GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Master of Technology in Structures Engineering
(M. Tech SE-148)

Session: 2021-22

Guru Gobind Singh College of Engg. & Tech.
Guru Kashi University, Talwandi Sabo

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Annexure -1

Program Name: Master of Technology in Structures Engineering

Program Code: 148

The Program Outcomes (POs) for the Program Master of Technology in Structures Engineering are as follows:

PO	Statement
PO1	**Engineering knowledge:** Apply the advance 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 and advanced engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design advanced solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Effectively 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 advance professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Individual and team work:** An ability to independently carry out advance research /investigation and development work to solve the practical problems.
PO9	**Communication:** An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
PO 10	**Project management and finance:** Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate Master program.
PO 11	**Life-long learning:** Ability to Analyze, evaluates, and select computer applications for the purpose of efficient and effective construction project management.

PO 12	**Ethics:** Enhance the ability to Analyze construction projects related to fundamental aspects of construction management (i.e., cost, schedule, quality, safety, ethics) and develop appropriate solutions

The Program Specific Outcomes (PSOs) for the Program Masters of Technology in Structures engineering are as follows:

PSO	**Statement**
PSO1	Enhancing the employability skills by making the students capable of qualifying National level competitive examinations.
PSO2	Inculcating in students technical competencies to deal with practical aspects of civil engineering.
PSO3	Enforcement of environmental legislation and Public awareness related to civil engineering.

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Annexure-2

Study Scheme										
Semester: Ist										
S.No	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	A148105	Advanced Structural Analysis	T	3	0	0	3	40	60	100
2	148106	Advanced Solid Mechanics	T	3	0	0	3	40	60	100
3		**Elective-I**	T	3	0	0	3	40	60	100
4		**Elective-II**	T	3	0	0	3	40	60	100
5	148107	Research Methodology and IPR	T	3	0	0	3	40	60	100
6		**Audit Course-I**	T	3	0	0	3	40	60	100
7	148108	Structural Design Lab	P	0	0	4	2	30	20	50
8	148109	Advanced Concrete lab	P	0	0	4	2	30	20	50
Total No. of Credits							22			

S.No	**Elective-I (Select one of the following Subjects)**	
1	148110	Theory of Thin Plates & Shells
2	148111	Theory & Applications of Cement Composites
3	148112	Theory of Structural Stability

S.No	**Elective-II (Select one of the following Subjects)**	
1	148113	Analytical and Numerical Methods for Structural Engineering
2	148114	Structural Health Monitoring
3	148115	Structural Optimization

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Study Scheme										
Semester: 2nd										
S.No	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	148208	FEM in Structural Engineering	T	3	0	0	3	40	60	100
2	148209	Structural Dynamics	T	3	0	0	3	40	60	100
3		**Elective-III**	T	3	0	0	3	40	60	100
4		**Elective-IV**	T	3	0	0	3	40	60	100
5		**Audit Course-II**	T	3	0	0	3	40	60	100
6	148210	Model Testing Lab	P	0	0	4	2	30	20	50
7	148211	Numerical Analysis Lab	P	0	0	4	2	30	20	50
8	148212	Mini Project*	P	0	0	4	2	50	NA	50
Total No. of Credits							21			

***Mini Project:- In case of mini project, they will solve a live problem using software/analytical/computational tools. Students will learn to write technical reports and will develop skills to present and defend their work in front of technically qualified**

Elective-III (Select one of the following Subjects)		
1	148213	Advanced Steel Design
2	148214	Design of Formwork
3	148215	Design of High Rise Structures
4	148216	Design of Masonry Structures

Elective-IV (Select one of the following Subjects)		
1	148217	Design of Advanced Concrete Structures
2	148218	Advanced Design of Foundations
3	148219	Soil Structure Interaction
4	148220	Design of Industrial Structure

Semester: 3rd										
S.No	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1		**Elective-V**	T	3	0	0	3	40	60	100
2		**Open Elective**	T	3	0	0	3	40	60	100
3	148314	Dissertation Phase-I*	P	0	0	2#+18^	10	300	200	500
Total No. of Credits				6			16			

***Dissertation Phase – I:-The work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem formulation with objectives and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.**

Elective-V (Select one of the following Subjects)		
1	148310	Design of Pre stressed Concrete Structures
2	148311	Analysis of Laminated Composite Plates
3	148312	Fracture Mechanics of Concrete Structures
4	148313	Design of Plates & Shells

	Open Elective Course List	
S.No	**Subject Code**	**Subject Name**
1	142245	Business Analytics
2	142246	Industrial Safety
3	142247	Cost Management of Engineering Projects
4	142248	Composite Materials
5	142249	Waste to Energy

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Semester: 4th										
S.No	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	148402	Dissertation Phase-II*	T/P	NA	NA	4#+36^	20	500	500	1000
Total No. of Credits							**20**			

*Dissertation Phase – II:-It is a continuation of research work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed research report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. . The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

	# = Max. hours for teacher	
	^= Independent study hours	

Select one from the Audit Course List	
Subject Code	**Subject Name**
150001	English for Research Paper Writing
150002	Disaster Management
150003	Value Education
150004	Constitution of India
150005	Pedagogy Studies
150006	Stress Management by Yoga
150007	Personality Development through Life Enlightenment Skills

Annexure - 3

Course Title: Advanced Structural Analysis

Course Code: A148105

L	*T*	*P*	*Cr*
3	*0*	*0*	*3*

Total hours: 45

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analyze the skeleton structures using stiffness analysiscode.
2.	Use direct stiffness method understanding itslimitations.
3.	Use the different methodology for solving Rigid joint plane frame
4.	Simplify the calculation using Stiffness Matrix Equations.

Course Contents:

Unit I

15 Hrs

Influence Coefficients: Physical Significance, Effects of Settlements, Temperature Change and Lack of Fit, Member Approach and Structure Approach. Stiffness Method applied to Large Frames using Local Coordinates and Global Coordinates.

Unit II

10Hrs

Stiffness Matrix Assembly of Structures: Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces.

Unit III

10hrs

Applications to Simple Problems using Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach. Linear Element Shape Functions, Solution for Poisson's Equation, General One Dimensional Equilibrium Problem.

Unit IV

10hrs

Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.

REFERENCE BOOKS

1. Weaver and Gere, (2009), *Matrix Analysis of Framed Structures*. Mcgraw hill.

2. Lewis P. E. and Ward.J. P (2011), *The Finite Element Method*,Addison-Wesley PublicationCo.
3. MeekJ. L., E and FN, (2012), *Computer Methods in Structural Analysis*, SpanPublication.
4. Desai and Able (2011), *The Finite Element Method*, CBS Publication.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	3	2	1	2	-	2	2	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	3	2	3	3	3	3
CO3	2	3	3	2	2	2	1	-	1	2	1	2	2	3	2
CO4	2	3	2	3	1	-	2	2	2	3	2	3	2	1	3
CO5	3	2	2	2	2	2	1	2	-	3	-	3	2	2	2
Average	**2.4**	**2.6**	**2.4**	**2.4**	**1.8**	**1.5**	**1.5**	**1.6**	**2.2**	**2.6**	**2.2**	**2.6**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Advanced Solid Mechanics

Course Code: 148106

L	T	P	Cr
3	0	0	3

Total Hours: 45

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Solve simple problems of elasticity and plasticity understanding the basic concepts.
2.	Apply numerical methods to solve continuum problems.
3.	Understand the Stress Components on an Arbitrary Plane.
4.	Develop Idealized Stress- Strain curve.

Course Contents:

Unit I

15 hrs

Introduction to Elasticity Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity. Strain and Stress Field Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.

Unit II

10hrs

Equations of Elasticity Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems, Co-axiality of the Principal Directions.

Unit III

10hrs

Two-Dimensional Problems of Elasticity Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates. Torsion of Prismatic Bars Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of ThinTubes.

Unit IV

10hrs

Plastic Deformation: Strain Hardening, Idealized Stress- Strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

REFERENCE BOOKS

1. Timoshenko S. and Goodier J. 1961, *Theory of Elasticity*, McGraw Hill,
2. SaddM.H.,2005, Elasticity,Elsevier,.
3. RagabA.R.,Bayoumi S.E, 1999, *Engineering Solid Mechanics*, CRCPress,.
4. Ameen M.,Narosa, 2005.*Computational Elasticity*,
5. KazimiS. M. A, 1994, Solid Mechanics, Tata McGrawHill,.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	1	2	3	3	2	3	3	3	3	2	2	3	3	2	3
CO2	2	1	2	2	3	1	3	2	2	3	1	2	2	2	2
CO3	2	1	3	1	2	3	3	3	2	2	2	3	2	1	2
CO4	1	2	1	2	1	2	3	1	3	2	1	2	1	2	3
CO5	2	3	2	2	2	3	2	3	3	3	2	2	3	3	2
Average	**2.4**	**2.6**	**2.6**	**2.6**	**2.4**	**2.6**	**2.8**	**3**	**2.6**	**2.4**	**2.4**	**2.4**	**2.8**	**2.2**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

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Course Title: Theory of Thin Plates and Shells

Course Code: 148110

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analytical methods for the solution of thin plates and shells.
2.	Use analytical methods for the solution of shells.
3.	Apply the numerical techniques and tools for the complex problems in thin plates.
4.	Numerical techniques and tools for the complex problems in shells.
5.	Introduction Space Curves, Surfaces, Shell Co-ordinates

Course Contents:

Unit I

10hrs

Introduction Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

Unit II

10hrs

Static Analysis of Plates Governing Equation for a Rectangular Plate, Navier Solution for Simply- Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions.

Unit III

10hrs

Circular Plates Analysis under Axi- Symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.

Unit IV

10hrs

Static Analysis of Shells: Membrane Theory of Shells- Cylindrical, Conical and Spherical Shells, Shells of Revolution with Bending Resistance- Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels. Thermal Stresses in Plate/Shell

REFERENCE BOOKS

1. Theory of Plates and Shells, Timoshenko S. and Krieger W., McGraw Hill.
2. Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
3. Thin Elastic Shells, Kraus H., John Wiley and Sons.
4. Theory of Plates, Chandra shekhara K., Universities Press.
5. Design and Construction of Concrete Shells, Ramaswamy G.S.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	2	1	2	2	2	1	2	2	-	2	1	2	2	2	2
CO3	2	1	2	1	2	2	2	2	2	-	2	2	2	1	2
CO4	1	2	1	2	1	2	-	1	2	2	1	2	1	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Average	**1.6**	**1.6**	**1.8**	**1.8**	**1.8**	**1.8**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Theory and Applications of Cement Composites

Course Code: 148111

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

Co	**Statement**
1.	Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain- stress behavior.
2.	Classify the materials as per orthotropic and anisotropic behavior.
3.	Estimate strain constants using theories applicable to composite materials.
4.	Analyze and design structural elements made of cement composites.
5.	Composite Materials- Orthotropic and Anisotropic behaviour

Course Content

Unit I

10hrs

Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

Unit II

10hrs

Mechanical Behaviour: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

Unit III

10hrs

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials andtheir Properties, Construction Techniques for Fibre Reinforced Concrete - Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing. Mechanical Properties of Cement Composites Behavior of Ferrocement, Fiber Reinforced ConcreteinTension,Compression,Flexure,Shear,FatigueandImpact,DurabilityandCorrosion.

Unit IV

10hrs

Application of Cement Composites: FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants. Analysis and Design of Cement Composite Structural Elements - Ferrocement, SIFCON and Fibre Reinforced Concrete.

Reference Books

1. Mechanics of Composite Materials, Jones R. M,,2nd Ed., Taylor and Francis,BSP Books,1998.
2. Ferrocement – Theory and Applications, Pama R. P., IFIC,1980.
3. New Concrete Materials, Swamy R.N., 1st Ed., Blackie, Academic and Professional, Chapman & Hall,1983.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	2	2	1	2	1	1	1	2	-	1	1	2	1
CO2	2	1	2	2	1	-	-	1	1	2	-	1	1	2	2
CO3	1	1	2	2	1	2	1	1	1	2	2	1	1	2	1
CO4	2	1	2	2	1	2	1	1	1	2	2	1	1	2	1

CO5	2	2	1	2	2	-	2	-	-	1	2	2	1	1	2
Average	**1.8**	**1.2**	**1.8**	**2**	**1.2**	**2**	**1.25**	**1**	**1**	**1.8**	**2**	**1.2**	**1**	**1.8**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Theory of Structural Stability

Course Code: 148112

L	T	P	Cr
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Estimate the stability of columns and frames
2.	Determine stability of beams and plates
3.	Use stability criteria and concepts for analyzing discrete and continuous systems.
4.	Study the concept of buckling under loads
5.	Understand the Inelastic Buckling and dynamic Stability

Course Content

Unit I

10hrs

Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behaviour.

Unit II

10hrs

Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

Unit III

10hrs

Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

Unit IV

10hrs

Stability of Beams: lateral torsion buckling. Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads. Introduction to Inelastic Buckling and Dynamic Stability.

Reference Books

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc GrawHill,1981
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt.Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	-	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
CO3	2	2	2	2	2	2	2	2	-	2	2	-	2	1	1
CO4	2	2	2	2	2	2	-	1	2	2	1	2	1	2	2
CO5	1	2	2	1	2	-	2	2	2	2	2	2	2	2	2
Average	**1.6**	**2**	**2**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Analytical and Numerical Methods for Structural Engineering

Course Code: 148113

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Solveordinaryandpartialdifferentialequationsinstructuralmechanicsusingnumericalmethods.
2.	Write a program to solve a mathematical problem.
3.	Understand the concept of linear equation using Eigen values.
4.	Analyze the Fuzzy Logic and Neutral Network.
5.	understand the codal provisions as per IS

Course Contents:

Unit I:

10hrs

Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting**;** Interpolation and extrapolation.

Unit II:

10hrs

Solution of Non linear Algebraic and Transcendental Equations. Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems.

Unit III

10hrs

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations.

Unit IV

10hrs

Finite Difference scheme: Implicit & Explicit scheme. Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neutral Network.

Reference Books

1. An Introduction to Numerical Analysis, AtkinsonK.E., J. Wiley and Sons, 1989.
2. Theory and Problems of Numerical Analysis, ScheidF, McGraw Hill Book Company, (Shaum Series),1988.
3. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India,1998.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	-	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
CO3	2	2	2	2	2	2	2	2	-	2	2	-	2	1	1
CO4	2	2	2	2	2	2	-	1	2	2	1	2	1	2	2
CO5	1	2	2	1	2	-	2	2	2	2	2	2	2	2	2
Average	**1.6**	**2**	**2**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Structural Health Monitoring

Course Code: 148114

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L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Diagnosis the distress in the structure understanding the causes and factors.
2.	Evaluate the health of structure using static field methods.
3.	Assessthe health of structure using dynamic field tests.
4.	Suggest repairs and rehabilitation measures of the structure
5.	Rehabilitation of structures using EMI technique

Course Contents:

Unit I:

10hrs

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

Unit II

10hrs

Structural Audit Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures. Static Field Testing Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements,

Unit III

10hrs

Static Response Measurement. Dynamic Field Testing Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit IV:

10hrs

Introduction to Repairs and Rehabilitations of Structures Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Reference Books

4. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons,2006.
5. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons,2007.
6. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK,2006.
7. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	-	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
CO3	2	2	2	2	2	2	2	2	-	2	2	-	2	1	1
CO4	2	2	2	2	2	2	-	1	2	2	1	2	1	2	2
CO5	1	2	2	1	2	-	2	2	2	2	2	2	2	2	2
Average	**1.6**	**2**	**2**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Title: Structural Optimization

Course Code: 148115

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Use Variation principle for optimization
2.	Apply optimization techniques to structural steel and concrete members.
3.	Design using frequency constraint.
4.	Evaluate the Nonlinear, Integer, Dynamic Programming using different design techniques.
5.	Understand the failure modes in different structures.

Unit I:

10hrs

Introduction: Simultaneous Failure Mode and Design, Classical External Problems.

Unit II:

10hrs

Calculus of Variation: Variation Principles with Constraints,

Unit III:

10hrs

Linear Programming, Integer Programming, Nonlinear Programming, Dynamic Programming,

Unit IV:

10hrs

Geometric Programming **and** Stochastic Programming. Applications Structural Steel and Concrete Members, Trusses and Frames. Design: Frequency Constraint, Design of Layouts.

Reference Books

1. Elements of Structural Optimization, Haftka, Raphael T., Gürdal, Zafer,Springer.
2. Variational methods for Structural optimization, Cherkaev Andrej,Springer

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	2	2	2	2	2	-	2	2	2	1
CO2	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO3	1	2	2	2	2	2	2	2	2	1	-	2	2	2	2
CO4	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO5	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2
Average	**1.4**	**2**	**1.6**	**2**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**2**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Structural Design Lab

Course Code: 148108

L	T	P	Cr
2	0	0	2

Course Outcomes: At the end of the course, students will be able to

1.	Design and Detail all the Structural Components of FrameBuildings.
2.	Design and Detail complete Multi-Storey FrameBuildings.

Course Content:

Design and detailed drawing of completeG+ 3 structures by individual student using latest relevant IScodes.

Course Title: Advanced Concrete Lab

Course Code: 148109

L	T	P	Cr
2	0	0	2

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Design high grade concrete and study the parameters affecting its performance.
2.	Conduct Non Destructive Tests on existing concrete structures.
3.	Apply engineering principles to understand behavior of structural/elements.
4.	Study the behavior of beams in torsion.
5.	Understand the torsion behavior of beams

List of Experiments/Assignments:

1. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
2. Effect of cyclic loading on steel.
3. Non-Destructive testing of existing concrete members.

4. Behavior of Beams under flexure, Shear and Torsion.

Reference Books

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall,2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co.,2006.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	2	2	2	2	2	-	2	2	2	1
CO2	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO3	1	2	2	2	2	2	2	2	2	1	-	2	2	2	2
CO4	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO5	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2
Average	**1.4**	**2**	**1.6**	**2**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**2**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Research methodology and IPR
Course Code: 148107

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analyze research related information to follow research ethics
2.	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
3.	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.
4.	UnderstandthatIPRprotectionprovidesanincentivetoinventorsforfurtherresearchwork and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
5.	Understand the plagrism report of the authenticity of the work

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Course Content

Unit 1:

10hrs

Meaning of Research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2:

10hrs

Effective literature studies approaches, analysis Plagiarism, Research ethics,

Effective technical writing, how to write report, Paper

Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 3:

10hrs

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 4:

10hrs

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Reference Books

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.
3. Mayall , "Industrial Design", McGraw Hill,1992.
4. Niebel , "Product Design", McGraw Hill,1974.
5. Asimov , "Introduction to Design", Prentice Hall,1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age",2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,2008

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	2	3	2	2	2	3	1	2	2	1	2	2	2	2
CO2	1	2	2	1	-	3	2	2	2	1	2	1	3	1	2

CO3	3	2	2	2	1	2	1	-	1	2	3	2	2	2	1
CO4	2	2	2	3	1	2	2	1	2	-	2	2	2	3	1
CO5	3	2	2	2	2	2	3	2	3	1	-	2	2	3	2
Average	**2.2**	**2**	**2.2**	**2**	**1.5**	**2.2**	**2.2**	**1.5**	**2**	**1.5**	**2**	**1.8**	**2.2**	**2.2**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Finite Element Method in Structural Engineering

Course Code: 148208

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Use Finite Element Method for structural analysis.
2.	Execute the Finite Element Program/Software.
3.	Solve continuum problems using finite element analysis.
4.	Practical use of the 3-D element approach
5.	Computer implementation using FEM approach

Course Contents:

Unit I:

10hrs

Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress.

Unit II:

10hrs

Beam Elements: Flexure Element, Element Stiffness Matrix, Element Load Vector. Method of Weighted Residuals: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications.

Unit III:

10hrs

Element Types: Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.

Unit IV:

10hrs

Application to Solid Mechanics: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi- Symmetric Stress Analysis, Strain and Stress Computations. Computer Implementation of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software.

Reference Books

1. Finite Element Analysis, Seshu P., Prentice-Hall ofIndia,2005.
3. Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York,1995.
4. Fundamentals of Finite Element Analysis, Hutton David, Mc-Graw Hill,2004.
5. Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York,1995.
6. Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier,2000.
7. Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India,1991.

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CO1	3	1	2	3	2	2	2	1	-	2	1	2	2	1	2
CO2	1	2	2	2	2	2	-	1	-	-	2	1	3	2	3
CO3	2	3	1	2	2	2	-	2	2	-	3	2	2	3	2
CO4	3	2	2	2	3	2	3	2	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Structural Dynamics

Course Code: 148209

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Study dynamics response of single degree freedom system using fundamental theory and equation of motion.
2.	Analyze the dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
3.	Use the available software for dynamic analysis.
4.	Design the structure under Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic

5.	Learn numerical solutions using Newmark & Wilson Method

Course Contents:

Unit I:

10hrs

Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems. Single Degree of Freedom System Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading, State Space Solution for Response.

Unit II:

10hrs

Numerical Solution to Response using Newmark Method and Wilson Method, Numerical Solution for State Space Response using Direct Integration. Multiple Degree of Freedom System **(Lumped parameter):** Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

Unit III:

10hrs

Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free and Forced Vibration, Generalized Single Degree of Freedom System.

Unit IV:

10hrs

Special Topics in Structural Dynamics(Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.

Reference Books

1. Dynamics of Structures, Clough R. W. and Penzien J., Mc GrawHill.
2. Structural Dynamics andIntroduction to Earthquake Engineering, Chopra A.K.
3. Vibration ofStructures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall.
4. Dynamics of Structures, HumarJ. L., PrenticeHall.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	2	1	3	-	1	2	2	1	2
CO2	1	2	2	2	2	-	3	1	1	1	2	-	3	2	3
CO3	2	3	1	2	2	2	-	2	2	1	3	2	2	3	2
CO4	3	2	2	2	3	2	-	2	2	-	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	1	2	2	2	2	3

Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**1**	**2**	**2**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Advanced Steel Design

Course Code: 148213

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Design components of steel structures using different design processes.
2.	Analyze and design beams and columns for stability and strength, and drift.
3.	Design welded and bolted connections.
4.	Study the Lateral Torsional Buckling in columns.
5.	Estimate the stability of the Columns under different loadings

Course Contents:

Unit I:

10hrs

Properties of Steel: Mechanical Properties, Hysteresis, Ductility. Hot Rolled Sections compactness and non-compactness, slenderness, residual stresses. Design of Steel Structures: Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, and Drift.

Unit II:

10hrs

Stability of Beams: Local Buckling of Compression Flange &Web, Lateral Torsional Buckling. Stability of Columns: Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.

Unit III:

10hrs

Method of Designs: Allowable Stress Design, Plastic Design, Load and Resistance Factor Design; Strength Criteria: Beams - Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length, PM Interaction, Biaxial Bending, Joint Panel Zones.

Unit IV:

10hrs

Drift Criteria: P Effect, Deformation Based Design. Connections of Welded, Bolted, Location Beam Column, Column Foundation, Splices.

Reference Books

1. Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.
2. Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.
3. The Steel Skeleton- Vol. II, Plastic Behaviour and Design - Baker J. F., Horne M. R., Heyman J.,ELBS.
4. Plastic Methods of Structural Analysis, Neal B. G., Chapman and HallLondon.
5. IS 800: 2007 – General Construction in Steel - Code of Practice, BIS,2007.
6. SP – 6 - Handbook ofStructural Steel Detailing,BIS,1987

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CO1	3	1	2	3	2	2	2	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	3	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	3	-	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	-	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.6**	**1**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Design of Formwork

Course Code: 148214

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Select proper formwork, accessories and material.
2.	Design the form work for Beams, Slabs, columns, Walls and Foundations.
3.	Design the form work for Special Structures.
4.	Understand the working of flying formwork.
5.	Learn about the Formwork Failures: Causes and Case studies in Formwork

Course Contents

Unit I:

10hrs

Introduction: Requirements and Selection of Formwork. Formwork Materials- Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

Unit II:

10hrs

Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.

Unit III:

10hrs

Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

Unit IV:

10hrs

Flying Formwork: Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues –Pre-and Post-Award. Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in Multi- Story Building Construction.

Reference Books

1. Formwork for Concrete Structures, Peurify, Mc Graw Hill India,2015.
2. Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education,2012.
3. IS 14687: 1999, False workfor Concrete Structures - Guidelines,BIS.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	2	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	3	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	3	-	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	-	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.6**	**1**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Design of High Rise Structures

Course Code: 148215

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Design and detailing of Transmission/ TV tower, Mast and Trestles with different loading conditions.
2.	Analyze the design and detail work of the RC and Steel Chimney.
3.	Detail study of the tall buildings subjected to different loading conditions using relevant codes.
4.	Practically understand the Application of software in analysis and design
5.	Estimate the Application of software in analysis and design

Course Contents

Unit I:

10hrs

Design of transmission/ TV tower,Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinalloads.

Unit II:

10hrs

Analysis and Design of RC and Steel Chimney, Foundation design for varied soilstrata.

Unit III:

10hrs

Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.

Unit IV:

10hrs

Applicationof software in analysis anddesign.

Reference Books

1. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Publishers, New Delhi,2002.
2. Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill,1988.
3. Illustrated Design of Reinforced ConcreteBuildings(GF+3storeyed), Shah V. L. &Karve S. R.,

Structures Publications, Pune,2013.
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications,1976.
5. Tall Building Structures, Smith Byran S. and CoullAlex, Wiley India.1991.
6. High Rise Building Structures, Wolfgang Schueller, Wiley.,1971.
7. Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	2	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	3	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	3	-	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	-	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.6**	**1**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Design of Advanced Concrete Structures

Course Code: 148217

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analyse the special structures by understanding their behavior.
2.	Design and prepare detailled structural drawings for execution citing relevant IS codes.
3.	Briefly study the Material Characteristics.
4.	Study the design as per the IS, ASIC codal provisions.
5.	estimate the design components as per IS codes.

Course Contents:

Unit I:

10hrs

Design philosophy, Modeling of Loads, Material Characteristics.

Unit II:

10hrs

Reinforced Concrete - P-M, M-phi Relationships, Strut-and- Tie Method, Design of Deep Beam and Corbel, Design of Shear Walls, Compression Field Theory for Shear Design, Design against Torsion; IS, ACI and Euro code.

Unit III:

10hrs

Steel Structures -- Stability Design, Torsional Buckling - Pure, Flexural and Lateral, Design of Beam-Columns, Fatigue Resistant

Unit IV:

10hrs

Design, IS code, AISC Standards and Euro code.

References Books:

1. Reinforced Concrete Design, Pillai S. U. and Menon D., Tata McGraw-Hill, 3rd Ed,1999.
2. Design of Steel Structures, Subramaniam N., Oxford University Press,2008.
3. Reinforced Concrete Structures, Park R.andPaulayT. , John Wiley & Sons,1995.
4. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, NewDelhi.
5. Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons,2010.
6. SteelStructuresDesignandBehaviorEmphasizingLoadandResistanceFactorDesign,Salmon C. G., Johnson J. E. and Malhas F. A., Pearson Education, 5th Ed, 2009.
7. Design ofSteel Structures - Vol. II, Ramchandra. Standard Book House,Delhi.
8. Plastic Methods of Structural Analysis, Neal B.G., Chapman and HallLondon.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	-	1	1	1	2	-	1	1	2	1
CO3	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO4	1	1	2	1	3	-	1	1	-	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2**	**1.6**	**2.2**	**1**	**1.4**	**1.5**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Advanced Design ofFoundations

Course Code: 148218

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Decide the suitability of soil strata for different projects.
2.	Design shallow foundations deciding the bearing capacity of soil.
3.	Analyze and design the pile foundation.
4.	Understand analysis methods for well foundation.
5.	Study the advancement in soil exploration using different techniques for Boring

Course Contents:

Unit I:

10hrs

Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests. **Coffer Dams**, Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure interaction

Unit II:

10hrs

Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws.

Unit III:

10hrs

Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load- Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.

Unit IV:

10hrs

Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods. Tunnels and Arching in Soils, Pressure Computations around Tunnels.

Open Cuts, Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types.

Reference Books

1. Design of foundation system, N.P. Kurian, Narosa Publishing House
2. Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill NewYork
3. Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	-	1	1	1	2	-	1	1	2	1
CO3	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO4	1	1	2	1	3	-	1	1	-	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2**	**1.6**	**2.2**	**1**	**1.4**	**1.5**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Soil Structure Interaction

Course Code: 148219

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Understand soil structure interaction concept and complexities involved.
2.	Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
3.	Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.
4.	Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.
5.	understand the concept of Action of Group of Piles

Course Contents:

Unit I:

10hrs

Critical Study of Conventional Methods of Foundation Design, Nature and Complexities of Soil Structure Interaction. Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method.

Unit II:

10hrs

Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of Structure under various Conditions of Loading and Subsoil Characteristics.

Unit III:

10hrs

Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems, Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts Etc.

Unit IV:

10hrs

Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear and Non-Linear Stress-Strain Characteristics. Determination of Pile Capacities and Negative Skin Friction, Action of Group of Piles Considering Stress-Strain Characteristics of Real Soils, Anchor Piles and Determination of Pullout Resistance.

Reference Books

1. Analytical and Computer Methods in Foundation, Bowels J.E., McGraw Hill Book Co., New York,1974.
2. Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., NewYork.
3. Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers.
4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company.
5. Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific Publishing Company.
6. Analysis & Design of substructures, Swami Saran, Oxford & IBH Publishing Co. Pvt.Ltd.
7. Design of Foundation System- Principles & Practices, Kurian N. P., Narosa Publishing

Course Title: Model Testing Lab

Course Code: 148210

L	T	P	Cr
2	0	0	2

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Understand the response of structures.
2.	Prepare the models.
3.	Conduct model testing for static loading
4.	Conduct model testing for free and forced vibrations
5.	Study the Characteristics of RC Beams using Piezoelectric Sensors

Course Content:

Unit I

10hrs

Response of structures and its elements against extreme loading events.

Unit II

10hrs

Model Testing: Static - testing of plates, shells, and frames models.

Unit III

10hrs

Model Testing: Free and forced vibrations, Evaluation of dynamic modulus.

Unit IV

10hrs

Beam vibrations, Vibration isolation, Shear wall building model, Time and frequency-domain study, Vibration Characteristics of RC Beams using Piezoelectric Sensors etc.

Reference Books

1. Analytical and Computer Methods in Foundation, Bowels J.E., McGraw Hill Book Co., New York,1974.

2.Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., NewYork.

3. Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers

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PUNJAB - INDIA

Course Title: Numerical Analysis Lab

Course Code: 148211

L	T	P	Cr
2	0	0	2

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1	Find Roots of non-linear equations by Bisection method and Newton'smethod
2	Do curve fitting by least square approximations
3	Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - JordenMethod
4	To Integrate Numerically Using Trapezoidal and Simpson'sRules
5	Estimate the Roots of Non-Linear Equation Using Bisection Method.

Course Contents

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss – Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss – Jorden Method.
7. Integrate numerically using TrapezoidalRule.
8. Integrate numerically using Simpson'sRules.
9. Numerical Solution of Ordinary Differential Equations By Euler'sMethod.
10. Numerical Solution of Ordinary Differential Equations ByRunge- KuttaMethod.

Reference Books

1. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company.
2. Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific Publishing Company

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	-	1	1	1	2	-	1	1	2	1
CO3	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO4	1	1	2	1	3	-	1	1	-	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2**	**1.6**	**2.2**	**1**	**1.4**	**1.5**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Mini Project

Course Code: 148212

L	**T**	**P**	**Cr**
2	**0**	**0**	**2**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Identify structural engineering problems reviewing availableliterature.
2.	Study different techniques used to analyze complex structuralsystems.
3.	Work on the solutions given and present solution by using his/her technique applying engineeringprinciples.
4.	Solve the problem based on the literature review
5.	Learn how to collect and analyze the data

Course Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals contribution.

Continuous assessment of Mini Project at MidSem and End Sem will be monitored by the departmental committee.

Reference Books

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House,1955.

2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi,1981.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	1	-	3	-	1	1	2	2	1	2
CO2	1	3	2	1	3	3	1	1	1	2	-	3	1	2	1
CO3	3	2	1	2	2	1	3	3	1	1	1	2	2	1	2
CO4	1	3	2	1	3	3	1	1	1	2	1	3	1	2	1
CO5	3	2	1	2	-	1	3	3	1	1	2	2	2	1	2
Average	**2.2**	**2.4**	**1.4**	**1.6**	**2.5**	**1.8**	**2**	**2.2**	**1**	**1.4**	**1.25**	**2.4**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Design of Prestressed Concrete Structures

Course Code: 148217

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Find out losses in the prestressed concrete. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.
2.	Analyse prestressed concrete deck slab and beam/girders.
3.	Design prestressed concrete deck slab and beam/girders.
4.	Design of end blocks for prestressed members.
5.	Learn about the codal provisions as per IS code

Course Contents:

Unit I:

10hrs

Introduction to prestressed concrete: types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.

Unit II:

10hrs

Statically determinate PSC beams: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

Unit III:

10hrs

Transmission of prestress in pretensioned members; Anchorage zone stresses for post tensioned members. Statically indeterminate structures- Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy.

Unit IV:

10hrs

Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack-width calculations. Analysis and design of prestressed concrete pipes, columns with moments.

Reference Books

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House,1955.
3. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi,1981.
4. Limited State Design of PrestressedConcrete,GuyanY., Applied Science Publishers,1972.
5. IS: 1343- Code of Practice for PrestressedConcrete
6. IRC:112

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	-	1	1	1	2
CO2	2	2	3	3	2	1	3	-	1	2	-	2	3	3	1
CO3	1	1	1	1	1	-	1	1	-	1	1	1	1	1	3
CO4	2	2	3	1	1	1	3	2	1	2	-	2	3	2	1
CO5	3	1	1	3	2	-	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**1.67**	**1.8**	**1.25**	**1.5**	**1.4**	**1**	**1.4**	**1.8**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Analytical and Finite Element Analysis of Laminated Composite Plates

Course Code: 148311

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1	Determine the rectangular composite plates using the analytical methods.
2	Analyse the composite plates using advanced finite element method.
3	Develop the computer programs for the analysis of composite plates.
4	Illustrate the use of the Finite element techniques.
5	Understand the Solutions for Bending of Rectangular Laminated Plates Using FSDT

Course Contents:

Unit I:

10hrs

Introduction: Displacement Field Approximations for Classical Laminated Plate Theory (CLPT) and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending ofRectangular Laminated Plates usingCLPT.

Unit II:

10hrs

Governing Equations. Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates, Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.

Unit III:

10hrs

Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT. Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses.

Unit IV:

10hrs

Finite Element Solutions for Bending ofRectangular Laminated Plates using FSDT.
Finite Element Model, C^0Element Formulation, Post Computation ofStresses.Analysis ofRectangular Composite Plates using AnalyticalMethods.

Reference Books

1. Mechanics of Laminated Composites Plates and Shells, Reddy J. N., CRCPress.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	-	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	2	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	2	2	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	2	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	-	1	2	1	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**1.75**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Fracture Mechanics of Concrete Structures

Course Code: 148312

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Identify and classify cracking of concrete structures based on fracture mechanics.
2.	Implement stress intensity factor for notched members
3.	Apply fracture mechanics models to high strength concrete and FRC structures.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the concept of Fatigue Cracking

Course Contents:

Unit I:

10hrs

Introduction: Basic Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture and Crack Growth, Cleavage Fracture, Ductile Fracture, Fatigue Cracking, Environment assisted Cracking, Service Failure Analysis.

Unit II:

10hrs

Stress at Crack Tip: Stress at Crack Tip, Linear Elastic Fracture Mechanics, Griffith's Criteria, Stress Intensity Factors, Crack Tip Plastic Zone, Erwin's Plastic Zone Correction, R curves, Compliance, J Integral, Concept of CTOD and CMD.

Unit III:

10hrs

Material Models: General Concepts, Crack Models, Band Models, Models based on Continuum Damage Mechanics,

Unit IV:

10hrs

Applications to High Strength Concrete, Fibre Reinforced Concrete, Crack Concepts and Numerical Modeling.

Reference Books

1. Fracture Mechanics, Suri C. T. and Jin Z.H., 1st Edition, Elsevier Academic Press,2012.
2. Elementary Engineering Fracture Mechanics, Broek David, 3rd Rev. Ed. Springer,1982.
3. Fracture Mechanics of Concrete Structures – Theory and Applications, Elfgreen L., RILEM Report, Chapman and Hall,1989.
4. Fracture Mechanics – Applications to Concrete, Victor, Li C., Bazant Z. P., ACI SP 118, ACIDetroit,1989.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	-	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	2	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	2	2	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	2	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	-	1	2	1	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**1.75**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Design of Plates and Shells

Course Code: 148313

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Approximate design the
2.	Prismatic folded plate systems.
3.	Design shells using approximate solutions
4.	Design Doubly Curved Shells using Approximate Solutions.
5.	Understand the equation of shell surfaces

Course Contents

Unit I:

10hrs

Introduction to Plate Theory: Thin and Thick Plates, small and large deflection theory of thin plates-assumptions, moment-curvature relations, stress resultants, Governing Differential Equation for bending of plates, various boundary conditions.

Unit II:

10hrs

Rectangular plates-Levy's solution: Plates subject to uniformly distributed and varying loads and sinusoidal parabolic loads between simply supported edges. Conditions for other two edges simply supported, fixed, free, elastically restrained

Unit III:

10hrs

Circular Plates: Bending of circular plates with clamped & simply supported edges, Plate with a central hole, uniformly distributed and varying loads, conical loads, distributed couples, ring loads, semicircular plates, axisymmetric loaded plates.

Unit IV:

10hrs

Introduction to shells: Classification of shells on geometry, thin shell theory, equation of shell surfaces, stress resultants, stress displacement relations, compatibility and equilibrium equations

Reference Books

1. Theory of Plates and Shells, Timoshenko and Woinowsky-Krieger S., Tata Mc GrawHill

Edition,2010.
2. Design and Construction of Concrete Shell Roofs, Ramaswamy G. S., 1st Edition,2005.
3. Design of Reinforced Concrete Shells & Folded Plate, Varghese P. C., 1st Edition,PHI.
4. Design of Plate and Shell Structures, Jawad Maan H., SpringerScience.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO3	3	2	1	2	2	2	-	-	-	1	1	3	2	1	2
CO4	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2.4**	**1.5**	**2**	**1**	**1.4**	**1.8**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Dissertation I

Course Code: 148314

L	**T**	**P**	**Cr**
0	**0**	**10**	**10**

Course Learning Outcomes: At the end of the course, the student will be able to:

1.	Identify structural engineering problems reviewing available literature.
2.	Identify appropriate techniques to analyze complex structural systems.
3.	Apply engineering and management principles through efficient handling of project

Course Contents:

Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out in dividuals contribution.

Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO**	**PSO**	**PS0**

													1	2	3
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO3	3	2	1	2	2	2	-	-	-	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2.4**	**1.5**	**2**	**1**	**1.4**	**1.8**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Title: Dissertation II

Course Code: 148402

L	T	P	Cr
0	**0**	**20**	**20**

Course Learning Outcomes: At the end of the course, the student will be able to:

1.	Solve complex structural problems by applying appropriate techniques and tools.
2.	Exhibit good communication skill to the engineering community and society.
3.	Demonstrate professional ethics and work culture.

Course Contents:

Dissertation – II will be extension of the to work on the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	2	2	2	1
CO2	1	1	2	1	3	3	1	1	1	2	2	1	3	3	2
CO3	3	2	1	2	2	2	-	-	-	1	1	2	2	2	1
Average	**2.3**	**1.6**	**1.3**	**1.6**	**2.3**	**2.3**	**1**	**1.3**	**1**	**1.4**	**1.3**	**1.6**	**2.3**	**2.3**	**1.3**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

GURU KASHI UNIVERSITY
PUNJAB - INDIA

OPEN ELECTIVES

Course Title: Business Analytics

Course Code: 142245

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Understand the role of business analytics within an organization.
2.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3.	To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4.	Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.
5.	Understand the scope of Business analytic in the Corporation

Course Contents:

Unit I:

10hrs

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Unit II:

10hrs

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple LinearRegression.

Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit III:

10hrs

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit IV:

10hrs

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression
Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Reference Books

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, personsEducation.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	-	2	1	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	-	2	2	2	1	2
CO4	1	3	2	3	1	1	2	2	1	-	2	2	2	1	2
CO5	3	3	2	1	3	2	1	-	2	1	1	1	1	2	1

Average	**2.2**	**2.2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**2**	**1.4**	**1.33**	**1.6**	**1.75**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

OPEN ELECTIVES

Course Title: Industrial Safety

Course Code: 142246

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Identify and classify cracking of concrete structures based on fracture mechanics.
2.	Implement stress intensity factor for notched members
3.	Apply fracture mechanics models to high strength concrete and FRC structures.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the salient points of factories act 1948 for health and safety

Course Content

Unit I:

10hrs

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment andmethods.

Unit II:

10hrs

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III:

10hrs

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV:

10hrs

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internalcombustion engine, v. Boiler,
vi. Electrical motors, Types of faults in machine tools and their generalcauses.

Reference Books

1. Maintenance Engineering Handbook, Higgins & Morrow, Da InformationServices.
2. Maintenance Engineering, H. P. Garg, S. Chand andCompany.
3. Pump-hydraulic Compressors, Audels, Mcgrew HillPublication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & HallLondon.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	2
CO2	2	2	3	3	2	1	-	2	1	2	2	2	3	3	1
CO3	1	1	1	1	1	3	1	1	2	1	-	1	1	1	3
CO4	2	2	3	1	1	1	2	2	1	2	2	2	3	2	1
CO5	3	1	1	3	2	3	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**2.2**	**1.25**	**1.4**	**1.6**	**1.4**	**1.75**	**1.4**	**1.8**	**1.6**	**1.8**

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GURU KASHI UNIVERSITY
PUNJAB - INDIA

Open Elective

Course Title: Cost Management of Engineering Projects

Course Code: 142247

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2.	To become familiar with processes needed to develop, report, and analyze business data.
3.	Use decision-making tools/Operations research techniques.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the salient points of factories act 1948 for health and safety

Unit I:

10hrs

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit II:

10hrs

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit III:

10hrs

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets.

Unit IV:

10hrs

Measurement of Divisional profitability pricing decisions including transfer pricing. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Reference Books

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, NewDelhi
2. Charles T. Horngren and George Foster, Advanced ManagementAccounting
3. Robert S Kaplan Anthony A. Alkinson, Management & CostAccounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheelerpublisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	2
CO2	2	2	3	3	2	1	-	2	1	2	2	2	3	3	1
CO3	1	1	1	1	1	3	1	1	2	1	-	1	1	1	3
CO4	2	2	3	1	1	1	2	2	1	2	2	2	3	2	1
CO5	3	1	1	3	2	3	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**2.2**	**1.25**	**1.4**	**1.6**	**1.4**	**1.75**	**1.4**	**1.8**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

GURU KASHI UNIVERSITY
PUNJAB - INDIA

Open Elective Course

Title: Composite Materials

Course Code: 142248

L	T	P	Cr
3	0	0	3

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2.	To become familiar with processes needed to develop, report, and analyze business data.
3.	Use decision-making tools/Operations research techniques.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the salient points of factories act 1948 for health and safety

Course Content

Unit I:

10hrs

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Unit II:

10hrs

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Unit III:

10hrs

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Unit IV:

10hrs

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Reference Books

1. Hand Book of CompositeMaterials-ed-Lubin.
2. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
3. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition,2007.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L.Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	2
CO2	2	2	3	3	2	1	-	2	1	2	2	2	3	3	1
CO3	1	1	1	1	1	3	1	1	2	1	-	1	1	1	3
CO4	2	2	3	1	1	1	2	2	1	2	2	2	3	2	1
CO5	3	1	1	3	2	3	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**2.2**	**1.25**	**1.4**	**1.6**	**1.4**	**1.75**	**1.4**	**1.8**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Open Elective
Course Title:Waste to Energy
Course Code:142249

L	**T**	**P**	**Cr**
3	**0**	**0**	**3**

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Identify and classify cracking of concrete structures based on fracture mechanics.
2.	Implement stress intensity factor for notched members
3.	Apply fracture mechanics models to high strength concrete and FRC structures.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Operation of the pyrolysis and liquefaction

Course Content

Unit I:

10hrs

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestorsBiomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications

Unit II :

10hrs

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation

Unit III:

10hrs

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit IV:

10hrs

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme inIndia.

Reference Books

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd.,1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd.,1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd.,1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**

CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	1	2	1	1	1	1	2	1
CO3	3	1	1	1	3	2	1	2	1	2	2	2	2	1	2
CO4	1	3	2	3	1	1	2	2	1	2	2	2	2	1	2
CO5	3	3	2	1	3	2	1	1	2	1	1	1	1	2	1
Average	**2.2**	**2.2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**1.6**	**1.4**	**1.6**	**1.6**	**1.6**	**1.6**	**1.4**	**1.6**

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GURU KASHI UNIVERSITY
PUNJAB - INDIA

AUDIT 1 and 2:
Course Title:ENGLISH FOR RESEARCH PAPER WRITING
Course Code:150001

1.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2.	To become familiar with processes needed to develop, report, and analyze business data.
3.	Use decision-making tools/Operations research techniques.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the salient points of factories act 1948 for health and safety

Course Content

1 Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
2 Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
3 Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
4 key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Reference Books

a. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks)
b. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge UniversityPress
c. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
d. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	-	-	1	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	2	2	-	2	1	2
CO4	1	-	2	3	1	1	2	2	1	2	2	2	2	1	2
CO5	3	3	2	1	3	2	1	-	2	1	1	1	1	2	1
Average	**2.2**	**2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**2**	**1.25**	**1.6**	**1.6**	**1.33**	**1.6**	**1.4**	**1.6**

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GURU KASHI UNIVERSITY
PUNJAB - INDIA

AUDIT 1 and 2: Course Title: DISASTER MANAGEMENT
Course Code:150002

1.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2.	To become familiar with processes needed to develop, report, and analyze business data.
3.	Use decision-making tools/Operations research techniques.
4.	Compute J-integral for various sections understanding the concepts of LEFM.
5.	Understand the salient points of factories act 1948 for health and safety

Course Content

Unit I

10hrs

Introduction Disaster Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters Difference, Nature, Types And Magnitude. Repercussions Of Disasters And Hazards Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit II

8hrs

Disaster Prone Areas In IndiaStudy Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit III

15hrs

Disaster Prone Areas In IndiaStudy Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics. Disaster Preparedness And Management

Preparedness Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports Governmental And CommunityPreparedness.

Unit IV

7hrs

Risk AssessmentDisaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies forSurvival.Disaster MitigationMeaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation InIndia.

Reference Books

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New

Royal bookCompany.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, NewDelhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., NewDelhi.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	-	-	1	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	2	2	-	2	1	2
CO4	1	-	2	3	1	1	2	2	1	2	2	2	2	1	2
CO5	3	3	2	1	3	2	1	-	2	1	1	1	1	2	1
Average	**2.2**	**2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**2**	**1.25**	**1.6**	**1.6**	**1.33**	**1.6**	**1.4**	**1.6**

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GURU KASHI UNIVERSITY
PUNJAB - INDIA

AUDIT 1 and 2: VALUE EDUCATION

Course Code:150003

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Understand value of education and self-development
2.	Imbibe good values in students
3.	Let the should know about the importance of character
4.	Understand the concept of Positive thinking in humans.
5.	Understand the implementation of Moral and non- moral valuation

Course Content

Unit I

5hrs

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Unit II

5hrs

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit III

5hrs

Personality and Behavior Development, Soul and Scientific attitude. Positive Thinking. Integrity anddiscipline.Punctuality, Love andKindness.Avoid faultThinking.Free from anger, Dignity oflabour.Universal brotherhood and religioustolerance.Truefriendship.HappinessVs suffering, love fortruth.Aware of self-destructivehabits.Association andCooperation.Doing best for savingnature

Unit IV

5hrs

Character and Competence –Holy books vs Blind faith.Self-management and Good health.Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Reference Books

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, NewDelhi

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	2	2	1	1	-	2	1	-	2	1	2	1
CO2	2	1	2	1	2	2	2	-	1	2	1	2	2	1	2
CO3	1	2	1	1	2	1	1	1	-	1	1	2	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	-	1	2	1
CO5	1	2	1	2	2	1	2	1	-	1	-	2	1	1	2
Average	**1.2**	**1.6**	**1.2**	**1.4**	**1.8**	**1.4**	**1.4**	**1**	**1.34**	**1.2**	**1**	**2**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Code:150004

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indianpolitics.
2.	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution inIndia.
3.	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the IndianConstitution.
4.	Discuss the passage of the Hindu Code Bill of1956.
5.	Importance of the human Right in ones life

Units	Content
1	• History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)
2	• Philosophy of the IndianConstitution: Preamble Salient Features

3	Contours of Constitutional Rights &Duties: FundamentalRights Right toEquality Right toFreedom Right againstExploitation Right to Freedom ofReligion Cultural and EducationalRights Right to ConstitutionalRemedies Directive Principles of StatePolicy FundamentalDuties. Organs ofGovernance: Parliament Composition Qualifications andDisqualifications Powers andFunctions
4	• Executive President Governor Council ofMinisters Judiciary, Appointment and Transfer of Judges,Qualifications Powers andFunctions
5	LocalAdministration: District's Administration head: Role andImportance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO o MunicipalCorporation. Pachayati raj: Introduction, PRI:ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position androle. Block level: Organizational Hierarchy (Differentdepartments), Village level: Role of Elected and Appointedofficials, Importance of grass rootdemocracy
6	ElectionCommission: Election Commission: Role andFunctioning. Chief Election Commissioner and ElectionCommissioners. State Election Commission: Role andFunctioning. Institute and Bodies for the welfare of SC/ST/OBC andwomen.

Reference Books

1. The Constitution of India, 1950 (Bare Act), GovernmentPublication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	2	2	1	1	-	2	1	-	2	1	2	1
CO2	2	1	2	1	2	2	2	-	1	2	1	2	2	1	2
CO3	1	2	1	1	2	1	1	1	-	1	1	2	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	-	1	2	1
CO5	1	2	1	2	2	1	2	1	-	1	-	2	1	1	2
Average	**1.2**	**1.6**	**1.2**	**1.4**	**1.8**	**1.4**	**1.4**	**1**	**1.34**	**1.2**	**1**	**2**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

GURU KASHI UNIVERSITY
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AUDIT 1 and 2: PEDAGOGY STUDIES

Course Code:150005

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2.	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3.	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
4.	Understand the concept of pedagogy practices.
5.	Alignment with classroom practices and follow- up support

Units	Content
1	Introduction andMethodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teachereducation. Conceptual framework, Researchquestions. Overview of methodology andSearching.
2	• Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developingcountries. • Curriculum, Teachereducation.
3	Evidence on the effectiveness of pedagogicalpractices Methodology for the in depth stage: quality assessment of includedstudies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies. • Professional development: alignment with classroom practices and follow- up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes
4	Research gaps and future directions Research design Contexts Pedagogy Teacher education Curriculum and assessment

5 Dissemination and research impact.

Reference Books

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3):361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London:DFID.
4. AkyeampongK, LussierK, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3):272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston:Blackwell.Chavan M (2003) Read India: A mass scale, rapid, ‘learning to read’campaign.

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AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Code:150006

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1.	Understand value of education and self-development
2.	Imbibe good values in students
3.	Let the should know about the importance of character
4.	Understand the concept of Positive thinking in humans.
5.	Understand the implementation of Moral and non- moral valuation

Course content

Unit

1
- Definitions of Eight parts of yog. (Ashtanga)

2
- Yam and Niyam. Do`s and

Don't's inlife.

i) Ahinsa, satya, astheya, bramhacharya andaparigraha
ii) Shaucha, santosh, tapa, swadhyay,ishwarpranidhan

3
- Asan andPranayam

i) Various yog poses and their benefits for mind &body
ii)Regularization of breathing techniques and its effects-Types ofpranayam

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department),Kolkata

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	3	2	3	2	-	2	-	-	1	2	3	2	3
CO2	2	1	2	1	2	1	2	1	2	-	2	1	2	1	2
CO3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	3	2	3	2	3	2	3	2	3	2	-	2	3	2	3
CO5	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Average	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**1.75**	**1.6**	**1.75**	**1.67**	**1.25**	**1.6**	**2**	**1.6**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

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Annexure-4

ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (40)						**External (60)**	**Total**
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	5	5	5	5	30	30	60	
Average Weightage	5	5			30		40	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.