CURRICULUM & SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

FOR

MASTER OF TECHNOLOGY

(STRUCTURAL ENGINEERING)

IN

CIVIL ENGINEERING

[w. e. f. 2024-25]

FACULTY OF ENGINEERING AND TECHNOLOGY
SRM UNIVERSITY DELHI-NCR, SONEPAT
Plot No.39, Rajiv Gandhi Education City, P.S. Rai, Sonepat
Haryana-131029

MASTER OF TECHNOLOGY (STRUCTURAL ENGINEERING)

VISION

SRM University Delhi-NCR, Sonepat, Haryana aims to emerge as a leading world-class university that creates and disseminates knowledge upholding the highest standards of instruction in Medicine & Health Sciences, Engineering & Technology, Management, Law, Science & Humanities. Along with academic excellence and skills, our curriculum imparts integrity and social sensitivity to mould our graduates who may be best suited to serve the nation and the world.

MISSION

- To create a diverse community campus that inspires freedom and innovation.
- Promote excellence in educational & skill development processes.
- Continue to build productive international alliances.
- Explore optimal development opportunities available to students and faculty.
- Cultivate an exciting and rigorous research environment.

OUTCOME

Program Educational Objectives (PEOs) for M.Tech. Program in Structural Engineering (SE):

PEO1: To expose the graduate students to advanced Structural Analysis, Structural Dynamics, allied theory in Elasticity and Plasticity, FEM etc.

PEO2: To impart training to graduate students in behavior and design of Advanced RC structures, behavior and design of Advanced Steel structure, latest procedures in earthquake resistant design practices and earthquake resistant design philosophies.

PEO3: To expose the graduate students to latest design codes, current national and international scenario on Structural Engineering and to motivate them in interdisciplinary involvement in problems related to Structural Engineering.

PEO4: To orient the graduate students to high value research related to Structural Engineering so that they get impetus to pursue research and lifelong learning.

Program Outcomes (POs) for the M.Tech. Program in Structural Engineering (SE):

After completion of the program graduates will be able to

PO1: Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude

PO2: Identify, formulate and solve engineering problems in the domain of structural engineering field.

PO3: Use different software tools for Analysis and Design structural engineering domain.

PO4: Design and conduct experiments, analyse and interpret data, for development of simulation experiments.

PO5: Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

PROGRAM SPECIFIC OUTCOMES (PSOs):

At the end of the program, the student:

PSO1: Is proficient in structural engineering profession by acquiring thorough knowledge in mathematical, computing and engineering concepts to Identify, formulate and solve real life problems thereby not only rendering safe and economical structures but also environmentally sustainable and useful to the society.

PSO2: Train and prepare them to exhibit professional attitude, ethical behaviour, and ability to communicate effectively with everyone and adapt to the latest developments and trends by engaging themselves in life-long learning.

PSO3: Have awareness of contemporary professional issues and support the engineering profession through participation in professional societies and/or educational institutions

FIRST YEAR
ODD SEMESTER

21ST101	MATRIX COMPUTER METHOD OF STRUCTURAL ANALYSIS	L	T	P	C
		4	0	0	4
Co-requisite	None				
Pre-requisite	Basics of structural analysis				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand flexibility & stiffness matrix analysis of different kinds of structures.
2	Write computer programs for 2D structural elements.
3	Write computer programs for 3D structural elements.
4	Do Non-linear analysis of structures

21ST102	ADVANCED REINFORCED CONCRETE STRUCTURES	L	T	P	C
		4	0	0	4
Co-requisite	None				
Pre-requisite	Basics of R.C. Elements, Structural analysis.				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand the background of structural concrete and behaviour of beams in flexure.
2	Understand the behavior of beams in shear and torsion.
3	Design columns in uniaxial and biaxial compression and combined loading.
4	Design RC and PSC members as per Indian Standards and specifications.
5	Detail reinforcement in RC and PSC members as per Codes of Practice.

21ST103	DESIGN OF BRIDGES	L	T	P	C
		4	0	0	4
Co-requisite					
Pre-requisite	Basics of structural analysis, R.C. & Steel Structures				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand types of bridges and codal provisions for loading and design standards of bridges.
2	Design of R.C., Steel and Pre-stressed concrete bridges.
3	Design and select materials suitable for bearings.
4	Analyze and design the bridge substructures.

21ST152	MATERIAL TESTING LABORATORY
Co-requisite	
Pre-requisite	
Data Books / Codes / Standards	
Course Category	
Course designed by	Department of Civil Engineering
Approval	

COURSE OUTCOME (COs)	
1	Student will be able to prepare a mix design as per IS Code
2	Student will be able to prepare a mix design as per ACI Code
3	Student will learn practical application of Rebound Hammer Test
4	Student will learn practical application of UPV
5	Student will learn to test beam in flexure and analyse result

22ST153	CAD in Structural Engineering	L	T	P	C
		0	0	2	2
Co-requisite					
Pre-requisite					
Data Books / Codes / Standards					
Course Category					

Course designed by	Department of Civil Engineering
Approval	

COURSE OUTCOME (COs)	
1	At the end of the course, students will be able to use the software like Auto Cad and Staad Pro effectively.

FIRST YEAR
EVEN
SEMESTER

21ST201	ADVANCED STEEL STRUCTURES	L	T	P	C
		4	0	0	4
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	General principle in the design of steel structures
2	Various types of connections
3	Steel transmission line towers
4	Plastic method of structural analysis
5	Analysis and design of industrial structures

21ST202	FINITE ELEMENTS METHOD WITH COMPUTER APPLICATION	L	T	P	C
		4	0	0	4
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Introduction to FEM and element properties
2	Study and Understand analysis of framed structures
3	Study and Understand analysis of axisymmetric and 3D stress analysis
4	Study and Understand analysis of plane bending, folded shells and plates
5	Study and Understand technique for non-linear analysis

21ST203	**PRESTRESSED CONCRETE STRUCTURES**	**L**	**T**	**P**	**C**
		4	0	0	4
Co-requisite	None				
Pre-requisite	Concrete Technology				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	analyze PSC flexural members
2	carry out the complete design of tension members
3	Understand analysis and design of compression member
4	Understand analysis and design of composite beam member
5	Understand analysis and design of indeterminate structures

22ST204	**RESEARCH METHODOLOGY& IPR**	**L**	**T**	**P**	**C**
		2	0	0	2
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	P PROFESSIONAL CORE				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand research problem formulation. Analyze research related information
2	Follow research ethics

3	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5	Understand analysis and design of indeterminate structure Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

21ST252	**STRUCTURAL ANALYSIS AND DESIGN LAB**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
Co-requisite					
Pre-requisite	21ST101, 21ST103.				
Data Books / Codes / Standards					
Course Category					
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand about Introduction to the use of Etabs.
2	Understand about graphical interface Basic modeling- element types –
3	meshing- Automatic Line Constraint
4	Understand about Analysis for wind and earthquake analysis, including the response spectra analysis
5	Understand about Concrete Design Steel

21ST252	**STAAD PRO**	**L**	**T**	**P**	**C**
		0	0	4	2
Co-requisite					
Pre-requisite	21ST101, 21ST103.				
Data Books / Codes /Standards					
Course Category					
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	To do modeling of Structures
2	To learn apply load as per IS codes

3	Analysis models for various load combinations
4	Design the model for worst loading conditions

LIST OF PROGRAM ELECTIVES

21STP01	ADVANCED NUMERICAL ANALYSIS	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite	Basics of Mathematics				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Will understand the concept of programming language C and its algorithm
2	Will be able to use programming language and civil engineering conceptual knowledge and imply the same to solve problems computationally
3	Design the model for worst loading conditions

21STP02	CONCRETE TECHNOLOGY & SPECIAL CONCRETES	L	T	P	C
		3	0	0	3
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	To do modeling of Structures
2	To learn apply load as per IS codes
3	Analysis models for various load combinations
4	Design the model for worst loading conditions

21STP03	DESIGN OF REINFORCED CONCRETE FOUNDATIONS	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite					
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Design isolated footings and analyse its various members
2	Should be able to design raft foundation for important structures
3	Should be able to design all kinds of concrete piles and pile cap
4	Should be able to understand the loads on beams and analyse those loads for safe designing
5	Should be able to design concrete foundations for towers

21STP04	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3
Co-requisite	Pone				
Pre-requisite	Basics and Applied soil mechanics				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Analyze the bearing capacity of foundations on cohesive & cohesionless soil.
2	Perform field experiment related to calculation of settlement in foundations.
3	Design different kind of foundations and cofferdams
4	Perform sub-soil exploration and calculate
5	design of coffer dam

21STP05	PROGRAMMING AND COMPUTER AIDED DESIGN OF STRUCTURES	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite					
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Student should be able to use computer software to analyse and design structural elements, water retaining structures, bridge components, multistoried building etc.

21STP06	RELIABILITY ANALYSIS & DESIGN OF STRUCTURES	L	T	P	C
		3	0	0	3
Co-requisite	None				
Pre-requisite	Basics of Structural Analysis				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Solve problems related to contemporary issues in structural Engineering by acquiring knowledge of mathematics, science and engineering.
2	To understand degree of freedom system.
3	Do analysis of practical problems related to earthquake phenomenon.
4	Do Non-linear analysis of structures
5	Solve problems related to contemporary issues in structural Engineering by acquiring knowledge of mathematics, science and engineering.

21STP07	SEISMIC DESIGN OF STRUCTURES	L	T	P	C
		3	0	0	3
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	To develop systematic knowledge of earthquake and its causes
2	To understand the basic concepts related to structural design for earthquake loads
3	To develop an idea about various structural systems adopted
4	To familiarize with design and detailing of various types of systems
5	To introduce fundamentals of repair and rehabilitation techniques

21STP08	SOIL STRUCTURE INTERACTION	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite	Basics of soil-mechanics and structural analysis.				
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand soil-structure-interaction models.
2	Analyze linear and non-linear soil-structure-interaction problems on different kinds of foundations.
3	Analyze the soil-structure interaction of framed structures.
4	Analyze of soil-foundation-structure interaction and various related models.

21STP09	STRUCTURAL DYNAMICS	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite					
Data Books / Codes / Standards					
Course Category	PE PROGRAM ELECTIVES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Solve problems related to contemporary issues in structural Engineering by acquiring knowledge of mathematics, science and engineering.
2	To understand degree of freedom system.
3	Do analysis of practical problems related to earthquake phenomenon.
4	Do Non-linear analysis of structures

21STP10	THEORY OF PLATES	L	T	P	C
		3	0	0	3
Co-requisite					
Pre-requisite	Mechanics of Solids and Theory of Elasticity				
Data Books / Codes / Standards					

Course Category	PE	PROGRAM ELECTIVES
Course designed by	Department of Civil Engineering	
Approval		

COURSE OUTCOME (COs)	
1	Student will be able to understand concepts of deflection, bending of various geometrical shapes and solve the problems related to them.
2	Students will be able to solve problem related to rectangular plates
3	Students will be able to understand and solve problem related to plates and elastic buckling of plates.
4	Students will be able to solve problems related to composite plates

22STP11	**THEORY OF ELASTICITY**	**L**	**T**	**P**	**C**
		3	0	0	3
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	PE	PROGRAM ELECTIVES			
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Students will have knowledge about stress analysis
2	Students will be capable of understanding behaviour of complex structures under various loading conditions.

LIST OF AUDIT COURSES

ST_AUD_01	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	The Students will become conscious citizens of India aware of their duties, rights and functions of various bodies of governance and welfare; thereby well equipped to contribute to India.

ST_AUD_02	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Know the significance of disaster management.
2	Study the occurrences, reasons and mechanism of various types of disaster
3	Learn the preventive measures as Civil Engineer with latest codal provisions
4	Apply the latest technology in mitigation of disasters

ST_AUD_03	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Understand basic Sanskrit language
2	Understand Ancient Sanskrit literature about science and technology

3	Get equipped with Sanskrit and explore the huge knowledge from ancient literature

ST_AUD_04	**VALUE EDUCATION**	**L**	**T**	**P**	**C**
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Knowledge of self-development
2	Learn the importance of Human values
3	Developing the overall personality
4	Strengthen the "EQ"

ST_AUD_05	**CONSTITUTION OF INDIA**	**L**	**T**	**P**	**C**
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	The Students will become conscious citizens of India aware of their duties, rights and functions of various bodies of governance and welfare; thereby well equipped to contribute to India.

ST_AUD_06	**PEDAGOGICAL STUDIES**	**L**	**T**	**P**	**C**
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	It will improve teaching effectiveness of prospective teachers.
2	A prospective teacher will be able to design curriculum and assess the curriculum of their discipline in an effective way by understating the needs of the learners.

3	How can teacher education, school curriculum and guidance support effective pedagogy?
4	It will be functional for professional development among teachers.

ST_AUD_07	**STRESS MANAGEMENT BY YOGA**	**L**	**T**	**P**	**C**
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
Approval					

COURSE OUTCOME (COs)	
1	Develop healthy mind and healthy body thus improving social health also
2	Improve efficiency
3	Improving "SQ"

ST_AUD_08	**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**	**L**	**T**	**P**	**C**
		2	0	0	0
Co-requisite	None				
Pre-requisite	None				
Data Books / Codes / Standards					
Course Category	AC AUDIT COURSES				
Course designed by	Department of Civil Engineering				
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COURSE OUTCOME (COs)	
1	The study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3	Study of Neetishatakam will help in developing versatile personality of students.