and Engineering						
2. Course Name	**Ethical Hacking**	**L**	**T**		**P**	
3. Course Code	13010422	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	**Knowledge of cyber security**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Course Description

The goal of this course is to help you master an ethical hacking methodology that can be used in a penetration testing or ethical hacking situation. You walk out the door with ethical hacking skills that are highly in demand.

9. Learning objectives:

The objective of this course is to give knowledge of computer systems architecture, programming, operating systems and databases, alongside specialist topics in digital forensics, legal issues, networking, ethical hacking and computer security.

10. Course Outcomes (COs):

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

- **i)** Establish type of attack on a given system.
- **ii)** Analyze nature and type of attack.
- **iii)** Simulate different types of attacks using tools
- **iv)** Design a secure system for protection from the various attacks by determining the need of security from various departments of an organization.

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction to Ethical Hacking**

Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering,

Unit – 2	**Number of lectures = 08**	**Title of the unit: Introduction to Networking**

Introduction to Computer Systems and Networks , information systems and networks (including wireless networks) and their role in industry business and society, System and Network Vulnerability and Threats to Security , various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography, Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking.

Unit – 3	**Number of lectures = 08**	**Title of the unit: Fundamentals of Hacking**

Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking

Unit – 4	**Number of lectures = 10**	**Title of the unit: Fundamentals of Computer Fraud**

Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process. Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

viii) Hands-On Ethical Hacking and Network Defense – By Michael T. Simpson, Kent Backman, James Corley

ix) Official Certified Ethical Hacker Review Guide – By Steven DeFino, Barry Kaufman, Nick Valenteen

x) The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy (Syngress Basics Series) [Paperback]

1. Name of the Department- Computer Science and Engineering						
2. Course Name	**Software Project Management**	**L**	**T**		**P**	
3. Course Code	13010524	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	**Knowledge of Software Engineering**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
Built along the software project management lifecycle, this course covers detailed topics of the basic concepts of software project management, including initiating, planning, controlling, executing, and closing projects.						
9. Learning objectives: The objective of this course is to **i)** define and highlight importance of software project management **ii)** describe the software project management activities **iii)** train software project managers and other individuals involved in software project **iv)** planning and tracking and oversight in the implementation of the software project management process.						
10. Course Outcomes (COs):						
On completion of this course, the students will be able to						
i) describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project						
ii) compare and differentiate organization structures and project structures						
iii) implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction and Software Project Planning**				
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.						
Unit – 2	**Number of lectures = 08**	**Title of the unit: Project Organization and Scheduling**				
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.						
Unit – 3	**Number of lectures = 08**	**Title of the unit: Project Monitoring and Control**				
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: 23						

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walk through, Code Reviews, Pair Programming.		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Software Quality Assurance and Testing**
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.		
13. Books Recommended		
i) "Project Management: The Managerial Process with MS" - Clifford F. Gray and Erik W. Larson, Mc Graw Hill		
ii) Software Project Management - M. Cotterell, Tata McGraw-Hill Publication.		
iii) Software Project Management - Royce, Pearson Education		
iv) Software Project Management - Kieron Conway, Dreamtech Press		
v) Software Project Management - S. A. Kelkar, PHI Publication		

1. Name of the Department- Computer Science and Engineering						
2. Course Name	**E-Commerce**	**L**	**T**		**P**	
3. Course Code	13010525	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	**Web development**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This course introduces the concepts, vocabulary, and procedures associated with E-Commerce and the Internet. The student gains an overview of all aspects of E-Commerce. Topics include development of the Internet and E-Commerce, options available for do-ing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.

9. Learning objectives:

- **i)** Discuss fundamentals of e-commerce, types and applications.
- **ii)** Evaluate the role of the major types of information systems in a business environment and their relationship to each other
- **iii)** Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business
- **iv)** Identify the major management challenges for building and using information systems and learn how to find appropriate solutions to those challenges.
- **v)** Learn strategies for e-commerce, Mobile Commerce, Wireless Application Protocol, WAP technology and Mobile Information devices.

10. Course Outcomes (COs):

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

- **i)** Understand the basic concepts and technologies used in the field of management information systems
- **ii)** Understand the processes of developing and implementing information systems
- **iii)** Be aware of the ethical, social, and security issues of information systems and
- **iv)** Develop an understanding of how various information systems work together to accomplish the information objectives of an organization
- **v)** Understand the role of information systems in organizations, the strategic management processes, and the implications for the management and learn about the importance of managing organizational change associated with information systems implementation

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction**

Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit – 2	**Number of**	**Title of the unit: Network Infrastructure For E-**

	lectures = 08	**Commerce**
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Web Security**
Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Encryption**
Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.		
13. Books Recommended		
i) Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.		
ii) Pete Lohsin , John Vacca "Electronic Commerce", New Age International		
iii) Goel, Ritendra "E-commerce", New Age International		
iv) Laudon, "E-Commerce: Business, Technology, Society", Pearson Education		
v) Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH		

<table>
<tr><td colspan="8">1.Name of the Department- Computer Science Engineering</td></tr>
<tr><td>2.Course Name</td><td colspan="2">Data Structure Analysis &Algorithms</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td>3.Course Code</td><td colspan="2">13010618</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="2">4.Type of Course (use tick mark)</td><td colspan="2">Core ((✓)</td><td colspan="2">PE()</td><td colspan="2">OE()</td></tr>
<tr><td>5.Pre-requisite (if any)</td><td colspan="2"></td><td>6.Frequency (use tick marks)</td><td>Even (✓))</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 42</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8.Course Description</td></tr>
<tr><td colspan="8">9.Learning objectives
.1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations</td></tr>
<tr><td colspan="8">10.Course Outcomes (COs):</td></tr>
<tr><td colspan="8">1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms .</td></tr>
<tr><td colspan="8">2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.</td></tr>
<tr><td colspan="8">3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.</td></tr>
<tr><td colspan="8">4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.</td></tr>
<tr><td colspan="8">5. For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.</td></tr>
<tr><td colspan="8">6. Explain the ways to analyze randomized algorithms (expected running time, probability of error).</td></tr>
<tr><td colspan="8">11.Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 08</td><td colspan="5"></td></tr>
<tr><td colspan="8">Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.</td></tr>
<tr><td>Unit – 2</td><td colspan="2">Number of lectures = 08</td><td colspan="5"></td></tr>
</table>

Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branchand-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.		
Unit – 3	**Number of lectures = 08**	
Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.		
Unit – 4	**Number of lectures = 10**	
Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques. Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE		
12.Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.		
13.Books Recommended		
1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill. **Reference books** 1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson. 2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley. 3. Algorithms—A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA. 4. Fundamentals of Algorithms – E. Horowitz et al.		

1. Name of the Department		**CIVIL ENGINEERING**				
2. Subject Name	**Construction planning and Management**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core ()**	**PE(√)**		**OE()**	
5. Pre-requisite (if any)	Nil	**Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (√)	Every Sem ()

6. Total Number of Lectures, Tutorials, Practical		
Lectures = 33	**Tutorials = 0**	**Practical =0**

7. Brief Syllabus:

Construction project planning and administration the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participation satisfaction. Teaching these requirements by the designed course content

8. Learning objectives:

1. To train the students in the field work so as to have a firsthand knowledge of practical problems related to Construction Management in carrying out engineering tasks
2. To optimize the time of construction of a project by project planning tools.
3. To update the planners at site for material resources, time scheduling and project cost.
4. To give knowledge of risk management and remedial measures.
5. To make students aware of different construction equipment.

9. Subject Outcomes:

On completion of this course the students will be able

1. To plan, schedule and control the construction of the project.
2. To use project planning tools.
3. To carry out cost analysis and project updating.
4. To study risk analysis and resource allocation at site.
5. Understand different types of construction equipment its uses and output.

10. Unit wise detailed content

Unit-1	**Number of lectures = 7**	**Title of the unit: Project Management**

Introduction, Project planning, scheduling, controlling, Role of decision in project management, **Project management Process and role of Project Manager**

Unit - 2	**Number of lectures = 09**	**Title of the unit: Project Planning Tools**

Bar Charts and Milestones Chart: Introduction, Development of bar chart, Short comings and remedial measures, Milestone charts.

CPM & PERT: Elements of network, Time estimates, frequency distribution, mean, variance and standard deviation, probability distribution.

Network Analysis: Slack, Float, Critical path, crashing of activity.

Unit - 3	**Number of lectures = 09**	**Title of the unit: Cost Analysis & Updating**

Introduction, Projects cost: Direct cost, Indirect cost, slope of direct cost curve, total project cost and optimum duration, Cost optimization.

Project Updating: Introduction, updating process, data required for updating, steps in process updating.

Unit - 4	**Number of lectures = 08**	**Title of the unit: Risk analysis and Resource allocation**

Certainty, risk and uncertainty, risk management, identification and nature of construction risks, contractual allocation of risk, types of risks, minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis.

Resource Allocation: Resource usage profiles, Resource smoothing and levelling.

11. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

12. Books Recommended

Text Books

1. Project Planning and Control with PERT and CPM by B. C. Punmia, K.K. Khandelwal, Laxmi Publication.

Referance books

1. Peurifoy, R.L., Ledbetter.W.B and schexnayder,C, construction planning and equipment methods, McGraw Hill, Singapore.

2. Callahan, M.T., Quackenbush, D.G.,and rowing,J.E., Construction project scheduling, McGraw Hill ,New York.

3. Cleland, D.I. and Ireland, L.R., project management: Strategic design and implementation, , McGraw-Hill, New York.

4. Fisk, D.R. Construction Project Administration, Prentice hall International, London.

1. Name of the Department: Civil Engineering Department						
2. Course Name	**Hydropower**	**L**	**T**		**P**	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 40		**Tutorials = 0**	**Practical = 0**			

8. Learning objectives:

1. The objective of this course is to understand the concept of hydropower projects including investigation, planning and design aspects.

9. Course Outcomes (COs):

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

1. To learn the elements of hydropower scheme.
2. To study the estimation of hydropower potential
3. To gain knowledge on water conveyance system by studying intake structures, power canals, surge tanks and penstocks.
4. To understand the force exerted by a jet on a fixed target, moving target, and by a jet on a series of curved vanes.
5. To gain knowledge on Francis turbine and Miscellaneous hydraulic machines

10. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Title of the unit: HYDROPOWER PLANT DEVELOPMENT**

Sources and forms of energy Hydropower plants classification Layout and components, Development of hydropower schemes Comparison of Hydro and Thermal power, Survey and Investigation

Unit – 2	**Number of lectures = 8**	**Title of the unit: POWER POTENTIAL**

Estimation of Hydropower potential Flow duration curve, Firm power, Secondary power, Load and Load duration curves, Load factor, Firm capacity Reservoir capacity, Capacity factor

Unit - 3	**Number of lectures = 8**	**Title of the unit: WATER CONVEYANCE SYSTEM**

Intake structures: Location function and types of intakes, Energy losses at intake trash rock Power canals , Alignment, Design of power canals Penstocks, Alignment, types of penstock, Economic diameter of penstocks and Anchor blocks Water hammer pressure. Behavior of surge tanks, Types of surge tanks. Hydraulic design of simple surge tank.

Unit - 4	Number of lectures = 8	Title of the unit: IMPACT OF JET ON VANES
Introduction to Impulse Momentum equation and its applications Force exerted by a Jet on a fixed, Force exerted by a Jet on a moving target, Force exerted by a Jet on a serious of curved vane		

11. Brief Description of self learning / E-learning component

The online platform, will involve the NPTEL and SWAYAM portal system. Lecture series and assignments will be beneficial for the students. Seminars will be conducted with the students. Online means will be explored for broad outlook in the syllabus.

12. Books Recommended (2 Books+ 4 References)

1. Modi .P.N. and Seth .S.M, "Hydraulics and Fluid Mechanics", Standard Book House, 2005.
2. Rajput .R.K, "Fluid Mechanics and Hydraulic Machines", S.Chand and Company Ltd., 2013.
3. Bansal .R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications 2010
4. M.M.Dandekar and K.N.Sharma, "Water Power Engineering", Vikas ublications 1