Establish the connect between the courses and POs (15)

After finalizing the structure and course names, COs are formulated by a faculty or the group of expert faculties for all of the courses. These COs are then discussed in DPPC. After that their mapping is carried out with POs. Entire CO-PO mapping is discussed and approved by DPPC and BoS.

The table shown below gives the course outcomes of the courses in the program curriculum for the year 2016-19.

Sr. No.	Course Code	Course Title	Course Outcomes	
Semester I:				
1	OEC	MATLAB for Engineers [To be offered to other programs]	CO1:	Understand the basics of MATLAB programming
			CO2:	Develop the computer programs in MATLAB
			CO3:	Apply MATLAB for solving engineering problems
2	PSMC	Computational Methods in Engineering	CO1:	Mathematically model and analyze physical system
			CO2:	Solve structural engineering problems using numerical methods
			CO3:	Write the code for a mathematical problem
3	PCC	Structural Dynamics	CO1:	Apply fundamental theory of structural dynamics and equation of motion
			CO2:	Analyze and study dynamics response of single and multi-degree-of freedom systems.
			CO3:	Use the available software for dynamic analysis.
4	PCC	Solid Mechanics	CO1:	Understand basic concepts of Elasticity and Plasticity
			CO2:	Solve problems of elasticity and plasticity applied to isotropic materials

5	PCC	Theory of Thin Plates and Shells	CO1	Understand basic concepts of theory of plates and shells
			CO2:	Solve problems related to thin plates and shells
			CO3:	Apply the numerical techniques and tools for the complex problems
6	PCC	Advanced Analysis of Structures	CO1	Solve the skeletal structures using the direct stiffness method
			CO2:	Solve the skeletal structures using flexibility method
			CO3:	Develop the computer programs using the direct stiffness method and Use the commercial software for the analysis
7	LC	Lab Practice- I	CO1	Handle appropriate equipments and tools
			CO2:	Design simple experiments related with structural systems
			CO3:	Function as team member for laboratory work
Semester II:				
8	PCC	Finite Element Method	CO1	Formulate the finite element model for the analysis of structural engineering problems
			CO2:	Develop the computer program using One D and Two D finite elements for the analysis.
			CO3:	Use the commercial software for the analysis
9	PCC	Advanced Design of Structures	CO1	Analyze the special structures by understanding their behaviour
			CO2:	design and prepare detail structural drawings for execution, citing relevant IS codes

10	PCC	Earthquake Analysis and Design of Structures	CO1:	Analyze structures and structural components by understanding their behaviour during earthquake
			CO2:	Design and prepare details for execution citing relevant IS codes
11	DEC	Design of Pre-stressed Concrete Structures	CO1:	Understand the basic aspects of pre-stressed concrete fundamentals, including pre and post-tensioning processes
			CO2:	Find out losses in the pre-stressed concrete
			CO3:	Analyse and design fully pre-stressed concrete flexural members, compression members
			CO4:	Design end blocks with pre-stressing anchorages
12	DEC	Computer Aided Analysis of Structures	CO1:	Deploy low end applications using low and high level languages on microcontroller platform
			CO2:	Implements simple sketches on the Arduino boards involving several peripherals
			CO3:	Identify, design and implement applications on the Arduino boards producing custom shields
13	DEC	Structural Health Monitoring	CO1	Analyze a structure from safety point of view
			CO2:	Analyze and do the audit of a structure
			CO3:	Analyze and suggest suitable measures for Retrofitting of Structures
14	LC	Lab Practice- II	CO1	Apply appropriate tools to design and conduct experiments
			CO2:	Select and apply appropriate numerical techniques
			CO3:	Function as team member for

				laboratory work
15	LC	Mini-Project	CO1	Carry out the literature survey
			CO2:	Identify and define formulation for small problems(Experimental/Analytical)
			CO3:	Communicate the findings of the study
16	MLC	Humanities	CO1	Understand the need, basic guidelines, content and process for value education
			CO2:	Understand the harmony in the family, difference between respect and differentiation
			CO3:	Understand the harmony in nature, interconnectedness and mutual fulfillment in nature, holistic perception of harmony
			CO4:	Understand natural acceptance of human values, competence in professional ethics
Semester III:				
17	DEC	Bridge Engineering	CO1	Understand behaviour of Bridge components
			CO2:	Analyse components of bridges
			CO3:	Design simple bridges
18	DEC	Advanced Steel Design	CO1	Analyze steel skeleton structures
			CO2:	Analyze and Design a framed multi-storey building using software
			CO3:	Analyze and Design a Trussed girder bridge
19	DEC	Advanced Finite Element Method	CO1	Implement advanced concepts in Finite Element Analysis
			CO2:	Solve plate and shell problems

			CO3:	Solve non-linear structural engineering problems
20	Dissertation	Dissertation Phase – I	CO1	identify structural engineering problems reviewing available literature
			CO2:	Identify appropriate techniques to analyze complex structural systems
			CO3:	Apply engineering and management principles through efficient handling of project
21	LLC	Liberal Learning Course	CO1	Demonstrate the additional information related to the area of their interest may be even non technical with enthusiasm
			CO2:	Demonstrate their hidden talent in the area of their Interest
22	MLC	Research Methodology	CO1	Understand research problem formulation
			CO2:	Analyze research related information
			CO3:	Follow research ethics
Semester IV:				
23	Dissertation	Dissertation Phase - II	CO1	Apply appropriate techniques and tools to solve complex structural problems.
			CO2:	Exhibit good communication and demonstrate professional ethics and work culture.
			CO3:	Show contribution in efficient technology transfer to the society
24	MLC	Intellectual Property Rights	CO1	Be vigilant and enlightened to generate new ideas
			CO2:	Appreciate the importance of IP in the institution of an efficiently organized society
			CO3:	Understand that how IPR are sources of national wealth and mark of an

				economic leadership in the context of global market scenario

Following table below gives the course outcomes of the courses in the program curriculum for the year 2019-23.

Sr. No.	Course Code	Course Title	Course Outcomes	
Semester I				
1	CSE-19001	Numerical Methods in Structural Engineering	CO1:	mathematically model and analyze physical system
			CO2:	solve structural engineering problems using numerical methods
			CO3:	write the code for a mathematical problem
2	CSE-19002	Advanced Analysis of Structures	CO1:	Analyse indeterminate structures using Flexibiltymethod
			CO2:	Develop member stiffness matrices for Framed structures
			CO3:	Develop computer program for Plane Frame structure
			CO4:	Analyse Framed structures using computer program
3	CSE(DE)-19001	Advanced Design of RC Structures	CO1:	Analyze the special structures by understanding their behavior
			CO2:	Design and prepare detail structural drawings for execution
			CO3:	Cite relevant IS codes
4	CSE(DE)-19002	Advanced Design of Steel Structures	CO1	Design and detail the beam to beam and beam to column connections

			CO2:	Analyze and design the plate girder for railway bridges
			CO3:	Analyse Bridge Substructures, bearings and wing walls
			CO4:	Analyse and Design of PEB frames
5	CSE-19003	Structural Dynamics	CO1	Apply fundamental theory of structural dynamics and equation of motion to field problems
			CO2:	Analyse and interpret dynamic response of single and multi-degree-of-freedom systems
			CO3:	Perform dynamic analysis of single and multi-degree-of-freedom systems using MATLAB programs / software
6	CSE-19004	Solid Mechanics	CO1	Understand Principles of Solid Mechanics to be used for the analysis of structures
			CO2:	Idealise continuum problems in structural engineering
			CO3:	Solve simple elasticity problems
7	CSE-19005	Lab Practice -I: NDT and Structural Dynamics	CO1	Apply appropriate tools to design and conduct experiments
			CO2:	Select and apply appropriate numerical techniques
			CO3:	Function as team member for laboratory work
8	CSE-19006		CO1	Apply appropriate tools to design and conduct experiments

		Lab Practice -II: Computer Aided Design	CO2:	Select and apply appropriate numerical techniques
			CO3:	Function as team member for laboratory work
Semester II:				
9		MATLAB for Engineering Applications	CO1:	Understand the basics of MATLAB programming
			CO2:	Develop the computer programs in MATILAB
			CO3:	Apply MATLAB for solving engineering problems
10	CSE(DE)-19003	High Rise Structures	CO1:	
			CO2:	
			CO3:	
			CO4:	
11	CSE(DE)-19004	Bridge Engineering	CO1:	Analyze the superstructure of bridges - slab, T-beam and Box type
			CO2:	Design the superstructure of bridges - slab, T-beam and Box type
			CO3:	Analysis of Bridge Substructures, bearings and wing walls
12	CSE(DE)-19005	Advanced Structural Dynamics	CO1	Apply fundamentals of Structural Dynamics to different Structures
			CO2:	Analyse RC and Steel Structural components from seismic considerations
			CO3:	Design RC and Steel building components from seismic considerations

13	CSE(DE)-19006	Nonlinear Structural Analysis	CO1	Use numerical technique to solve nonlinear system of equilibrium equations.
			CO2:	Develop geometric stiffness matrix for plane frame structures.
			CO3:	Develop computer program for geometric non-linearity.
			CO4:	Analyse structures considering geometric as well a material non-linearity.
14	ML-19011	Research Methodology and Intellectual Property Rights	CO1	Demonstrate research problem formulation and approaches of investigation of solutions for research problems
			CO2:	Learn ethical practices to be followed in research and apply research methodology in case studies and acquire skills required for presentation of research outcomes
			CO3:	Discover how IPR is regarded as a source of national wealth and mark of an economic leadership in context of global market scenario
			CO4:	Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits
15	ML-19012	Effective Technical Communication	CO1	Produce effective dialogue for business related situations
			CO2:	Use listening, speaking, reading and writing skills for communication purposes and attempt tasks by using functional grammar and vocabulary effectively
			CO3:	Analyse critically different concepts / principles of communication skills
			CO4:	Demonstrate productive skills and have a knack for structured

				conversations
			CO5	Appreciate, analyse, evaluate business reports and research papers
16	LL-19001	Liberal Learning Course	CO1	Survey new topics from various disciplines and Select various sources and avenues to harvest/gather information.
			CO2:	Explain qualitative attributes of a good learner.
			CO3:	Demonstrate quantitative measurements of learning approaches and learning styles
			CO4:	Appreciate openness to diversity
17	CSE-19007	Finite Element Method	CO1	Solve structural engineering problems using one dimensional finite elements.
			CO2:	Solve structural engineering problems using two and three dimensional elements.
			CO3:	Use the commercial software/ Computer programs for the analysis.
18	CSE-19008	Theory of Thin Plates and Shells	CO1	Understand the basic concepts of theory of thin plates and shells
			CO2:	Solve problems based on thin plates and shells
			CO3:	Understand the basic concepts of laminated composite plates
19	CSE-19009	Mini Project	CO1	
			CO2:	
			CO3:	

			CO4:	
20	CSE-19010	Lab Practice III Experimental Concrete Technology	CO1	
			CO2:	
			CO3:	
			CO4:	
Semester III				
21	SBC (CSE-19011)	Dissertation Phase – I	CO1	Identify structural engineering problems reviewing available literature.
			CO2:	Identify appropriate techniques to analyze complex structural systems.
			CO3:	Demonstrate application of engineering and management principles through efficient handling of project
22	SLC (CSE-19012)	Massive Open Online Course –I:	CO1	
			CO2:	
			CO3:	
			CO4:	
Semester IV				
23	SBC (CSE-19013)	Dissertation Phase – II	CO1	Apply appropriate techniques and tools to solve complex structural problems.
			CO2:	Exhibit good communication skill to the engineering community and society. Students will be able to

				demonstrate professional ethics and work culture.
			CO3:	Contribute in efficient technology transfer to the society.
			CO4:	
24	SLC (CSE-19014)	Massive Open Online Course –II:	CO1	
			CO2:	
			CO3:	
			CO4:	

After discussions and deliberation among the stake-holders relevant program outcomes are sorted out. The M. Tech. Civil (Structural Engineering) program has following Program Outcomes (POs).