Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Choice Based Credit System (CBCS) in Light of NEP-2020

M. Tech (Common for all Engineering branches)

(2021-2023)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTRM301	AECC	Research Methodology in Engineering	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. The course has been developed with orientation towards research related activities and recognizing the ensuing knowledge as property.
2. To analyze and evaluate research works and to formulate a research problem to pursue research.
3. To develop skills related to professional communication and technical report writing.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understanding and formulation of research problem.
2. Apply quantitative and qualitative methods used in engineering research.
3. Analyze interpret and evaluate data that relate to engineering problems.
4. Develop skills related to professional communication, technical report writing and publishing papers.
5. Act professionally, autonomously, ethically and in teams to produce a professional product.

Syllabus

Unit-I

Introduction to Research Methodology: - An overview of Research process, Types of research; Approaches to research, Importance of criticism in Literature review, identifying research gaps; Formulation of research problem; Research design,

Data: Primary and secondary data-sources, advantages/disadvantages; Sampling and primary data collection, sampling size, random and structured sampling

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Unit-II

Measurement and Scaling Techniques: - Types of scales, Criteria for good measurement, Attitude measurement - Likert's scale, Semantic differential scale, Thurstone-equal appearing interval scale.

Statistical Tools for Data Analysis: - Measure of central tendency, Measures of dispersion, Correlation and Regression, Formulation of hypothesis, Type I & Type II error, Parametric test, non-parametric test.

Unit-III

Research Methods I - Use of computer software in research and understanding the limitations. Multi-attribute decision making methods, Data envelopment analysis, Grey relational analysis etc., Multidisciplinary research problems, Synthesis of disciplinary research findings; Reliability and sensitivity analysis.

Unit-IV

Research Methods II - Modeling and simulation of engineering problem; Mathematical modeling-formulation, calibration, validation, application; measurement design – validity, reliability, scaling and sources of error. Mathematical programming methods, Numerical analysis, Optimization techniques, Design of laboratory experiments and field tests.

Unit-V

Academic Writing Skills and Presentation - Layout of a Research paper, research report, Thesis structure, Impact factor of Journals, Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Reference Management Software like Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism. Guidelines on how to write research papers. Content of Poster presentation, Power point presentation, Oral presentation

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Text Books -

1. C.R. Kothari, 2012. Research Methodology Methods and Techniques, 3/e, Vishwa Prakashan,
2. Montgomary, Douglas C., 2007. Design and Analysis of Experiments (Wiley India).
3. Chawla, D. and Sodhi, N., 2011. Research methodology: Concepts and cases. Vikas Publishing House.

Reference:

1. Donald H.McBurney, "Research Methods", 5th Edition, Thomson Learning, ISBN: 81-315-0047.
2. Donald R. Cooper, Pamela S. Schindler, "Business Research Methods", 8/e, Tata McGraw-Hill Co. Ltd.,
3. Timothy J. Ross, "Fuzzy Logic with Engg Applications", , Wiley Publications, 2nd Ed[d]
4. Thiel D.V. "Research Methods for Engineering", Published by Cambridge University Press, UK
5. P.J. van Laarhoven & E.H. Aarts, "Simulated Annealing: Theory and Applications" (Mathematics and Its Applications).

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 1201	DCC	Theory and Design of Metal Structures	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The students (A) will be able to design the different Steel Structures (B) according to IS codal specification(C) efficiently & economically (D) with safety provisions.

Course Outcomes:
Student will be able to
1. Design bolted and welded connections in different steel structures.
2. Design various storage structures like bunker, silo, and tanks.
3. Design light gauge steel sections.
4. Understand and analyze the behavior of space structures.
5. Design various types of steel bridges.

Syllabus

UNIT I **6 Hrs.**
Design of Connections: Types of connections; Welded and bolted; Throat and root stresses in fillet welds; Seated connections; Un-stiffened and stiffened seated connections; Moment resistant connections; Clip angle connections; Split beam connections; Framed connections; HSFG bolted connections

UNIT II **5 Hrs.**
Design of Storage Structures: Introduction to storage structures and classifications; Design of Bunkers; Design of silos; Design of pressed steel water tank

UNIT III **6 Hrs.**
Design of Bridges: Study and interpretation of loading standards for bridges; Codal provision for bridge structure; Classification for bridge structure; Design of truss bridges; Plate girder bridge as per IS codes Specification

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MTCE 1201	DCC	Theory and Design of Metal Structures	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
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UNIT IV **6 Hrs.**

Analysis and Design of Industrial Buildings: Analysis and design of different types of trusses; Introduction to space structures and double layer grids; Analysis and design of industrial buildings; Braced and un-braced gable frames with gantry rigid industrial frames and fire resisting design.

UNIT V **6 Hrs.**

Design of Light Gauge Steel Sections: Forms of light gauge sections; Shapes of decks and panels; Local buckling of thin element; Multiple stiffened compression element; Compression on un-stiffened elements; Axially loaded compression members.

Text Books:

1. Duggal S.K., Limit state design of steel structure, TMH publication,2014
2. Punmia BC, Design of Steel structure, Laxmi Publication, 2011

Reference Books:

1. Subramanian.N, Design of Steel Structures, Oxford University Press, 2014.
2. Dayaratnam P, Design of Steel structure, S. Chand ltd. New Delhi 2008.
3. Ramchandra, Design of Steel structure, Scientific Publishers,2011

List of Practical's:

Detailed drawing of various structural systems as per the syllabus.

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MTCE 1202	DCC	Design of Tall Structures	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1 To know the behaviour of tall structures
2 To understand Characteristics of Wind and Earthquake Forces
3 To understand the shear walls and frame structure

Course Outcomes:

1. Achieve Knowledge of design and development of problem solving skills.
2. Understand the principles of strength and stability
3. Design and develop analytical skills.
4. Summarize the behavior of various structural systems.
5. Understand the concepts of P-Delta analysis

Syllabus:

UNIT I **8 Hrs.**

Design Criteria: Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads

UNIT II **8 Hrs.**

Wind loading: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.

UNIT III **8 Hrs.**

Behaviour of Various Structural Systems: Factors affecting growth, Height and structural form; High rise behaviour, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores

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MTCE 1202	DCC	Design of Tall Structures	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
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UNIT IV **8 Hrs.**

Analysis and Design: Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist,

UNIT V **9 Hrs.**

Stability of Tall Buildings: Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis,
Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire.

Text Book:

1. Tall Building Structures: Analysis and Design, Bryan Stafford Smith, Wiley,
2. Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, Bungale S. Taranath, CRC Press, 2011.
3. Lynn S.Beedle, "Advances in Tall Buildings"- CBS Publishers and Distributors.

References Books:

1. Designing Tall Buildings: Structure, Mark Sarkisian, Routledge; 1 edition, 2011.
2. Dr. Y.P. Gupta – Editor, "Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"- New Age International Limited

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MTCE 1203	DCC	**Finite Element Method**	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
To provide the fundamental concepts of the theory of the finite element method

Course Outcomes:
1. To obtain an understanding of the fundamental theory of the FEA method
2. To develop the ability to generate the governing FE equations for systems governed by partial differential equations
3. To understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements
4. To understand the application and use of the FE method for heat transfer problems.

Syllabus:

UNIT I **8 Hrs.**
Introduction to Finite Element Method: General applicability and description of finite element method; Comparison of different methods

UNIT II **8 Hrs.**
Solution of Finite Element Method: Solution of Equilibrium Problems; Eigen value problems; Propagation problems; Computer implementation of Gaussian Eliminations; Choleski's decomposition; Jacobi's and Ranga Kutta Method

UNIT III **9 Hrs.**
General Procedure of Finite Element Method: Descretization of the domain; Selection of shapes; Types and number of elements; Node numbering technique; Interpolation polynomials, their selection and derivation in terms of global and local coordinates; Convergence requirements; Formulation of element characteristic matrices and vectors; Variational approach; Assembly of element matrices and vectors and derivation system equations; Computation of element resultants

UNIT IV **8 Hrs.**
Iso-parametric Formulation: Lagrange and Hermite's interpolation functions; Isoparametric Elements; Numerical Integration.

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MTCE 1203	DCC	Finite Element Method	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
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UNIT V **8 Hrs.**

Static Analysis: Formulation of equilibrium equation; Analysis of truss and frames; Plane Stress and Plane Strain Problems.

Text Book:

1. Weaver, Johnson, Finite element for structural analysis, Prentice-Hall International
2. HC Martin, Matrix structural analysis, McGraw-Hill Inc.
3. CF Abel, CS Desai, Finite element methods, Prentice Hall India Learning Private Limited, 2008

References Books:

1. Schaum's Outline of Finite Element Analysis (Schaum's Outlines), McGraw-Hill Education,1995
2. C. S. Krishnamoorthy, Finite Element Analysis Theory and Programming, Tata McGraw-Hill,200

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MTCE 1204	DCC	Design of Earthquake Resistant Structures	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
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Course Objectives:
This course integrates information from various engineering and scientific disciplines in order to provide a rational basis for the design of earthquake-resistant structures.

Course Outcomes:
1 Understanding of basic principles and importance of structural dynamics and earthquake effects on structures.
2 Learning the importance of structural dynamics and earthquake exactions in civil engineering in practice.
3 Learning and apply basic methods employed for analysis of civil engineering problems involving dynamics and earthquake.

Syllabus:

UNIT I **8 Hrs.**
Seismic Strengthening of Existing Buildings: Cases Histories-Learning from earthquakes; Seismic strengthening procedures.

UNIT II **9 Hrs.**
Torsion and Rigidity: Rigid Diaphragms; Torsional moment; Center of mass and center of rigidity torsion effects; Lateral Analysis of Building Systems; Lateral load distribution with rigid floor diaphragms; Moment resisting frames; Shear walls; Lateral stiffness of shear walls; Shear wall-frame combination, examples.

UNIT III **9 Hrs.**
Concept of Earthquake Resistant Design: Objectives of seismic design; Ductility, hysteric response & energy dissipation; Response modifications factor, Design spectrum, Capacity design; Classification of structural system; IS code provisions for seismic design of structures; Multi-storied buildings; Design criteria; P-A effects; Storey drift; Design examples of ductile detailing of RCC structures.

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MTCE 1204	DCC	Design of Earthquake Resistant Structures	60	20	20	0	0	2	1	0	3

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UNIT IV **8 Hrs.**

Seismic Design of Special Structures: Elevated liquid storage tanks; Hydrodynamic pressure in tanks; Stack like structures; IS-1893 code provisions for bridges; Superstructures and substructures; Submersible bridges; Hydrodynamic effect due to reservoir; Concrete gravity dams.

UNIT V **8 Hrs.**

Engineering Seismology: Basic terms related to engineering seismology; Seismic waves; Earthquake magnitude and intensity; Ground motion; Dynamic response of structures; Normalized response spectra; Seismic coefficients and seismic zone coefficients.

Text Book:

1. Chopra A.K., Dynamics of Structures', Theory & Applications to Earthquake Engineering, Prentice Hall India, New Delhi-1995
2. Clough & Penzien, Dynamics of Structures, McGraw Hill Book Co. Inc.
3. Paz M, Structural Dynamics, Van Nostrand Reinhold, New York
4. Paz, M, International Handbook of Earthquake Engineering, Chapman & Hall, New York.

References Books:

1. IS-1893-1984, Indian Standard Criteria for Earthquake Resistant Design of Structures, B.I.S., New Delhi.
2. IS-4326-1993, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, B.I.S., New Delhi.

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