SYLLABUS

OF

M.E. CIVIL (STRUCTURES)
w.e.f. July, 2013
University of Pune  
M.E. (Civil) (Structures)  
COURSE STRUCTURE (2013Course)  
(w.e.f. June – 2013)  
University of Pune, Document on Rules and Regulation for P.G.Courses be referred for the detailed information  
SEMESTER I

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501 005-Elective I

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**SEMESTER –IV**

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Module 1: Analysis of Stresses and Strains
Concept of stress at a point, stress tensor, stress on inclined plane, stress components on a rectangular parallelepiped in Cartesian coordinate system, derivation of stress equilibrium equations, transformation of stresses, stress invariants. The state of strain at a point, strain displacement relations, strain compatibility condition and stress compatibility conditions, Relations between Elastic Constants, Problems on Navier Lame’s Equilibrium Equations, Problems on Beltrami-Michell compatibility equations, Boundary value problems in Elasticity.

Module 2: Stress-Strain Relationship
Generalized Hook’s law for Isotropic, Orthotropic, plane stress, plane strain and axisymmetric problems, Problems in 2D and 3D Cartesian coordinate system, Airy’s stress function, bending of beams.

Module 3: Polar Coordinate System
Relationship between Cartesian and Polar coordinate system, Equilibrium equations, Strain-displacement relations, Stress-strain relationship, Strain-displacement relationship for plane stress and plane strain conditions,

Module 4: Stress concentration problems
Stress concentration problems such as stress concentration due to circular hole in stressed plate(Kirsch’s Problem), stresses under concentrated load such as concentrated load acting on the vertex of a wedge (Michell’s Problem) and Concentrated load acting on the free surface of a plate (Flamant’s Problem), Axisymmetric Problems such as stresses in thick cylinders subjected to internal and external uniformly distributed pressures (Lame’s Problem).

Module 5: Beams Curved in Plan
Analysis of Beams Curved in Plan such as cantilever circular arc, Semicircular beams fixed at two ends and subjected to central concentrated load, simply supported semicircular beam subjected to UDL supported on three equally spaced columns, Analysis of circular ring beam.

Module 6: Beams Curved in Elevation
Analysis of Beams Curved in Elevation, Application to curved circular and elliptical Rings and Crane hooks.

Module 7: Torsion
Assumptions and Torsion equation for general prismatic solid bars, Warping of Non-circular sections and St. Venant’s theory, Prandtle’s stress function approach, Torsion of Circular,
Elliptical and Triangular cross-section, Torsion of thin-walled structures by membrane analogy, Torsion of rolled sections and shear flow

**Module 8:**

**Beams on Elastic Foundation**
Differential equation, Infinite beams with concentrated load, concentrated moment, and finite uniformly distributed load. Semi-Infinite beams with free & hinged ends subjected to finite uniformly distributed load, hinged end. Finite beams with free end and hinged end.

**Reference Books**
5. Nautiyal, B.D.--Introduction to Structural Analysis--- New Age International Publishers
7. Irving Shames, Mechanics of deformable solids, Prentice Hall
501 002 : Structures Dynamics

Teaching Scheme
Lectures: 4 hours/week
Credits  4

Examination Scheme
In semester Exam: 50 marks
End Sem. Exam. : 50 marks
Duration of End Sem. Exam: 3 Hrs

Module1:
Nature of exciting forces, degrees of freedom and mathematical modelling of dynamic systems. Single degree freedom system (SDOF): An undamped and damped free vibrations, Viscous and Coulomb’s damping.

Module 2:
SDOF system: Undamped and damped Forced Vibrations to harmonic excitations, Fourier analysis of periodic forces. Response to unit impulse and arbitrary loading by Duhamel’s integral.

Module 3:
SDOF system: Step and Ramp forces, Pulse loadings, Response to ground motion and transmissibility.

Module4:
Non-linear analysis by step-by-step method with linear acceleration

Module 5:
Multiple degrees of freedom (MDOF) system: Free vibrations of a shear building, fundamental frequencies and mode shapes.

Module6:
Orthogonality of mode shapes, Power and Stodola methods. Concept of Tuned Mass Dampers.

Module7:

Module8:
Continuous system: Free transverse vibrations of beams for various boundary conditions. Free vibration analysis of a cantilever beam by Rayleigh Ritz and Finite Element Method.

Lab Practice assignment for the term work:
Report on the experimental work based on Horizontal and Vertical Shake Table

Reference Books
1. Dynamics of structures--Poultre, Wiley India
3. Anil K Chopra – Dynamics of Structures Theory and Applications to Earthquake Engineering,
   Prentice-Hall Publications
5. R.C. Roy - Structural Dynamics an Introduction to Computer Methods, John Wiley & Sons Publications.
Module 1: Hoarding Structures - Analysis and design of hoarding structures under dead, live and wind load conditions as per codal provisions by limit state method, introduction to fatigue failure.

Module 2: Castellated beams - Concept, fabrication of the castellated beam from rolled steel section, design of castellated beam for bending and shear as per codal provisions by limit state method.

Module 3: Microwave Towers - Introduction, structural configuration, function, analysis and design.

Module 4: Transmission Towers - Introduction, structural configuration, bracing systems, analysis and design as per codal provisions. Use working stress method.

Module 5: Tubular Structures - Design of tubular Trusses and scaffoldings using circular hollow, rectangular hollow sections as per codal provisions, detailing of joints.

Module 6: Cold form light gauge section - Type of cross section, stiffened, multiple stiffened and un-stiffened element, flat-width ratio, effective design width, design of light gauge compression, tension and flexural members as per codal provisions.

Module 7: Design of chimneys – Introduction, type, joints, lining, ladder, forces acting on chimneys, design of thickness of steel plates for self supporting chimney.

Module 8: Design of base plate, anchor bolt and foundation, stability of steel chimneys. Use working stress method.

References Books and I. S. Codes

6. Sarwar Alam Raz—Structural Design in Steel---New Age International Publishers

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University of Pune  
M.E. (Civil) (Structures)--2013 Course  
Semester I  
1Credit =2 Modules=15 Hrs.  

501 004 : Research Methodology  

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Module 1:  
**Introduction to Research**  
Meaning of research , types of research, process of research, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, formulation of research hypotheses. Search for causation

Module 2:  
**Developing a Research Proposal**  
Format of research proposal, Individual research proposal, Institutional research proposal, Significance, objectives, methodology, Funding for the proposal, Different funding agencies, Framework for the planning

Module 3:  
**Literature survey**  
Definition of literature and literature survey, need of literature survey, sources of literature, elements and objectives of literature survey, styles of literature survey, and strategies of literature survey.

Module 4:  
**Data collection, Measuring, Sampling and Scaling**—Classification of data, benefits and drawbacks of data, evaluation of data, qualitative methods of data collection, methods of qualitative research, Sampling, sample size, sampling strategy, attitude measurement and scaling, types of measurements, criteria of good measurements, classification of scales.

Module 5:  
**Preliminary data analysis**—Testing of hypothesis— concepts and testing , analysis of variance techniques, introduction to non parametric tests, Validity and reliability, Approaches to qualitative and quantitative data analysis,

Module 6:
Advanced data analysis techniques—Correlation and regression analysis, Introduction to factor analysis, discriminant analysis, cluster analysis, multidimensional scaling, descriptive statistics, inferential statistics, multidimensional measurement and factor analysis.

Module 7:
Report writing—Need of effective documentation, importance of report writing, types of reports, report structure, report formulation, plagiarism.

Module 8:
Presentation of research—Research briefing, presentation styles, impact of presentation, elements of effective presentation, writing of research paper, presenting and publishing paper, patent procedure.

Reference Books:
2. Research Methods for Business—Sekaran Uma and Rogure Boudie—Wiley, India
5. Research Methodology: An Introduction’ by Wayne Goddard and Stuart Melville

e-Resource---For class room ppts---www.wileyeurope.com/college/sekaran

University of Pune
M.E. (Civil) (Structures)—2013 Course
Semester I
1 Credit = 2 Modules = 15 Hrs.

501 005: ELECTIVE – I

Teaching Scheme
Lectures: 5 hours/week
Credits 5

Examination Scheme
In semester Exam: 50 marks
End Sem. Exam. : 50 marks
Duration of End Sem. Exam: 3 Hrs

Select any combination having total of 5 credits from following technical / interdisciplinary courses

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**501 005 –A-Elective I - Cyber Security / Information security (2Credits course)**

**Module 1:**

**Module 2:**
**Intelligent Property Issues in Cyber space**: Domain names and related issues, Copyright in digital media, Patents in cyber world.

**Rights of Neitizens and E-Governance**: Privacy and freedom issues in cyber world, E-Governance, Cyber crimes and Cyber laws.

**Module 3:**
**Information Security Fundamentals**: Background, Importance, Statistics, National and International Scenario, Goals of security, Confidentiality, Privacy, Integrity, Non-repudiation, Availability.


**Module 4:**
**Security Investigation**: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

**Access Control, Intrusion Detection and Server Management, Firewalls**: Overview of Identification and Authorization, Overview of IDS, Intrusion, Detection Systems and Intrusion Prevention Systems, User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features


**Reference Books:**

501 005 –B-Elective–I  Soil Structure Interaction (2Credits course)

**Module 1**
Introduction, Importance and Applications of Soil Structure Interaction (SSI)

a) Introduction to SSI, Importance of SSI, Applications and examples of SSI for structural engineer, Effects of structure roughness/smoothness on soil behaviour.

b) General soil-structure interaction problems – Shallow Foundations, Sheet piles, Mat/Raft foundations etc., Contact pressures and soil-structure interaction for shallow Foundations, Fixed/Flexible Base.

**Module 2:**
Soil Structure Interaction - Parameters

a) Concept of sub grade modulus, effects/parameters influencing sub grademodulus, Flexiable and Rigid Foundations – Rigidity calculations, Static and Dynamic Spring Constants – Winkler Model, Estimation of soil spring constants/stiffness for foundations design.

b) SSI Models - Elastic Continuum, Winkler Model, Multi-Parameter Models, Hybrid Model.

**Module 3:**
Soil Behaviour


**Module 4:**
A) SSI in Retaining Structures: Curved failure surfaces, their utility and analytical/graphical predictions from Mohr-Coulomb envelope and circle of stresses. Earth pressure computations by friction circle method. Earth pressure distribution on walls with limited/restrained deformations, Dubravo’s analysis. Earth pressures on sheet piles, braced excavations. Design of supporting system for excavations.

Reference Books:

General Reading Suggested:

Codes/Hand books:

E-Resources:
1) http://trb.metapress.com/home/main.mpx ... … (Free Online Research Reports)

501 005 –C-Elective-I Plastic Analysis& Design of Steel Structure (2Credits course)

Module 1:
Plastic collapse loads of gable portal frames, various mechanisms.
Analysis of Multi Bay- Multi Storey rectangular portal frame, Joint & Various mechanisms (Two bays - Three storeys)

Module 2:
Secondary design considerations: Effect of axial force, shear, residual stresses and brittle fracture on moment capacity. Design of beams with high shear, interaction of bending & axial force: section and member strength.

Module 3:

Module 4:

Reference Books:
2) “Limit State Design of Steel Structures”, Dr. M R Shiyekar, PHI Publication, 3rd Print
3 ) A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nemchand & Bros., Roorkee
4) Ramchandra – Design of Steel Structures Vol – II, Standard Book House, Delhi
5) B.G. Neal – Plastic Method of Structural Analysis, Chapman & Hall
6) L.S. Beedle – Plastic Design of Steel Frames, John Willey & Sons
7) Structural design in steel by Salwar Alam Raz New Age International Publishers
8) Steel Designers Manual – ELBS

**General Reading Suggested:**
1) Codes: IS: 800 - 2007 Code of Practice for General Construction in Steel Handbooks
2) SP: 6 (6) – 1972 Handbook for Structural Engineers: Application of plastic Theory in Design of Steel Structures
4) NPTEL
5) e-Recourses: Teaching Resource for Structural Steel Design – INSDAG Kolkata

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**501 005 –D-Elective –1 Optimization Techniques (2Credit Course)**

**Module 1:**
**Linear Programming I:** Introduction to Optimization techniques, Linear programming basic concepts, graphical method, Simplex method

**Module 2:**
**Linear Programming II:** Big M Method, Two phase method, Duality, sensitivity analysis. Application of Linear Programming to Hydraulics & Water Resource

**Module 3:**
**Non Linear Programming:** Unconstrained one Dimensional search methods: Dichotomous search method, Fibonacci, Golden section, Multivariable unconstrained techniques: Steepest ascent and Descent methods, Newton’s methods, Constrained technique: Lagrangian Multiplier

**Module 4:**
**Dynamic Programming:** Principle of optimality, recursive equations.

**Reference Books**
2. Engineering Optimization—Methods and Applications —Ravindran, Wiely
3. Operation Research – Taha Hamdey A.

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**501 005 –E-Elective –I Structural Mechanics of Modern Materials (2 Credits course)**

**Module 1**

**Module 2**
matrices for generally anisotropic, specially orthotropic material, transversely isotropic material, orthotropic, isotropic materials, Plane stress condition for thin lamina, transformation of stress
b) Design of Steel Fiber Concrete elements – flexure, shear, ductility etc., smeared concept, constitutive models for FRC, codal provisions for FRC (ACI, RILEM etc.), Hybrid Fiber composites, behaviour of macro-micro-nano fiber matrix.
Module 3
Module 4
Reference Books

501 005 –F- Elective –I Economics and Finance for Engineers (1 Credit Course)

Module1:

Module2:

Reference
1. As specified by the instructor
501 005 –G- Elective –I Foreign Language -I (French-I)  (1Credit Course)

Module 1:
Introduction: Glimpse of France, life of French people (Culture, food, etc.), French alphabets, accent, etc., Unit zero of the Text Book (Grammar, Vocabulary, and Lesson), Exercise of Unit zero of Text Book & workbook

Module 2:
French Lessons: Brief revision, Unit-1 of the Text Book (Grammar, vocabulary), Unit-1, Lesson 1 of the Text Book, Exercise of Unit-1, Lesson 1 of the Text book & workbook

Reference
2. Jumelage-I workbook by Roopa Luktuke

501 005 –H- Elective –I Engineering Ethics (1Credit Course)

Module 1:
Introduction: Meaning & scope of Ethics in general & for engineers in particular, Moral obligations and rules in engineering, Categories of moral, Work Culture, Corporate, local & global issues, Rights & responsibilities of Engineers, Conflicts in the profession, Mental Stresses & Emotional Intelligence

Module 2:
Code of Ethics for Engineers: First principles of Engineering Ethics & Ethical terminology, Social Values, Character, considerations for general Individuals, Engineers & the Society, Recommendations of the Professional bodies (Code of Conduct), Introduction to Copyright, IPR (Intellectual Property Right), Plagiarism & Legal issues

Reference

501 005 –I- Elective –I Intellectual Property Rights  (1Credit Course)

Module 1
Introduction to Intellectual Property Rights

International Scenario
International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Module 2
Patent Rights

Recent Developments in IPR
Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies,
Reference Books

501 005 –K-Elective –I  Mass communication, Photography and Videography
(Audit Course—No Credits)

Module 1:
Mass Communication - Theories & methods

Module 2:  
Photography and Videography
Camera Basics, Still Photography, Lenses, Exposure, Composition, Colour. Shot Angle, Camera Movement, Light techniques and final printing. Videography Basics – Video camera –types, mounting. Sound Basics, Film Sound appreciation, Sound Track analysis, Editing Basics, Fragmentation Juxtaposition: Frame, Shot, Sequence, Scene Time, Pace, Rhythm. Learning basic editing software and primary editing on available/given materials.

Reference Books
5. Holman, Tomlinson, Sound for film and television, Focal Press
7. Talbot-Smith, Michael, Sound engineering explained, Focal Press
8. Talbot-Smith, Michael, Sound assistance, Focal Press
10. Truebitt, Rudy and David, Trubitt, Live sound for musicians,
11. Hal Leonard Nathan, Julian, Back to basic audio,
12. Newnes Yewdall, Lewis, David, Practical art of motion picture sound, Focal Press
Module 1

Yoga: Sukshma (subtle) yoga techniques, Difference between physical exercises and yogasans, Impact of yogasans on human body, benefits of yogasans, Patanjali yoga sutras, Technique of different yogasans like, Trikonasan, Ardhachandrasan, Padmasan, Akarnadhanurasan, Ardhamatsendrasan, Vajrasan, Pachhimottanasan, Bhujangasan, Shalhasan, Dhanurasan, Naukasans, Makrasan, Pawanmuktasan, Halasan, Sarvangasan, Shavasan, Suryamanaskar (Sun Salutation), Yoga and Food.

Module 2

Meditation: Breathing Technique, Pranayam, Benefits of Pranayam, Precautions for Pranayam, Kumbhak, Bandh (Locks), Chakras, Mudra, Technique of Pranayam, Anulom-Vilom Pranayam, Ujjayi Pranayam, Bhramari Pranayam, Bhashrika Pranayam, Agnisar Pranayam, Kapalbhati Pranayam, Meditation (Dhyan).

References Books:

1. Light on Yoga: by B.K.S. Iyengar, Harper Collins Publishers India
2. Light on Pranayama: by B.K.S. Iyengar, Harper Collins Publishers India
3. Yoga for Dummies by Georg Feuerstein and Larry Payne, Wiley India publishing
4. The Yoga Sutras by Patanjali, Swami Satchidananda, Integral Yoga Publications
5. Meditation - Science and Practice by N. C. Panda, D. K. Printworld Publisher
6. Yog Prayesh by Vishwas VMandlik, Yogchaitanya Prakashan
7. Asanand Yog Vigyan, Bhartiya Yog Sansthan, Delhi
8. Pranayam Vigyan, Bhartiya Yog Sansthan, Delhi

Reference Web Sites:


University of Pune
M.E. (Civil) (Structures)--2013 Course
Semester I
1 Credit = 15 Hrs.

501 006 : Lab.Practice–I

Teaching Scheme
Lectures: 4 hours/week
Credits: 4

Examination Scheme
Term work: 50 marks
Oral: 50 marks
Lab Practice I
The lab. practice-I will be based on completion of assignments/ practicals/ reports of site visits, confined to the course in that semester.

The term work will consist of--

i) Visit reports of minimum three site visits, exploring the field aspects for various subjects

ii) Report on minimum 3 assignments/ designs/ laboratory work on each subject. Report on the experimental work based on Horizontal and Vertical Shake Table is mandatory.

iii) Report on minimum 2 software applications on any subject of the semester.

iv) Report on atleast one patent with its details studied in any subject of the semester.

v) Technical review and critique of a research article/paper on any topic from the refereed journal paper related to any subject learnt in the semester--

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester II
1Credit = 2 Modules = 15 Hrs.

501 007-Finite Element Method

Teaching Scheme
Lectures: 4 hours/week

Credits 4

Examination Scheme
In semester Exam: 50 marks
End Sem. Exam.: 50 marks
Duration of End Sem. Exam: 3Hrs

Module 1:
b) Variational theorem; Principle of minimum potential energy, Use of polynomial displacement function. Variational approach for formulation of element stiffness matrix for truss and beam elements.

Module 2:
a) Two dimensional elements in plane stress/plane strain problems. CST, LST & Rectangular elements, modelling considerations; aspect ratio, Use of polynomial displacement functions, Pascal triangle. Requirements for convergence, Geometric Invariance, Grid refinement

Module 3: Standard stiffness and load vector formulation procedure using variational principle.

Module 4:
a) Shape functions in cartesian & natural coordinate systems, shape functions for one dimensional element such as truss & beam. Shape function for two dimensional elements.
b) Three dimensional elements such as Tetrahedon, Hexahedron, shape functions, stress strain relations

Module 5:
a) Axisymmetric elements in axisymmetric problems, stress strain relations, triangular and Quadrilateral elements.

Module 6:
Concept of isoparametric elements and isoparametric mapping, Jacobian Matrix, Formulation procedure for 2 D quadrilateral isoparametric element in plane elasticity problem, 3-D isoparametric elements.

**Module 7:**
a) Thin Plate bending elements, various Triangular and Rectangular elements, ACM (Adini, Clough, Melosh) and BFS (Bogner, Fox, Schimdt) elements
Conforming & nonconforming elements, Concept of four noded & eight noded isoparametric elements, Mindlin’s hypothesis for plate bending element.

**Module 8:**
a) Flat & curved shell element, elements for cylindered shells, curved solid element
b) Ahmad’s degenerated solid element, Pawsey’s eight noded shell element.

**Reference Books**
1. S.S. Bhavikatti - Finite Element Analysis – New Age International Publishers, Delhi
2. Thompson---Introduction to the Finite Element,Method: Theory, Programming and Applications, Wiley,India

**Lab Practice assignment for the term work:**
1. Any three assignments based on FEM by using coding tools such as EXCEL, MATLAB etc. for
   a) Formulation of stiffness matrix for any 1-D element
   b) Formulation of stiffness matrix for any 2-D element
   c) Formulation of stiffness matrix for any 3-D element
   d) Assembly procedure using Jacobian matrix
2. Finite Element Method – Software applications of any one of following cases using either SATDD-Pro / Anysis / Etabs / SAP .
   a) Plane stress / plane strain problem
   b) Axisymmetric problem
   c) Three dimensional problem
   d) Plate or shell structures
501 008-Theory of Plates and Shells

Teaching Scheme
Lectures: 4 hours/week
Credits 4

Examination Scheme
In semester Exam. : 50 marks
End Semester Exam. : 50 marks
Duration of End Sem. Exam: 3Hrs

Module 1:

Module 2:
Analysis of Rectangular Plates: Navier solution for plates with all edges simply supported. Distributed loads, point loads and rectangular patch load.

Module 3:
a) Levy’s Method: Distributed load and line load. Plates under distributed edge moments. Raleigh- Ritz approach for simple cases in rectangular plates.
b) Introduction to shear deformation theories. Reissener - Mindlin Theory, Moment curvature relationship for First order shear deformation theory.

Module 4:
b) Simply supported and fixed edges. Distributed load, ring load, a plate with a central hole.

Module 5:
a) Introduction: Classification of shells on geometry, thin shell theory, equations to shell surfaces, stress resultants, stress-displacement relations, compatibility and equilibrium equations.
b) Shells of Revolution: Membrane theory, equilibrium equations, strain displacement relations, boundary conditions, cylindrical, conical and spherical shells.

Module 6:
a) Circular cylindrical shells: Membrane theory: Equilibrium equations, strain displacement relations, boundary conditions.

Module 7:
b) Bending Theory: Equilibrium equation, strain displacement relations, governing differential equation, solution for a simply supported cylindrical shell, various boundary conditions. Application to pipes and pressure vessels.

Module 8:
Beam theory of cylindrical shells: Principles of Lundgren’s beam theory, beam analysis, arch analysis, application to cylindrical roof shells.

Reference Books
2. Ansel C. Ugural Stresses in Plates and Shells, Mc Graw Hill
3. G. S Ramaswamy, Design and Construction of Concrete Shell Roofs, CBS Publications
Teaching Scheme                                                                 Examination Scheme
Lectures: 4 hours/week                                                        In semester Exam. : 50 marks
Credits  4                                                                     End Semester Exam. : 50 marks
                                                  Duration of End Sem. Exam: 3 Hrs

Module 1:
Yield line theory for analysis of slabs, Various patterns of yield lines , Assumptions in yield line theory, Equilibrium and virtual work method of analysis ,

Module 2:
Design of various slabs such as rectangular, triangular, circular with various edge conditions Using yield line theory, Design for limit state of strength and serviceability orthotropically reinforced slabs,

Module 3 :
- Grid and coffered floors, general features , rigorous and approximate method of analysis design of grid floor by approximate method, Design of flat slab, column and middle strip, proportioning of flat slab element,

Module 4:
Design methods for flat slabs , Design by direct method only of intermediate and end panel , total design moment , distribution of moments , effect of pattern loading, Design for shear.

Module 5 :
Elevated service reservoir – Rectangular and Circular type only flat bottom, Design of staging for wind and earthquake forces, Effect of joint reactions and continuity

Module 6:
Design of Bunkers, Silos, and chimney—Square and circular bunkers, silos shallow and deep

Module 7:
Design of raft foundations, Pile foundations, single pile, group of piles, Pile cap

Module 8:
Design of Shear wall, design of form work for slabs, girders, columns etc.

Reference Books-
1. Advance R.C.C. DesignBy S.S.Bhavikatti, New Age International Publishers
5. Reinforced Concrete design ---Dr.H.J.Shah—Charotar publishing house
7. IS: 456-2000 Indian Standard code of practice for plain and reinforced concrete, Bureau of
Indian Standards, New Delhi.
design of Structures, Bureau of Indian Standards, New Delhi.
9. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids,
Bureau of Indian Standards, New Delhi

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester II
1Credit =2 Modules=15 Hrs.

501 010 - Elective –II

Teaching Scheme
Lectures: 5 hours/week
Credits  5

Examination Scheme
In semester Exam: 50 marks
End Sem. Exam. : 50 marks
Duration of End Sem. Exam: 3 Hrs

Select any combination having total of 5 credits from following technical / interdisciplinary courses

<table>
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<th>Code</th>
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<th>Code</th>
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<th>Audit Course (No Credit Course)</th>
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<td>501 010 A</td>
<td>Human Rights</td>
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<td>Foreign Language II</td>
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<td>501 010 B</td>
<td>Design of precast components and Ferrocement</td>
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<td>Building Services and Maintenance</td>
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<td>Principle Centred Leadership</td>
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<td>501 010 C</td>
<td>Design of Foundations</td>
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<td>Green Building Design and Construction</td>
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<td>501 010 D</td>
<td>Non linear Analysis of structure</td>
<td>501 010 H</td>
<td>Forensic Civil Engineering</td>
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</tbody>
</table>

501 010 –A-Elective II Human Rights  (2 Credits course)

Module 1
Human Rights – Concept, Development, Evolution
- Philosophical, Sociological and Political debates
- Benchmarks of Human Rights Movement.
Human Rights and the Indian Constitution
- Constitutional framework
Module 2:
**Human Rights & State Mechanisms**
- Police & Human Rights
- Judiciary & Human Rights
- Prisons & Human Rights
- National and State Human Rights Commissions

Module 3:
**Human Rights of the Different Sections** and contemporary issues
- Unorganized Sector
- Right to Environment, particularly Industrial sectors of Civil Engineering and Mechanical Engineering.
- Globalization and Human Rights
- Right to Development

Module 4.:
**Citizens’ Role and Civil Society**
- Social Movements and Non-Governmental Organizations
- Public Interest Litigation
- Role of Non Government organizations in implementation of Human rights.
- Right to Information

**Human Rights and the international scene** – Primary Information with reference to Engineering Industry.(2 hrs)
- UN Documents
- International Mechanisms (UN & Regional)
- International Criminal Court

**Reference Books:**
1. Introduction to International Humanitarian Law by Curtis F. J. Doebbler - CD Publishing
3. Study material on UNESCO,UNICEF web site

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**501 010 –B- Elective II Design of Precast Components and Ferrocrete** (2 Credits course)

Module 1
**Introduction**
History and Development of Precast concrete construction, Advantages and disadvantages of precast concrete construction; different types of units involved in general building construction, including residential, factory and industrial framed structure; their general principles of design; mechanical handling of large projects like stadium, bridges etc.
Materials viz. Concrete, Self Compacting Concrete, Grout, Reinforcement and structural welded wire cages. Requirements of industrialized buildings, standardization of precast elements and unification of building design. Influence of manufacture, transport and erection technologies on design solution (Modular and Tilt-Up); expansion and contraction joints.
Module 2
**Prefabricated Components and Its Behaviour**
Design of Precast Concrete Components and Behaviour of structural components, large panel constructions, Construction of roof and floor slabs, Wall panels, Beams, Columns, Shear walls.
Design for Flexure: Strength Design (Depth of Stress block, Flanged Elements, Strength reduction factor, Limitations on reinforcement, Critical sections), Service load design.
Design for Shear: Horizontal and vertical shear resistance.

Module 3
**Joints and Connections**
Joints and connections in precast construction; classification and their requirements.
Design of Concrete bracket and corbels; Cantilever beam-design method, Strut-and-tie method. Introduction to Hanger Connections. Design of bearing pads, column bases and moment connections. Typical connection designs for lateral load resisting systems.

Module 4
**Design of Ferrocrete Structures**
Design, analysis and optimization, Special design considerations, Typical features of ferrocrete affecting design, Design criteria, Rational method of design ferrocrete structure. Strength through shape, Shape and form of a structure, various structural forms and their behaviour, Comparative study of various forms

**Reference Books**
1. Ferrocement Construction Manual-Dr. D.B.Divekar-1030, Shivaji Nagar, Model Colony, Pune
2. CBRI, Building materials and components, India, 1990
7. State-of-the-art report and guide for Design, Construction and Repairs of Ferrocement; ACI committee Report. No ACI549R-88 and ACI 549.1R.88. Published by American Concrete Institute, Detroit, USA
10. Ferrocement- Materials and applications--- Publication SP 61, A C I Detroit. U S A
11. Concrete Technology by Kulkarni & Ghosh, New Age International Publishers
12. Ferrocement code -ACI 549.1R

501 010 –C- Elective I - Design of Foundations (2 Credits course)

Module 1
**Soil Structure Interaction**
Foundation objectives and their importance, Classification of foundations, Soil classification. Geotechnical design parameters, bearing capacity, settlements and factors affecting...
settlement. Loads for design, depth of foundation and depth of soil exploration. Parameters for design of foundation on various types of soil, soil structure interaction.

Module 2
Design of Raft Foundations
Types of rafts, Design of Flat slab raft foundation .Design of beam and slab raft foundation.

Module 3
Pile Foundation –I
Function and Classification of piles, Concrete piles, Precast and cast-in-situ piles. Static point and skin resistance capacity of a Pile, Pile settlements.
Laterally loaded Piles. Various pile group patterns, Efficiency of Pile in group, Negative skin friction. Shell Foundations: Types and applications, Soil structure interaction, Membrane analysis for Hyper and Conical RC shells with and without edge beams, detailing of critical sections.

Module 4
Pile Foundation-II
IS code recommendations for structural design for various piles. Design of RC cast-in-situ and precast pile by IS code method. Pile group analysis by rigid and flexible methods, Design of pile cap.

References Books
8.Shamsher Prakash, Soil Dynamics, McGraw Hill
17.IS 2974: Part 1to 5: 1982 Code of practice for design and construction of machine foundations
**General Reading Suggested :Codes:**
(http://www.fhwa.dot.gov/engineering/geotech/foundations/nhi10016/nhi10016.pdf)

**Hand books:**

**e-Resources:**
1) http://www.fhwa.dot.gov/engineering/geotech/library_listing.cfm … … (Free Reports)
2) www.Wikipedia.com

**Lab Practice assignment for the term work:**
Technical review and critique of a research article/paper on any one of the topics –
1) Drilled Shaft
2) Caisson - Construction, Analysis, Design, Problems, Case Study
A detailed review and critique of a research article/paper in writing (5-10 pages) is expected from the students.

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**501 010 –D- Elective I -Non Linear Structural Analysis(2 Credits course)**

**Module 1**
Types of Nonlinearities - Geometric Nonlinearity, Material Nonlinearity, Nonlinear Governing Equation for Beams: Moment-curvature Nonlinearity, Geometric Nonlinearity Due to Strectching, Material Nonlinearity, Geometrically Nonlinear Beam Problems - Moment-Curvature Nonlinearity-Cantilever Beam, Centrally Loaded beam with two supports, Cantilever Beam subjected to Tip Load

**Module 2**
Nonlinear Analysis of Columns- Post buckling of cantilever column, Large deflection of column with both ends hinged

**Module 3**

**Module 4**

**Reference Books**
**501 010 –E-Elective II  Foreign Language –II French-II  (1 Credit course)**

Module 1
French Grammar and Vocabulary: Unit-1, Lesson 2 of the Text Book (Grammar & Vocabulary), Unit-1, Lesson 1 of the Text Book, Exercise of Unit-1, Lesson 2 of the Text Book & workbook

Module 2
Advance Vocabulary, Writing & Speaking: Unit-1, Lesson 3 of the Text Book (Grammar & Vocabulary), Unit-1, Lesson 3 of the Text Book, Exercise of Unit-1, Lesson 3 of the Text Book & workbook, Revision & speaking practice

**Reference**
2. Jumelage-I workbook by Roopa Luktuke

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**501 010 –F--Elective II  Building Services and Maintenance  (1 Credit course)**

Module 1
Integrated design: factors affecting selection of services/systems, Provision of space in the building to accommodate building services, Structural integrity of building services equipment. Sound and vibration attenuation features, Provisions for safe operation and maintenance, Building services engineering system for intelligent buildings: Introduction to information transmission systems, communication and protection system, call systems, public address system and Building automation/management systems.

Module 2
The concepts and importance of energy conservation and energy efficiency for environmental protection, environmental protection and maintenance of building services systems, selection of environmentally friendly products and materials used in building services systems. Co-ordination and management of design and installation of various building services systems during the design and construction stages in particular the builder’s works. Computer-aided design and installations of building services. Testing and commissioning of building services systems: fire safety systems, vertical transportation equipment ventilation systems, etc. Sick building syndrome. The impacts of life-cycle-cost on planning and implementation. An appreciation of capital and operating costs. Implication of low cost, inefficient equipment, poor installation, inadequate access for maintenance.

**Reference books**
2. Building Maintenance Management, 2ed,---Chanter, Wiley India
Module 1
Principles of Sustainability, Energy Conservation and Water Conservation

Module 2
Green Materials and Green building codes

Reference Books
3. Energy Conservation Building Code (ECBC)

Experiencing ethos and bliss by listening to performances of various reputed artists. Experiencing oneness with nature and the super power by performing individually or in a group.

**Module 2 : Indian Classical Dance**

Types –Kathak, Bharatnatyam, Kuchipudi, Odissy etc. Importance of “Abhinaya” (acting) in dance. Role of “Taala” and “Laya” in dance. Various dance form. Various gharanas in traditional dance types Fusion with other dance styles. Experiencing the Indian cultural power through individual and group performances.

**Books/Audio CD**

5. Anup Rag Vilas by Pt. Kumar Gandharava, Bandishes composed and sung by author mostly available on cassettes Swarganga Foundation.
7. Introduction to Bharata’s Natyashastra by Adya Rangacharya, Munshiram Manoharlal publication.
8. Art of Dancing classing and folk dance by priyabala Shah, Parimal publication

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**501 010 –J-Elective II   Principle Centered Leadership**

(Audit course--Non Credit course)

**Module 1 :**

**Motivation, Leadership and Competency**

a) **Motivation:**

b) **Competency Mapping:**

**Module 2 :**

**Entrepreneurship and strategic Management**

a) **Entrepreneurship:**

b) **Strategic Management:**


Reference Books
1. Seven habits of highly effective people—Stephen Covey—Franklin Covey Publications
2. Living the seven habits Stephen Covey—Franklin Covey Publications
3. 8th Habit – from effectiveness to greatness Stephen Covey—Franklin Covey Publications
5. Human Resources Management & Human Relations , V P Michael , Himalaya
7. Construction project Management, integrated approach—Feedings First Indian Reprint 2011—Yesdee publications
8. Cases in Strategic Management, Amita Mital , Tata Mcgraw Hill

University of Pune
M.E. (Civil) (Structures)--2013 Course
Semester II
1 Credit =15 Hrs.

501 011- Lab. Practice–II

Teaching Scheme
Lectures: 4 hours/week
Credits : 4

Examination Scheme
Term work : 50 marks
Oral : 50 marks

The lab. practice-II will be based on completion of assignments / practicals / reports of site visits, confined to the courses in that semester.

The term work will consist of --

i) Visit reports of minimum two site visits, exploring the field aspects for various subjects

ii) Report on minimum 3 assignments / designs / laboratory work on each subject.

iii) Finite Element Method – Software applications of any one of following cases using either SATDD-Pro / Anysis / Etabs / SAP .

   a) Plane stress / plane strain problem
   b) Axisymmetric problem
   c) Three dimensional problem
   d) Plate or shell structures

iv) Report on atleast one patent with its details studied in any subject of the semester.

v) Technical review and critique of a research article/paper on any one of the topics –
   (1) Drilled Shaft  (2) Caisson - Construction, Analysis, Design, Problems, Case Study

vi) A detailed review and critique of a research article/paper in writing (5-10 pages) is expected from the students

vii) Any three assignments based on FEM by using coding tools such as EXCEL, MATLAB etc. for

   a) Formulation of stiffness matrix for any 1-D element
   b) Formulation of stiffness matrix for any 2-D element
c) Formulation of stiffness matrix for any 3-D element

d) Assembly procedure using Jacobian matrix

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester II
1Credit =15 Hrs.
501 012 - Seminar – I

Teaching Scheme
Pract. 4 hrs./week

Examination Scheme
Oral : 50 Marks,
TW :: 50 Marks
Credits 4

The seminar I shall be on state of the art topic of own choice approved by the guide
Term work of the seminar should consist of spiral bound report , preferably printed on both
the sides of pages on any technical topic of interest associated with the post graduate course
and should be submitted in a standard format having the following contents .

i. Introduction
ii. Literature Survey
iii. Theoretical contents
iv. Relevance to the present national and global scenario of construction industry
v. Strengths and weaknesses of the particular area of seminar
vi. R & D in the particular area
vii. Field Applications / case studies / Experimental work / software application / Benefit
cost studies – feasibility studies
viii. Vendors associated
ix. Conclusions
x. References

Students should prepare a power point presentation to be delivered in 15 minutes and should
be able to answer questions asked in remaining five minutes.
It is desired that based on the seminar work, a paper be prepared and presented in a state /
national conference.

At the end of first year, the students are required to undergo through a field training of
minimum 2 weeks duration. The presentation and separate report of the vocational training
will be submitted along with report of seminar II.

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester III
1Credit =2Modules=15 Hrs.

601 013-Earthquake Engineering and Disaster Management
Module 1:
Introduction to Disaster and its Management
Definition of Disaster, Types of Disasters i.e. Natural and Man Made Disasters. Natural: Earthquake, Volcanoes and Tsunamis. Man Made: Fire, Blast etc.

Module 2:
Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities. Effect on structural elements.

Module 3:
Design of RCC Structures
Design of multi-story RC structure with foundation as per latest IS: 1893 by Equivalent static lateral load method and Response Spectrum Method.

Module 4:
Design of Steel Structures
Introduction to Time history method, Capacity based design of soft story RC building, design of Shear Walls. Ductile detailing as per latest IS:13920.

Module 5:
Blast Loading
Introduction to Blast Loading, Blast Wind, Clearance Time, Decay Parameter, Drag Force, Ductility Ratio, Dynamic Pressure, Equivalent Bare Charge, Ground Zero, Impulse, Mach Number, Overpressure, Reflected Overpressure, Shock Wave Front, Side-on Overpressure, Transit Time, Yield.

Module 6:
General Characteristics of Blast and Effects on structures, Blast force, Blast load on above and below ground structures, Response of structural elements, Time period of structural members, Design Stresses for Steel and Reinforced Concrete, Load combinations, Design of structure for blast loading.

Module 7:
Fire
Analysis of steel structure subjected to fire, Design consideration of structural steel members as per IS-800: 2007.

Module 8:
Post Disaster Measures
Retrofitting of Structures, Sources of weakness in framed buildings, Classification of retrofitting techniques, Conventional and non-conventional methods, Comparative study of various methods and case studies. Introduction to Base Isolation systems. IS code provisions for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques.

Reference Books:


ii. Earthquake resistant design of building structures building---Hosure, Wiley India.

iii. Seismic Design of Reinforced Concrete and Masonry Buildings---Paulay, Wiley India.


vi. IS: 13828 – Improving Earthquake Resistance of Low Strength Masonry Buildings, 1993
viii. IS: 800 2007 - Code for general construction in steel structures
ix. IS:13827 - Improving Earthquake Resistance of Earthen Buildings, 1993
x. IS:13920 – Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Force, 1993
xiv. Joshi P S et al. - Design of Reinforced Concrete Structures for Earthquake Resistance Published by Indian Society of Structural Engineers, 2001

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester III
1Credit =15 Hrs.

601 014-Structural Design of Concrete and Prestressed Bridges

**Teaching Scheme**

| Lectures: 4 hours/week | Credits 4 |

**Examination Scheme**

| In semester Exam. : 50 marks | End Semester Exam. : 50 marks |
| Duration of End Sem.Exam:3Hrs | |

**Module 1:**
Introduction to bridge engineering, classification and components of bridges, layout, planning. Structural forms of bridge decks, beam and slab decks, cellular decks.

**Module 2:**
Standard specification for bridges, IRC loadings for road bridges, loading standards for railway bridges.

**Module 3:**
Design of slab culvert, box culvert and skew bridge.

**Module 4:**

**Module 5:**
Structural classification of Rigid Frame bridge, analysis and design of Rigid Frame bridge.

**Module 6:**
Classification and design of bearings. Expansion joints. Forces acting on abutments and piers,

**Module 7:**
Analysis and design, types and design of wing walls.

**Module 8:**
Bridge foundations, design of open well, pile and caisson foundation.

**Reference Books**
2. T.R. Jagadeesh, M.A. Jayaram - Design of Bridge Structures, Prentice-Hall of India
4. David Lee – Bridge Bearings and Expansion Joints, E & FN Spon
5. V.K. Raina – Concrete Bridge Practice Analysis, design and Economics, Tata McGraw Hill

University of Pune
M.E. (Civil) (Structures)--2013Course
Semester III
1 Credit =15 Hrs.

601 015: Elective –III

Teaching Scheme
Lectures: 5 hours/week
Credits 5

Examination Scheme
In semester Exam: 50 Marks
End Sem. Exam. : 50 marks
Duration of End Sem.Exam:3Hrs

Select any combination having total of 5 credits from following technical / interdisciplinary courses ---

<table>
<thead>
<tr>
<th>Code</th>
<th>2 Credits Course</th>
<th>Code</th>
<th>1 Credit Course</th>
<th>Code</th>
<th>Audit Course (No Credit Course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>601 015B</td>
<td>Adv analysis of steel Frames</td>
<td>601 015F</td>
<td>Foreign Language-III</td>
<td>601 015I</td>
<td>Abacus</td>
</tr>
<tr>
<td>601 015D</td>
<td>Design of Concrete Plate and Shell Structures</td>
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</tbody>
</table>
Module 1:
A) Structure of biomaterials, classification of bio materials, mechanical properties, isoelasticity, elasticity of non-Hookean materials.
B) Metallic Biomaterials and ceramic biomaterials, Polymeric Biomaterials, Composite Biomaterials, Bio degradable Polymeric Biomaterials. stainless steel Co-Cr-alloys Ti & its alloys, medical applications, corrosion of metallic implants. Non-absorbable or relatively

Module 2:

Module 3:

Module 4:

Reference books
Module 2:
First order elastic (FOE) & first order inelastic (FOIE) (Plastic) analysis of rectangular portal frames. Elastic & limit state of strength of frame.

Module 3:

Module 4:
Second order inelastic (SOIE) analysis of frames, elastic plastic hinge analysis, plastic zone method, use of finite element method Refined plastic hinge analysis, reduction in stiffness of member due to plasticity at hinge. Advantages of advanced analysis. Design of frame using advanced analysis. Use of suitable software illustrating difference in analytical results among all methods such as FOE, FOIE, SOE, SOIE.

Reference Books:
4. “Plastic Analysis and Design of Steel Structures”, M Bill Wong, Elsevier

General Reading Suggested:
Codes:
1. IS: 800 - 2007 Code of Practice for General Construction in Steel
2. AISC Steel Construction Manual

601 015-C  Elective –III  Theory of Plasticity  
(2 Credit Course)

Module 1:
Basic equations of theory of elasticity: Index notation, equations of equilibrium, constitutive relations for isotropic bodies, strain-displacement relations, compatibility, displacement and traction boundary conditions, admissibility of displacement and stress fields, plane stress and plane strain problems.

Module 2:
Plastic behaviour in simple tension, generalisation of results in simple tension, yield surfaces, uniqueness and stability postulates, convexity of yield surface and normality rule, limit surfaces. Initial Yield Surfaces for Polycrystalline Metals: Summary of general form of plastic constitutive equations, hydrostatic stress states and plastic volume change in metals, shear stress on a plane, the von Mises initial yield condition, the Tresca initial yield condition, consequences of isotropy.

Module 3:
Plastic Behaviour under Plane Stress Conditions: Initial and subsequent yield surfaces in tension-torsion, the isotropic hardening model, the kinematic hardening model, yield surfaces made of two or more yield functions, piecewise linear yield surfaces, elastic perfectly plastic materials. Plastic Behaviour of Bar Structures - Behaviour of a three bar truss, behaviour of a
beam in pure bending, simply supported beam subjected to a central point load, fixed beams of an elastic perfectly plastic material, combined bending and axial force.

**Module 4:**
Theorems of Limit Analysis - Alternative statement of the limit theorems, the specific dissipation function, cold bending of bar beyond elastic limit, spring back, plastic bending with strain hardening material, plastic bending of wide plate.
Limit Analysis in Plane Stress and Plane Strain: Discontinuities in stress and velocity fields, the Tresca yield condition in plane stress and plane strain, symmetrical internal and external notches in a rectangular bar, the punch problem in plane strain, remarks on friction.

**Reference Books**
5. Chen, W.F., and Han, D.J., Plasticity for Structural Engineers, Springer Verlag.
6. Timoshenko, Theory of Plasticity, McGraw Hill

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**601 015-D- Elective –III  Design of Concrete Plate and Shell structures**

**2 Credit Course**

**Module 1 :**
Types of plates, scope and assumptions, Simpson and Iteration method of analysis and design, Ridge load resolution, edge shear, stress distribution, deflection and rotations, joint moment effect, design of north-light folded plate

**Module 2 :**
Design of flat and concave plate circular in shape resting on ring beam, Continuous folded plate design

**Module 3 :**
Membrane and bending theory of shells, Theories in Matrix form, Boundary conditions, Shell Parameter selection, Stress resultant calculation, Reinforcement parameters and details, composition of Ferro-cement shells

**Module 4:**
Design by Beam theory, Beam and arch analysis, modified beam method, Design of Multiple bay cylindrical shell, Design of North light cylindrical shell, continuous cylindrical shell, hyperbolic paraboloid shell, Design of Pre-stressed cylindrical shell and dome, selection of optimum pre-stressing force, effect of pre-stressing force on stress distribution in shell

**Reference Books :**
1. G. S. Ramaswamy, ‘Design and construction of concrete shell roofs’, CBS publication
2. Naaman ‘Ferrocement Construction’
Codes:

601 015-E-Elective III Design of Composite Construction
(1 Credit course)

Module 1:
Composite floors, Structural elements, Profiled sheet decking, Bending resistance, Serviceability criterion, Analysis for internal forces and moments

Module 2:
Composite Columns, Materials, Concrete filled circular tubular sections, Non-dimensional slenderness, local buckling of steel sections, Effective elastic flexible stiffness, resistance of members to axial compressions, Composite Column design, Fire Resistance. Design of Multi-storeyed commercial and residential composite building, Design basis, load calculations, Design of composite slabs with profile decks, composite beam design, design for compression members, vertical cross bracings, design of foundation.

Reference Books
2) Composite Structures of Steel and Concrete: Beams, Slabs Columns and Frames for Buildings, 3ed Johnson, -Wiley India.
3). INSDAG teaching resources for structural steel design Vol – 2, Institute for Steel Development and Growth Publishers, Calcutta

601 015-F-Elective III Foreign Language-- French-III
(1 Credit course)

Module 1:
French Grammar and Vocabulary: Unit-1, Lesson 4 of the Text Book (Grammar & Vocabulary), Unit-1, Lesson 4 of the Text Book, Revision & speaking practice

Module 2:
Advance Vocabulary, Writing & Speaking, Exercise of Unit-1, Lesson 4 of the Text Book & workbook, Practicing Simple conversation in French, Revision & practice of conversation (Simple questions & answers)

**Reference:** Jumelage-I Text Book by Manjiri Khandekar & Roopa Luktuке
Jumelage-I workbook by Roopa Lukтуке

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**601 015—G--Elective III Safety Practices in Construction**
(1 Credit course)

**Module 1:**
Introduction to Construction Safety And Safety Technology--Introduction to construction safety; historical background and current perspective; Government's policy in industrial safety; safety & health legislation in India, Construction Sites (Safety) Regulations; Codes of practice; Potential hazards/risks associated with construction sites and high risk activities such as the use of hoist, Working at height and working in confined space. Safety in typical civil structures – Dams-bridges-water Tanks-Retaining walls-Critical factors for failure- Regular Inspection and monitoring. Safety in Erection and closing operation - Construction materials –Specifications – suitability – Limitations – Merits and demerits – Steel structures – Concrete structure.
Workplace ergonomics including display screen equipment and manual handling, personal protective equipment, first aid and emergency preparedness, fire safety, electrical hazards.

**Module 2:**
Construction Safety Management and Accident Prevention
Safety training; safety policy; safety committees; safety inspection; safety audit; reporting accidents and dangerous occurrences.
Accident Prevention: Principles of accident prevention; job safety analysis; fault tree analysis; accident management

**References**

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**601 015—H--Elective III CHESS**
(Audit course--Non Credit course)

**Module 1**
Introduction of chess game, What is chess board, the place of chess board, Chess pieces position & its moves, The concept of attacking, , The concept check with different pieces, Mate/Checkmate, Castling, Pawn Promotion, Notation, Stalemate, Pointing

**Module 2**
End game, attacking a piece, Opening principles, Piece exchange, Pin, Defining the draws in Chess

**Reference:** As specified by the instructor
Module 1
Introduction of Abacus, addition & subtraction with help of small friends, big friends & big family, Concept of visualization, Multiplication & Division

Module 2
Additional & Subtraction with decimal concept, Determine cube root & square root

Reference: As specified by the instructor

UNIVERSITY OF PUNE
M.E. (CIVIL) (Structures)
SEMESTER III
1 Credit = 15 Hrs.
601 016--Seminar – II

Teaching Scheme        Examination Scheme
Pract. 4 hrs./week        Oral : 50 Marks,
                          TW :: 50 Marks
                          Credits 4

Seminar II shall be on the topic relevant to latest trends in the field.
Term work should consist of ---
I) Spiral bound report preferably, printed on both the sides of paper on the topic of dissertation work and should be submitted in a standard format having the following contents.
   i) A report on training undergone on a construction project site/organization/for a period of minimum 15 days, including the data collection necessary for the project work.
   ii) A report on the topic of dissertation, containing the following:
       a) Literature review and problem statement formulation.
       b) Research Methodology and proposed schedule of completion of project work.
          Students should prepare a power point presentation to be delivered in 15 minutes and should be able to answer questions asked in remaining five minutes.
II) Spiral bound report preferably, printed on both the sides of paper on vacational training of 2 weeks
UNIVERSITY OF PUNE  
M.E. (CIVIL) (Structures)  
SEMESTER III  
1Credit =15 Hrs.  

601 017- Project Stage I

Teaching Scheme  
Pract. 8 hr./week  

Examination Scheme  
Oral: 50 marks,  
TW : 50 marks  
Credits 8

The project work will start in semester III, and should preferably be a live problem in the industry or macro-issue of industry and should involve scientific research, design, collection, and analysis of data, determining solutions and must preferably bring out the individuals contribution.

The dissertation stage I report should be presented in a standard format, in a spiral bound hard copy, preferably printed on both the sides of paper, containing the following contents.

i. Introduction including objectives, limitations of study.  
ii. Literature Survey, background to the research.  
iii. Problem statement and methodology of work  
iv. Theoretical contents associated with topic of research  
v. Field Applications, case studies  
vi. Data collection from field/organizations or details of experimental work/analytical work  
vii. Part analysis / inferences  
viii. Details of remaining work to be completed during the project work stage II  
ix. References

Students should prepare a power point presentation to be delivered in 25 minutes and should be able to answer questions asked in remaining five minutes.(It is preferred that at least one paper on the research area be presented in a conference or published in a referred journal.)

UNIVERSITY OF PUNE  
M.E. (CIVIL) (Structures)  
SEMESTER IV  
1Credit =15 Hrs.  

601 018- Seminar – III

Teaching Scheme  
Pract. 5 hrs./week  
Credits : 5  

Examination Scheme  
TW : 50 marks  
Oral / Presentation-50 marks
Term work should consist of a spiral bound report on the topic of dissertation work, preferably typed on both the sides of pages and should be submitted in a standard format.
Seminar III will be assessed based on the requirements of completion of project work for the project stage II.
Students should prepare a power point presentation to be delivered in 15 minutes and should be able to answer questions asked in remaining five minutes.

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**UNIVERSITY OF PUNE**  
M.E. (CIVIL) (Structures)  
SEMESTER - IV  
1 Credit = 15 Hrs.

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td>Pract. 20 hrs./week</td>
<td>Oral/Presentation : 50 Marks</td>
</tr>
<tr>
<td>Credits : - 20</td>
<td>TW : 150 Marks</td>
</tr>
</tbody>
</table>

The final dissertation should be submitted in black bound hard copy as well as a soft copy on CD.  
(The due weightage will be given for the paper(s) on topic of project presented in a conferences or published in referred journals.)  
The Term Work of Dissertation of semester IV should be assessed jointly by the pair of internal and external examiners, along with oral examination of the same.