SYLLABUS

OF

M.E. CIVIL (Construction & Management.)

w. e. f. 2017
### Course Structure

**University of Pune, Document of Rules and Regulation for P. G. Courses be referred for the detailed information**

1 Credit = 2 Modules/Units

**SEMESTER=I**

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lect/Practs.</td>
<td>Paper</td>
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<td></td>
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<td>In Semester</td>
<td>End Semester</td>
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<td></td>
<td></td>
<td>Assessment</td>
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<td>501021</td>
<td>Applications of Statistical Methods in construction</td>
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<tr>
<td>501022</td>
<td>Management and Project Planning in Construction</td>
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<tr>
<td>501023</td>
<td>Construction Technology</td>
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<td>501024</td>
<td>TQM in Construction</td>
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<tr>
<td>501025</td>
<td>* Elective I</td>
<td>5</td>
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<tr>
<td>501026</td>
<td>Lab Practice I</td>
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<td><strong>25</strong></td>
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* Elective I - Students should select the combination of technical and interdisciplinary courses in order to complete 5 credits from following list.

### 501 025 -Elective I

<table>
<thead>
<tr>
<th>Code</th>
<th>4 Credits Course</th>
<th>Code</th>
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<tbody>
<tr>
<td>501025 A</td>
<td>Cyber Security / Information</td>
<td>501025 F</td>
<td>Economics &amp; Finance For Engineers</td>
<td>501025 J</td>
<td>Mass communication, Photography and Videography</td>
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<tr>
<td>501025 B</td>
<td>Sustainable Construction Materials</td>
<td>501025 G</td>
<td>Foreign Language I</td>
<td>501025 K</td>
<td>Yoga and Meditation</td>
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<tr>
<td>501025 C</td>
<td>Disaster Management</td>
<td>501025 H</td>
<td>Engineering Ethics</td>
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<tr>
<td>501025 D</td>
<td>Retrofitting of Structures</td>
<td>501025 I</td>
<td>Intellectual Property Rights</td>
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<td>501025 E</td>
<td>Construction Safety</td>
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### SEMESTER –II

<table>
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<tr>
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<th>Subject</th>
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<tr>
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<td>End Semester Assessment</td>
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<td>501028</td>
<td>Project Economics and Financial Management</td>
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<td>Operations Research</td>
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**Elective II - Students should select the combination of technical and interdisciplinary courses in order to complete 5 credits from following list.**

<table>
<thead>
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<th>Code</th>
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<tr>
<td>501030 A</td>
<td>Human rights</td>
<td>501 030 E</td>
<td>Foreign Language II</td>
<td>501 030 I</td>
<td>Performing Arts</td>
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<td>501030 C</td>
<td>Material Management</td>
<td>501 030 G</td>
<td>Green Building Design and Construction</td>
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<td>501 030 D</td>
<td>Value Engineering &amp; Valuation</td>
<td>501 030 H</td>
<td>Forensic Civil Engineering</td>
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**SEMESTER –III**

<table>
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<td>End Semester Assessment</td>
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<td>601033</td>
<td>Environment and energy for sustainable construction</td>
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<td>601034</td>
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<tr>
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### 601037 Project Work Stage I

<table>
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<td>601035A</td>
<td>Advanced Construction Technology</td>
<td>601035 E</td>
<td>Construction Equipment Management</td>
<td>601035 I</td>
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<td>Infrastructure Development</td>
<td>601035 F</td>
<td>Foreign Language</td>
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<td>601035C</td>
<td>International Contracting</td>
<td>601035 G</td>
<td>Risk Analysis &amp; Mitigation Practice</td>
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<td>601035D</td>
<td>Thrust Areas in Project Management</td>
<td>601035 H</td>
<td>Safety Practices in Construction</td>
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**SEMESTER – IV**

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***Elective III – Open Elective - Students should select the combination of technical and interdisciplinary courses in order to complete 5 credits from following list.***

601 035 – Open Elective III
EXAMINATION SCHEME

A) Compulsory Subjects: Credits 4

Total marks: 100

<table>
<thead>
<tr>
<th>To be done at Institute Level</th>
<th>University Exam</th>
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<tbody>
<tr>
<td>In semester assessment</td>
<td>End-semester assessment</td>
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<tr>
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<tr>
<td>Class tests</td>
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<tr>
<td>Assignments /Mini Project</td>
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<td>20 Marks</td>
<td>16 Marks</td>
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<td>50 Marks</td>
<td>19 Marks</td>
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B) Elective Subjects: Credits 5

Total marks: 100

<table>
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<tr>
<th>Module 1 (Credits-4)</th>
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<tr>
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<table>
<thead>
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<th>Module 2 (Credit 1)</th>
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<td>Class Tests/Assignments</td>
</tr>
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</table>
Savitribai Phule Pune University [SPPU]
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)
SEMESTER I

501 021- Application of Statistical Methods in Construction

Teaching Scheme:
Lectures: 4 Hrs. /Week
Credits: 4

Examination Scheme:
Theory Paper: 100 Marks
In Semester Assessment: 50 marks
End Semester Assessment: 50 marks
Duration: 3 hrs.

Unit – 1 (8 Hours)

**Distributions:** Theoretical probability Distributions: Binomial Distribution, Poisson Distribution. Normal Distribution, Exponential Distribution, Beta, Gamma.

Unit – 2 (8 Hours)
**Sampling:** Sampling and sampling distribution: Probability samples, Non-probability Samples, sample Random sampling, other sampling schemes, sampling distribution and Standard error, some Sampling and Quality control. Use of concepts of standard deviation, Coefficient of variance, range in quality control of concreting and similar such activities.

Unit -3 (8 Hours)
**Testing:** Testing Hypothesis: Sampling of distribution – Test based on Normal Distribution, Students-t test, chi-square, K-S test for goodness of fit and distribution. Analysis of variance one Way & two way classification.

Unit – 4 (8 Hours)
**Correlation Analysis:** Correlation types, co-efficient. Bi-variate Frequency Distribution, Scatter Diagram, Correlation Analysis, Practical applications in civil engineering projects.

**Regression Analysis:** Regression and Multivariate Analysis, Multiple Regression Analysis Nonlinear Regression. Use of regression analysis in Construction Projects.
Unit – 5  (8 Hours)

Simulation: Simulation – Types, case studies in construction using simulation Techniques, simulation software’s used. Griffi’s waiting line Method, Concept of Downtime Cost of Equipment, Cox and Nunally Model, Failure Cost Profile (FCP), LID.

Unit – 6  (8 Hours)

Applications: Use of mathematical models based on probabilistic and statistical methods, Simulation in risk identification, analysis and mitigation of project risks. EOQ in civil Engineering, Sensitivity analysis, ABC analysis.

Reference Books

8. Applied Statistics for Civil and Environmental Engineers by Kottegoda—Stratford Books
M.E. CIVIL (Construction & Management)
Subject: Management and Project Planning in Construction
(Syllabus – Revision Year 2016)
Subject Code: 501022

Teaching Scheme:
Lectures: 4 Hrs. /Week
Credits: 4

Examination Scheme:
Theory Paper: 100 Marks
In Semester Assessment: 50 marks
End Semester Assessment: 50 marks

Syllabus
Unit–1 (8 Hours)

A)Basics of Management:
Modern scientific management(Contribution by Fayol , F.W. Taylor , Mayo), Management Functions, Management Styles, SWOT Analysis in construction

B)Project Management:
Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Enterprise Resource Planning (ERP)

Unit 2 8 Hours

Project Scheduling:
Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modeling) techniques. LOB technique, Mass haul diagrams. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

Unit 3 8 Hours

a) Project Controlling :
Monitoring and Control, Crashing, Resource Leveling, Updating.

b) Construction site management:
Site mobilization – demobilization aspects, various Resources management based on funds availability,
coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers ,Engineers , Supervisors

Unit -4

Work Study:
8 Hours

a) Definition, Objectives, basic procedure, method study and work measurement, Work study applications in Civil Engineering.

b) Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.

c) Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse, photography technique,

Analytical production studies

Unit -5

8 Hours

Safety Engineering:

a) Causes of Accidents on various sites, safety measures and safety policies to be adopted, determination of safety parameters, personal protective equipment. Workmen Compensation Act, Minimum wages act

b) Type Of Industrial Hazards-Nature, Causes And Control Measures, Hazard Identifications And Control Techniques - HAZOP, FMEA, FMECA. -Cost of Construction Injuries-Legal Implications

c) Safety Organization –Safety Policy, Safety Record Keeping, Safety Culture, Safety and First Line Supervisors, Middle Managers, Top Management Practices, Sub contractural obligation, Project Coordination and Safety Procedure

Unit – 6

8 Hours

Administration of Incentive Schemes

a) Necessity, Merit rating, job evaluation, installation, modification and maintaining of incentive schemes based on implementation experience.

b) Introduction to artificial intelligence technique ANN, Fuzzy Logic , Genetic Algorithms

Introduction to BIM

Any ERP based software training/assignment is compulsory (in lab practice I & II)

Reference books

2. Construction Project planning & Scheduling By Charles Patrick, Pearson, 2012
5. Modern construction management--.Harris, Wiley India.
8. Work study – Currie.
12. Construction Management – Roy, Pilcher
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

501 023 - Construction Technology

Teaching Scheme:                  Examination Scheme:
Lectures: 4 Hrs. /Week              Theory Paper: 100 Marks
Credits: 4                          In Semester Assessment: 50 marks
                                          End Semester Assessment: 50 marks

UNIT -1                                      (8 hours)


UNIT – 2                                      (8 hours)

Underwater construction: Problems encountered in excavation, Underwater drilling, blasting, Grouting methods in soft and hard soil including Jet grouting and Chemical grouting, Dewatering in shallow and deep excavations using different methods, Vacuum Dewatering and Well point system.

UNIT – 3                                      (8 hours)

Construction using Concrete Technology: Concrete – Various types and erection methods of shuttering, Operation and erection of Ready Mix Concrete Plant, Pumped Concrete, Concrete mix design with various methods of concreting and also underwater concreting using tremie method, Concreting for under water Construction, Self-compacting concrete.

UNIT – 4                                      (8 hours)


UNIT – 5                                      (8 hours)

Coffer Dams: Cofferdams – types, design and construction of single, double wall, Cofferdam. Sheet pile cofferdams, concrete wall movable cofferdam, land cofferdams, soldier construction method. Cofferdam wall by ICOS method, coffer dams with touching and interlocking piles and diaphragm wall.
UNIT – 6  
(8 hours)

**Caissons**: Types, box, pneumatic and open caissons, Well foundations, details, design and Construction of pneumatic and precast caissons.

**Minimum 1 Case study with Presentation by students** be discussed /analyzed in each of the above topics with Subject Teacher.

**Reference Books:**

1. Construction Technology: Analysis, and Choice, 2ed, Bryan, Wiley India
3. Construction Equipment Planning and Applications – Dr. Mahesh Varma
4. Brochures Published by various agencies associated with construction.
5. Journals such as CE & CR. Construction world, International Construction.
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)
501 024 TQM in Construction

Teaching Scheme: Lectures: 4 Hrs. /Week Credits: 4
Examination Scheme: Theory Paper: 100 Marks
In Semester Assessment: 50 marks
End Semester Assessment: 50 marks

Unit –1 (6 hours)
Concept of Quality:
Definition of quality as given by Deming, Juran, Crosby, difference between Quality control, Quality Assurance (QA/QC). Total quality control (TQC) and Total Quality Management (TQM), Need for TQM in construction industry. Organization necessary for implementation of quality, Quality manual-Contents, data required, preparation, responsibility matrix, monitoring for quality- PDCA Cycle. Quality aspects in every phase in the life cycle of Construction project.

Unit-2 (6 Hours)
Quality Control tools and statistical quality Control:
(A) Histogram, Pareto diagram, Fishbone diagram, Quality control chart-Testing required for quality control of construction material used in RCC Work- destructive and Non destructive Test (NDT)

(B) Statistical Quality Control- Necessity, Benchmarking, Application of dispersion methods in quality control of construction activity.
Unit –3

Training and development of Human Resources:
Training needs assessment, technical and managerial competencies necessary for achieving quality, preparation for training. Training on Project Rework Reduction Tool (PRRT) software- training for preparation of checklist necessary for RCC work, for commonly used formats.

Unit –4

Development of quality circles, quality inspection team, inspection reports, monitoring and control, 360’ feedback for quality.

Unit –5

Study of ISO 9004- Quality System Standards.

Unit–6

Achieving TQM on Construction Projects:
Advantages, barriers, principles, steps in implementation, seven types of construction defects.
Determining cost of poor quality including hidden cost.
Quality functions deployment (QFD). Importance of third party quality audits. CIDC-CQRA quality rating systems, customers satisfaction surveys, Non Conformity reports (NCR), remedial strategy for reducing NCR’s.

Unit –7

Six Sigma:
Definition of six sigma, evolution – Historical aspects, probability distribution Six sigma ratings, Six sigma training, six sigma as an effective tool in TQM.

Unit –8

Application of Six Sigma tool to:
i) RCC Work in building
ii) DLC and PQC layers in road construction
(iii) Assessment of overall construction process from concept to completion of a
construction project.

**Reference Books**

1. International Standards Organization – ISO 9001 and ISO 9004
4. Probability and Statistics for Engineers – Miller, Freund-Hall, Prentice India Ltd.
501 025 - A-Elective I - Cyber Security / Information Security (4 Credits course)

Teaching Scheme:
Lectures: 4 Hrs. /Week
Credits: 4

Examination Scheme:
Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks

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

Module 3

Module 4
Reference Books:

4) Vakul Sharma, Information Technology Law and Practice, Delhi Law House, 3rd Edn, 2011
Teaching Scheme:  
Lectures: 4 Hrs./Week  
Credits: 4

Examination Scheme:  
Theory Paper: 75 Marks  
In Semester Assessment: 25 marks  
End Semester Assessment: 50 marks

Module 1:  
Necessity and importance of sustainable construction materials. Material composition and properties, production, storage, distribution, testing, acceptance criteria, limitations of use, economic consideration, recent development related to the following materials to be studied.

Module 2:  
Various construction chemicals/admixtures, Fly ash and its use in concrete, Silica fume concrete, Self compacting concrete, Fiber Reinforced plastics and concrete, Light weight concrete

Module 3:  
Crumb modified bitumen Rubber, Glenium Concrete, Materials used in nuclear-containment structures.

Module 4:  
High performance concrete, Nano technology in cement concrete, Ferrocement Technology

Reference Books:  
1. Concrete Technology by Neville  
2. Construction Materials, Methods & Techniques(3e) by William P Spence, Yesdee Publication 2012, Pvt. Ltd., Chennai, India  
4. Concrete Technology by M.S.Shetty, S.Chand Publ.  
8. Civil Engineering and Construction Review magazine  
9. Engineering Materials –Dr. S.V.Deodhar
501 025–C-Elective I - Disaster Management (4 Credits course)

Teaching Scheme:  
Lectures: 4 Hrs. /Week  
Credits: 4

Examination Scheme:  
Theory Paper: 75 Marks  
In Semester Assessment: 25 marks  
End Semester Assessment: 50 marks

Module 1:  
Disasters – Natures and extent of disasters, natural calamities such as earthquake, floods, drought volcanoes, forest, coasts hazards, landslides etc. Manmade disasters such as chemical and industrial hazards, nuclear hazards, fire hazards etc. Disaster Management – Financing relief expenditure, legal aspects, rescue operations. Casual management, risk management.

Module 2:  
Emergency Management program – Administrative setup and organization. Hazard analysis, training of personnel, information management, emergency facilities and equipment necessary public awareness creation, preparation and execution of the emergency management program.

Module 3:  
Various organizations registered with Government and NGO’s working for disaster relief-Challenges faced by organizations. Methods of assessment of impact of disasters such as photogrammetric methods, media survey, ground data collection.

Module 4:  
International adopted practices for disaster mitigation. Rules and regulations, Monitoring aspects of disaster mitigations programs.

Reference Books:  
1. An Introduction to Disaster Management –Natural Disasters and Man Made Hazards, S.Vaidyanathan, Ikon Books  
2. Construction Engineering and Management – Seetharaman, Umesh Publ.  
3. NICMAR Publications  
4. Different sites on internet on disaster management  
5. Project Management – K Nagarajan – New Age International Ltd.  
501 025 –D-Elective I - Retrofitting of Structures (4 Credits course)

Teaching Scheme:
Lectures: 4 Hrs. /Week
Credits: 4

Examination Scheme:
Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks

Module 1:
Importance of rehabilitation repairs and retrofitting as a part of construction engineering. Difference between the term. Rehabilitation studies of buildings, underground construction, bridges, streets and highways, sewage treatment plants – masonry work, R.C.C. works, steel structures- types of distress.

Module 2:
Numerical condition surveys for foundation, structural and functional deterioration, design criteria, materials and technology. Predictive performance models, evaluating alternatives based on technical, commercial, management, financial feasibilities, data collection and database management, maintenance of rehabilitated structures. Procedure adopted by BIFR (Board of Industrial and Financial Reconstruction).

Module 3:
Earthquake damages of buildings, their retrofitting, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of buildings.

Module 4:
New Construction materials, processes and techniques used for repairs, rehabilitation and retrofitting- Construction chemicals based on nanotechnology, construction points based on nanotechnology, various types of fibre wrappings etc.

Reference Books:
1. Technology of Building Repairs, Raikar R N
2. The Bombay Building Repairs & Reconstruction Board Act 1969, Govt. of Maharashtra
3. Maintenance & Repairs of Buildings, P. K. Guha
4. Concrete Structures Protection Repair and Rehabilitation, R. Dodge Woodson, Elsevier Publication
5. Construction, Maintenance & Restoration and Rehabilitation of Highway Bridges, K. S. Rakshit
6. Retrofitting of Concrete Structures by Externally Bonded FRP’s – CEB – FIP, Technical report,
501 025 –E-Elective I - Construction Safety (4 Credits course)

Teaching Scheme: 
Lectures: 4 Hrs. /Week
Credits: 4

Examination Scheme:
Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks

Module 1:
Construction Safety Management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.

Module 2:
Safety in construction operations – Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used.

Module 3:
Various safety equipment and gear used on site. First aid on site, Safety awareness program. Labor laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices.

Module 4:
Study of safety policies, methods, equipment, training provided on any ISO approved construction Company ,safety in office, working on sites of high rise construction, deep excavation

Reference Books
4. ISI for safety in Construction – Bureau of Indian Stanrards.
Teaching Scheme: 
Lectures: 1 Hr. /Week
Credits: 1

Examination Scheme: 
In Semester Assessment: 25 marks

Module 1: 

Module 2: 
**Principles of Costing, Estimation & Valuation:** Basics of Costing, activity based costing & case studies, Basics of Estimation & Valuation, present & future values of properties, Profitability & Financial Decisions, Inventory Management.

**Reference**
1. Financial Management, Khan.
2. Financial management, Prassanachandra
501 025 –G-Elective –I - Foreign Language -I (French-I)  (1 Credit Course)

Teaching Scheme:  
Lectures: 1 Hr./Week  
Credits: 1

Examination Scheme:  
In Semester Assessment: 25 marks

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

501 025 - H -Elective –I -Engineering Ethics (1Credit Course)

Teaching Scheme:  
Lectures: 1 Hr./Week  
Credits: 1

Examination Scheme:  
In Semester Assessment: 25 marks

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.
501 025 –I- Elective –I Intellectual Property Rights  (1Credit  Course)

Teaching Scheme:
Lectures: 1 Hr. /Week
Credits: 1

Examination Scheme:
In Semester Assessment: 25 marks

Module-1
Introduction to Intellectual Property Rights

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

Module2
Patent Rights
Geographical Indications.

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
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, Akaramdhansaras, Ardhamatsendrasan, Vajrasan, Pachhimottanasan, Bhujangasan, Shalbhasan, Dhanurasan, Naukasas, Makrasan, Pawanmuktasans, Halasan, Sarvangasans, Shavasan, Suryanamaskar (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, UjjayiPranayam, BhramariPranayam, Bhashrika Pranayam, Agnisar Pranayam, KapalbhatiPranayam, Meditation(Dhyan).

**References Books:**

Light on Yoga: by B.K.S. Iyengar, Harper Collins Publishers India
2. Yoga for Dummies by Georg Feuerstein and Larry Payne, Wiley India publishing
3. Yoga, Pilates, Meditation & Stress Relief By Parragon Books Ltd
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. YogPravesh by Vishwas VMandlik, YogchaitanyaPrakashan
7. Asanand YogVigyan, BhartiyaYogSansthan, Delhi
8. PranayamVigyan, BhartiyaYogSansthan, Delhi

**Reference Web Sites:**

SEMESTER - I
501 026 Lab Practice – I

Teaching Scheme
Pract. 4 hrs./ week
Credits – 4

Examination Scheme
Oral : 50 Marks,
TW: 50 Marks

----Term work should consist of any 6 assignments out of the first 8.
----Assignments 9,10 are compulsory.
1. Assignment on use of means of dispersion in quality control.
2. Assignment on formulation of linear regression equation between a dependent variable and independent variable, applicable in construction.
3. Working out total number of construction equipment necessary to complete a particular quality of item work in a particular time and determining its direct cost per MODULE-for construction equipment working in a group.
4. Assignment on showing the schematic of a pumped concrete layout and determining the total length of the pipe-line required, considering dependent factors.
5. Assignment on developing a precedence network, calculation of floats and project crashing.
6. Assignment on work study
7. Any 2 assignments on Elective I
8. Site Visits Minimum Two site visits to study construction techniques and use of major construction equipment associated with ongoing major construction works. Visit Report to be submitted
10. Assignment on using MS Excel, MS Project software and ERP software to be done
Teaching Scheme:
Lectures : 4 Hrs./Week
Credits : 4 marks

Examination Scheme:
Theory Paper : 100 Marks
In Semester Assessment : 50 marks
End Semester Assessment : 50 marks
Duration : 3 hrs.

Unit 1 : Construction Contracts : 8 hours
a) Indian Contract Act (1872) : a) Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. (from model 5)
b) Clauses 1 to 75- Contract formation, contract performance, valid excuses for non-performance, Breach of contract, effects of breach- understanding the clauses and applying them to situations/scenarios on construction projects. Importance of the Workmen’s Compensation Act on construction projects.

Unit 2: Contract Formation 8 hours
a) Standard forms of contracts, methods of inviting tenders, pre-bid meetings, pre-qualification system, scrutiny of tenders and comparative statement.
b) Contract formation, conditions of contracts, contracts with various stakeholders on a major construction projects, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure.

Unit 3: Contract Conditions 8 hours
a) General condition and Particular conditions,

Unit 4: FIDIC 8 hours
ICE conditions-Introduction, FIDIC conditions- evolution of FIDIC document, types based on whether design is of employer or contractor, Design & Build contract, EPC contract, short forms of contract- Colour Code. Various conditions of Red Book.

Unit 5 Construction Claims and Dispute Resolution 8 hours
a) Construction Claims: Extra items and causes of claims. Types of construction claims, documentation. settlement of claims
b) **Dispute Resolution:** Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards.

**Unit 6 Conciliation & Arbitration**


**Reference Books:**


M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT) SEMESTER II

501 028- Project Economics & Financial Management

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./Week Theory Paper : 100 Marks
Credits: 4 In Semester Assessment : 50
marks

End Semester Assessment : 50 marks
Duration : 3 hrs.

Unit 1  8 hours

**Principles of Economics**: Importance of the economic background to measurement, objectives of business firm. Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms, Study of present economy.

**Capital**: Analysis of need for working capital, Estimation of requirements of working capital, Credit Management, Cash Management., Corpus Fund

Unit 2  8 hours

**Economic Analysis**: Cost implication to different forms of construction and maintenance and maintenance and replacement lives of material, Installation and running cost of services, Capital investment in project, Cost analysis by traders and by functional element, Cost planning techniques, Cost control during design and Construction, Depreciation, Various Appraisal Criteria Methods. Break-even analysis, Cash flow analysis, Risk Analysis and Management Practice, Role of Lender’s Engineer. Cost pricing method

Unit 3  8 hours


**Budget**: Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual. Accounting Information System:, Project Commentary, project Running Commentary

Unit 4  8 hours

**Corporate Sector**: Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction sector, SEBI regulation., GST, CGST, SGST, Direct Tax Court System

Unit 5  8 hours

**Construction Accounts**: Accounting process, preparation of profit and loss account and balance sheet as per the companies Act2013, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis. Escrow Account for PPP Project.
Unit 6  8 hours

Case Studies (Any Two): Case studies for 1)PPP projects  2)Dams and Canals 3)Mass Transit System  5)Government Funded Projects with respect to  a) Project Appraisal  b) Raising of funds  
c) Cost to complete analysis

Reference Books
1. Construction project scheduling and control ----Mubarak, Wiley India.
Teaching Scheme:  
Lectures: 4 Hrs./Week  
Credits: 4 marks  

Examination Scheme:  
Theory Paper : 100 Marks  
In Semester Assessment : 50 marks  
End Semester Assessment : 50 marks  
Duration : 3 hrs.

Unit 1  
8 hours  
Use of Operations Research in Civil Engineering and Managerial Decision making process. Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction. Various models; Objective function and constraints, convex and concave functions, regions and sets.

Unit 2  
8 hours  
Linear programming: Formulation of Linear optimization models, Civil engineering applications. Simplex method, special cases in simplex method, Method of Big M, Two phase method, duality, sensitivity analysis.

Unit 3  
8 hours  
a) Transportation Model and its variants,  
b) Assignment Model and its variants.  
c) Decision theory.

Unit 4  
8 hours  
(a) Dynamic programming: Multi stage decision processes, Principle of optimality, Recursive equation, Application of D.P.  
b) Non-Linear programming: Single variable unconstrained optimization –Local & Global optima, Uni-modal Function- Sequential Search Techniques: Dichotomous, Fibonacci, Golden Section methods.

Unit 5  
8 hours  
Multivariable optimization without constraints-The gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton’s Method. Multivariable optimization with equality constraints-Lagrange Multiplier Technique.

Unit 6  
8 hours  
(a) Queuing Theory, Simulation.  
(b) Sequencing model – n jobs through 2, 3 and M machines.  
(c) Replacement models.
(d) Games Theory.
Reference Books
1. Operations Research by Hamdy A.Taha
3. Engineering Optimization—Methods and Applications—Ravindran,Wiely
5. Quantitative Techniques in Management by N.D.Vohra
6. Principles of Construction Management by R.Pilcher
7. Operations Management by E.S.Buffa
10. Operation Research – Hira and Gupta, S.Chand

501 030 –A -Elective II  Human Rights  (4 Credits course)

Teaching Scheme:
Lectures: 4 Hrs./Week
Credits: 4

Examination Scheme:
Theory Paper : 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks
Duration: 3 hrs.

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
- Fundamental Rights & Duties
- Directive Principles of State Policy
- Welfare State & Welfare Schemes

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.

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

**501 030-B-Elective II Human Resource Development (4 Credits course)**

Teaching Scheme:
Lectures: 4 Hrs./Week
Credits: 4

Examination Scheme:
Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks
Duration: 3 hrs.

**Unit 1**
**Introduction:** Need of HRD in the context of globalization, Organization Policies various HRD parameters viz. Elements of the ICDP i.e. integrated construction development paradigm, key elements
of HRD such as basic literacy, functional skills, supervisory skills, entrepreneurship skills. Database concept & application in Human Resource Information System

Unit 2: Recruitment process
Recruitment policies, Pre requisites skills- Soft and technical skills. Employee testing & selection
Personal Management – Concept of Personal Management, Responsibilities & authority Role and Function of Personal Manager, Necessity of Personal Management

Unit 3
Training: –Training of multi-skilled workforce, quality, productivity and employee relations in construction, contractors & sub-contractors – selection, training & development, performance appraisal, potential appraisal, training rewards and recognition etc. Selection of contractors region wise & retaining, Upgrading HRD for construction MNC/Multi portfolio project handling organization. formation of joint ventures, privatization and BOT type of systems. CIDC – IGNOU Training programs.

Unit 4
Career Plan & development
Career development cycle, career need assessment, use of assessment centers by small organization, teams synergy,

Participative management

Reference Books
1. Human Resource Management by Biswajeet Pattanayak
3. Managing Human Resources by Bohlander & Snell
501 030—C- Elective II --Materials Management (4 Credits course)

Teaching Scheme:
Lectures : 4 Hrs./Week
Credits : 4

Examination Scheme:
Theory Paper : 75 Marks
In Semester Assessment : 25 marks
End Semester Assessment : 50 marks
Duration : 3 hrs

Unit – 1

Importance of Materials Management: Importance of material management and its role in
construction industry-scope, objectives and functions, Integrated approach to materials
management, Role of materials manager.

Unit - 2

Codification and procurement: Classification and Codification of materials of construction.
ABC analysis-Procedure and its use, Standardization in materials and their management,
Procurement, identification of sources of procurement, vendor analysis. Vendor analysis
concept of (MRP) Material requirement planning, planning, purchase procedure, legal
aspects.

Unit - 3

Inventory and Stores Management:
(a) Inventory Management – Inventory Control techniques. EOQ, Advantages and limitation
of use of EOQ, Periodic ordering, order point control, safety stock, stock
outs, application of AC analysis in inventory control, concept of (JIT)- Just in time
management, Indices used for assessment of effectiveness of inventory management.
(b) Stores Management: Receipt and inspection, care and safety in handling, loss on storage,
wastage, Bulk purchasing, site layout and site organization, scheduling of men, materials
and equipment.

Unit–4

Quality Control and use of MMS: Quality Control – Conventional methods of quality control of
Construction materials. Statistical method of quality control, sampling techniques quality control in
process. Quality management and its economics. Use of (MMS) – Materials Management Systems in
materials planning, procurement, inventory, control, cost control etc. Application of software in MM
such as TALLY, ERP, SAP etc.

Reference Books
1. Purchasing and Inventory Control- by K. S. Menon, Wheeler Publication.
Elective –II
(501030 D) Value Engineering and Valuation (4 credits)

Teaching Scheme:

Lectures: 4 Hrs./Week
Credits: 4

Examination Scheme:

Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks
Duration: 3 hrs

Unit 1: Value Analysis 8 hours

a) Value Engineering: Definition, Importance to Contractors, Potential VE Applications Value: basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic: identifying reasons or unnecessary costs:

b) Value Analysis: 10 Commandments of value analysis; value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow up action, benefits of value analysis, various applications; assessing effectiveness of value analysis.

Unit 2 Life cycle costing: 8 hours

Life cycle costing – Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis. Different methods of performing value engineering.

Unit 3: VE Methodology 8 hours

Orientation phase, Information phase, Function Analysis phase, Creative Phase, Evaluation Phase, Development Phase, Presentation Phase, implementation Phase

Unit 4: Application of Value Engineering to a Construction Project 8 hours

VE during the Planning Phase of a Construction Project, VE during the Design Phase of a Construction Project, VE during the Construction Phase of a Construction Project

Unit 5: Valuation 8 hours

Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places.

Unit 6 Valuation Report

Valuation Report, contents, standard formats, Case study of any one Report.

Reference Books

1. Value Engineering: Analysis And Methodology By Del Younke
4. Estimating and Costing in Civil Engineering: Theory and Practice B.N Dutta Published
   S. Dutta & Company, Lucknow.
5. Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty
   Published By: Author.
7. Estimating and Costing By: Rangwala Published By: Charotar Publishing House,
8. Practical Information for Quantity Surveyors, Property valuers, Architects Engineers and Builders,

501 030—E-Elective II-- Foreign Language –II French-II   (1 Credit course)

Teaching Scheme:
Lectures : 1 Hrs./Week
Credits : 1

Examination Scheme:
In Semester Assessment : 25 marks

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
501 030—F--Elective II Building Services and Maintenance
(1 Credit course)

Teaching Scheme:
Lectures: 1 Hrs./Week
Credits: 1

Examination Scheme:
In Semester Assessment: 25 marks

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
Subject: - 501030 – G-Elective II - Fundamentals of Green Building Design and Construction

(1 Credit course)

Teaching Scheme:
Lectures: 1 Hrs./Week
Credits: 1

Examination Scheme:
In Semester Assessment: 25 marks

Unit 1
a. Definition of Sustainability, Need of sustainability, advantages, issues related to impact on Environment. (Major Environment Challenges),
b. Introduction to Green Building, Principles of Green Building (Site Aspect :- Soil conservation, Vegetation retention, Energy Efficiency, Materials and Resources, Water Efficiency, rainwater harvesting, grey water gardening, solid waste management, , Indoor Environmental Quality:- Passive cooling and heating, Transportation, Pollution Control Green Building Rating system and its criteria for evaluation of building (For E.g. LEED, IGBC, TERI-GRIHA, etc.), Design Aspect: - Building green team, integrated design process.
c. Construction Aspect, Zero Carbon emission building/ Zero Carbon Housing/ Zero Energy Housing,

Unit 2
b. Material selection criteria, Benefits of Use on green material, Replacement of conventional material by green material eg:-(Concrete, Bricks, sloping roof material, admixtures, plantation, paints, etc.)
c. Life Cycle Cost Analysis of Green Building

Reference Books --
3. Energy Conservation Building Code (ECBC)
**501 030- H--Elective II -- Forensic Civil Engineering**  
(1 Credit course)

Teaching Scheme:
Lectures: 1 Hrs./Week  
Credits: 1

Examination Scheme:
In Semester Assessment : 25 marks

**Module 1**
Introduction to forensic engineering, Forensic investigations-tools and techniques, Failures-types, causes and mechanisms, Monitoring and instrumentation, Mitigation of failure.

**Module 2**
Professional practice and ethics, Legal issues, Repairs and remediation, Risk and risk assessment, Assessment of damage, Case studies.

**References:**
Proceedings, Conference on Forensic Civil Engineering, Association of Consulting Civil Engineers(I), August, 2013

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**501 030—I-Elective II -- Performing Arts – Music and Dance**  
(Audit course--Non Credit course)

**Module 1:**

**Indian Music**
Vocal, Instrumental, Sur, Laya, Tal. Ragas and their classification based on time and “Raasa- Nirmitee”. Seasons and Ragas. Various “Bandishes” and “Gharanas” or styles. Light Indian Music-different types. 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 Natyashashtra by Adya Rangacharya, Munshiram Manoharlal publication.

8. Art of Dancing classing and folk dance by priyabala Shah, Parimal publication


**501 030 – J-Elective II -- Principle Centered Leadership**

*(Audit course--Non Credit course)*

**Module 1:**

**Motivation, Leadership and Competency**

**a) Motivation:**
Types of Leadership viz. Lassez Fairre, transactional, transformational. Principle centered leadership based on Stephen Covey habits.

**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
501 031 Lab Practice II

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

Term work should consist of any 6 assignments out of the first 8, assignments 9 and 10 are compulsory.
1. Assignment on study on a tender/contract document on Civil Engineering Work.
2. Assignment on preparation of comparative statement for an item rate contract.
3. Assignment on project cash flow statement and its evaluation using at least 2 methods.
5. Assignment on use of linear programming
6. Assignment on use of Transportation Model.
7. Any 2 assignments on Elective-II
8. Minimum two site visits to study the feasibility aspects, tendering procedures, accounting systems, funds raising and other financial management aspects, billing procedures etc. associated with on-going major construction work-visit report to be submitted.
9. Assignment on any one software used - An estimation and tendering software /primavera software / ERP software. Students are required to operate the software; The demonstration of software is not expected.

501 032 Seminar – I

Teaching Scheme: Examination Scheme:
4 Hours/Week TW: 50 marks
Credits: 04 Oral/Presentation: 50 marks

Seminar I: Shall be on state of the art topic of student’s own choice approved by an authority. The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned Guide and head of the department/institute.
SEMESTER - III

601 033-Environment & Energy for Sustainable Construction

Teaching Scheme:
Lectures: 4 Hrs./Week
Credits: 4

Examination Scheme:
Theory Paper : 100 Marks
In Semester Assessment: 50 marks
End Semester Assessment: 50 marks
Duration: 3 hrs.

Module –1

Environment and its impact:
Concept of Environment & Environmental Impact Factors & area of consideration for Mega Projects such as Airports, Highways, Power Projects, Water Related Projects. 3E’s Environmental Economics, Ethics & Ecology of sustainable development.

Measurement of Environmental & Socio Economic Impact & Other concepts:
Natural /Physical Environmental Impacts, Social Impacts, Economic Impacts Concept of Significance
Effect, Commitments of resources.

Module –2

Socio Economic Impacts: Physical, Social, Aesthetic and Economic Environment, Type of Socio economic Impacts, Outline of basic steps in performing the socio economic assessment, Fiscal Impacts Analysis

Module –3

Environment and pollution Control Laws:

Module-4
Moduleed nations Framework Convention on Climate change(UNFCC),Protocol, Conference of Parties(COP), Clean Development Mechanism(CDM),Prototype Carbon Funds(PCF), Carbon credits and its trading, Benefits to developing countries

Module –5

Energy Efficient Projects & Financing of energy Efficiency Projects:
Energy efficient Projects, Evaluation of energy efficient projects, Various ways of financing Energy efficient projects, Role of Financial Institutions and corporate banks, Deferred Payment Financing, Types of energy Performance Contracts, Energy Services Companies (ESCOs), and their role, Emphasis on ESCOs
Module -6

Module –7

Module –8

Reference Books:
7. Financing Energy Efficiency: Forging The Link
9. Public Procurement Of Energy Efficiency Services Lessons From International
Experience by Jas Singh, Dilip R. Limaye, Brian Henderson, And Xiaoyu Shi


601 034: Research Methodology

Teaching Scheme
Lectures: 4 hours/week
Credits: 4

Examination Scheme
In semester Exam. : 50 marks
End Semester Exam. : 50 marks
Duration of End term. Exam: 3 hrs

Unit 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. 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

Unit 2: 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.

Unit 3: 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.

Unit 4: 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.

Unit 5: Advanced data analysis techniques
Correlation and regression analysis, Introduction to factor analysis, discriminant analysis, cluster analysis, multidimensional scaling, Descriptive statistics, Inferential statistics, Multi-dimensional measurement and factor analysis

Unit 6: Report writing
Need of effective documentation, importance of report writing, types of reports, report structure, report formulation, Plagiarism. Research briefing, presentation styles, impact of presentation, elements of effective presentation, writing of research paper, presenting and publishing paper, patent procedure.

References
3. Research Methodology: Methods and Trends, by Dr. C. R. Kothari, New Age
   International Publishers.
   Group)/ Cambridge University Press India Pvt. Ltd.
6. Research Methodology: A Step by Step Guide for Beginners, by Ranjit Kumar

601035—Open Elective- III
601035A— Advanced Construction Technology

Teaching Scheme:  Examination Scheme:
Lectures: 4 Hrs./Week  Theory Paper: 75 Marks
Credits: 4  In Semester Assessment: 25 marks
Duration: 3 hrs.  End Semester Assessment: 50 marks

Unit 1
Construction of power generating structures – Atomic Power stations, Thermal power
stations. Co-generation Power Plant, Windmills, Transmission towers, Chimneys (single
and multi-flue), cooling towers - Natural draft cooling towers (NDCT) & Induced
draft cooling tower (IDCT), Ash handling system, Containment Structure, Electro Static
Precipitator (ESP), Case study of Kaiga atomic power station, Madras atomic power station. Or
Any other Case Study and Safety Hazards

Unit 2
Bridges, Steel Bridges, Arch Bridges, Cantilever Bridges Segmental construction & Box
Girders. Construction of special type of bridges such as cable stayed bridge, suspension and
Pre-stressed bridge, construction of foundation and Super structure.

Unit 3
Construction of Metro Railway & Monorail - Underground and over ground structures, different
methods and techniques of construction. Problems and solutions – during maintenance and up-
keep of structures. Fire, Ventilation, Dewatering and power supply, Subsidence, Vibration etc.,
Concept of Magrail.
Unit 4
High rise buildings – Construction methods and techniques using different materials, Minerals, Admixtures in-situ concrete, Precast Concrete & Structural Steel, finished concrete, tunnel form, fire Fighting ,Safety & Hazards, Job Safety Analysis.
Innovative methods of construction – Slip form technology, Jump form technology, Aluform & Tunnel Form Technology, Dry wall technology, Plastering Machines.

Unit 5
Offshore structure such as- Beacons, Oil drilling Platforms, light houses.

Unit 6
Dredging System, Mechanism, Hydraulic dredger in waves, Water & Booster System, Dredging in navigation system, Agitation dredging system, silt dredging system, water injection system, Pneumatic dredging system, Amphibious & scrapper dredging system, Advantages & Disadvantages of Various Dredging System , Production Cycle for Dredgers, Application, Capacity of dredgers, & its economical use, dredging economics

Reference Books :
3. Construction Equipment Planning and Applications – Dr. Mahesh Varma
4. Manuals, brochures, publications from construction companies, firms etc.
5. Reports of actual works executed.
6. NICMAR Publications on Construction Engineering
Module—1
Construction Industry:
Nature, characteristics, size and structure. Role of infrastructure development in employment generation and improving of the National economy. Various Agencies associated with infrastructure development in India as regards various sectors.

Module—2
Status of Infrastructure in India:
Road sector Port, Railway, communication, water supply and drainage, Power sector, oil and gas industry, Health and educational services. Infrastructure Development, Indian budget and its relation with Infrastructure development projects in India. Various programs related with Infrastructure development in rural and urban sector.
Public Private Partnership (PPP) in Infrastructure, Draft Concession Agreement for PPP projects, Escrow Agreement.

Module—3
Issues related to infrastructure development – pre – requisites necessary to ensure success for switching over from public sector management to private sector management, issues in developing, funding and managing infrastructure projects, role, responsibility of project management consultants. FDI in Infrastructure development, Problem areas and solutions.

Module – 4
SPV’s for Infra projects.
Reference Books

2. India Infrastructure Report – Rakesh Mohan.
3. Infrastructure Today – Magazine.
4. Document of five year plans, published by Govt. of India.
6. Infrastructure Development in India by Rajarshi Majumder Rawat Publications – 2010
8. Indian Highways – Journals.
601 035- C- Elective III - International Contracting (4 Credits course)

Teaching Scheme:
Lectures : 4 Hrs./Week
Credits : 4

Examination Scheme:
Theory Paper : 75 Marks
In Semester Assessment : 25 marks
End Semester Assessment : 50 marks
Duration : 3 hrs

Module –1
International contracting – meaning, scope, nature, present status of the International construction market, role of Asia-Pacific region countries in the present construction development. Impact of WTO/GATS on the Indian Construction Sector as regards domestic market and export sector. Selection of personnel to suit socio-economic-environmental culture in other countries, suitable organizational structure.

Module – 2
Study and application of various conditions of contract under the FIDIC document.
Development of regulatory framework. Project exports from India. International financing:
Various institution such as WB, IMF, ADB. African bank etc. and their role, rules – regulations in funding various projects, forming alliance, bilateral and multilateral funding, trade practices etc.

Module –3
International Projects – Types of BOT systems such as BOT, BOOT, BOO, DBO, BOR, BLT, BRT, BTO & DBFOT, MOOT, ROO, ROT, BOLT – Contractual procedures, special features, methods of handling.

Module – 4
Disputes Resolving – International Courts, formation of DRB’s (Dispute resolving boards) functioning and experiences in India and abroad, Advantages of DRB’s UNICTRAL Proceedings for International Arbitration. Institutionalized Arbitration, CIDC – SIAC Arbitration. CASE studies of any 2 major project executed/functioning under International contracting.

Reference Books:
1. A Short Course in International Contracts: Drafting the International Sales by By Karla C. Shippe : world trade press
2. FIDIC documents
601 035 – D-Elective III -Thrust Areas in Project Management (4 Credits course)

Teaching Scheme:
Lectures: 4 Hrs./Week
Credits: 4

Examination Scheme:
Theory Paper: 75 Marks
In Semester Assessment: 25 marks
End Semester Assessment: 50 marks
Duration: 3 hrs.

Module—1
Project Pre-planning and Partnering

a) Project preplanning:-
Project Influence cost diagram. Need for project preplanning in the context of time and cost overruns, reduction in economic benefits. Definition selecting pre-planning team and evaluation of alternatives. Decision whether to invest in project design Concept of PDRI—Project definition rating index. PDRI for residential and industrial buildings. Utility of PDRI with respect to benchmarking. Any case study on Project pre—planning.

b) Project partnering:-
Delimitation, partnering as an effective risk sharing mechanism, partnering charter, partnering workshop. Advantages of partnering role in preventing construction disputes, risk management and QM. C Critical success factors for implementation Any case study on project partnering.

Module-2
S. W. O. T. analysis and S. C. M

a) S. W. O. T

b) S. C. M.
Supply Chain Management. Concept of Supplier and customer in context of ISO. Identifying the chain associated connecting various processes between the supplier and the customer in context of construction project. Management strategy for implementing S. S. C. M. in construction organizations and on construction projects. Benefits of S. C. M.
Module-3

Critical Chain Management (CCM) and Fast Track Construction

Critical Chain Management (CCM):--
Concept of critical chain in construction projects based on the theory of constraints. Developing critical chain plans for a single project and multiple projects. Measuring, monitoring and controlling the critical chain. Advantages of CCM.

Fast Track Construction:--

Module--4

Earned Value Analysis and Project Reporting

Earned Value Analysis:--
Definition of earned value. Importance of Earned value analysis. Concepts of cost variance, schedule variance, cost performance index and schedule performance index methods of determining earned value viz. Ratio method, repetitive type work package method, Complex construction work package method, start or finish method. Accounting practices for determining the earned value.

Project Reporting

Reference Books
1. Pre-project planning handbook—published by Construction Industry Institute (CIT) USA. ASCE journal papers on project pre-planning to be used. ASCE journal papers on project partnering to be used.
601035—Open Elective- III

601035 E - Construction Equipment Management

Teaching Scheme:
Lectures : 1 Hr./Week
Credits : 1

Examination Scheme:
In Semester Assessment : 25 marks

Unit 1 6 Hours


Equipment maintenance - Planned, unplanned, preventive, breakdown maintenance, merits and demerits of maintenance

Unit 2 6 Hours

Construction Equipment: Construction Equipment’s – Understanding basics, Capacity, Function & Efficiency of All Machinery, involving all machinery data, power use, fuel consumption and labour utilization. Equipment for Earthmoving Machinery, Concreting Equipment, Material Handling Equipment such as cranes, boom, lift and maintenance transportation Equipments.

Work cycle time of any machine with corrective factors, depreciation of equipment, operative cost, inventory cost control, higher/rental- a) Average Investment value, b) Annual Ownership Cost.

Reference Books:
1. Construction Technology: Analysis, and Choice, 2ed, Bryan, Wiley India
3. Construction Equipment Planning and Applications – Dr. Mahesh Varma
4. Brochures Published by various agencies associated with construction.
5. Journals such as CE & CR. Construction world, International Construction.
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 Luktuke Jumelage-I workbook by Roopa Luktuke

Module – 1 - Risk analysis

Dealing with uncertainties
Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty index method, point estimated method.

Module –2
Use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment. Risk Mitigation – by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of un-quantified risk. Coverage of risk through CIDC’s MOU with the Actuarial Society of India
through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI). Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.

**Reference Books**

2. Industrial Engineering And Management Of Manufacturing Systems.- Dr.Surendra Kumar Satya Prakashan
3. RAMP Handbook By Institution Of Civil Engineers And The Faculty And Institute Of Actuariesthomas Telford Publishing, London.
7. Construction Management Practice, Dr.V.K.Raina, Shroff Publ.
9. Project Management, K.Nagarajan, New Age International
10. [www.cidc.in](http://www.cidc.in)

**601 035—H--Elective III - Safety Practices in Construction**

(1 Credit course)

**Teaching Scheme :**
Lectures : 1 Hr./Week
Credits : 1

**Examination Scheme:**
In Semester Assessment : 25 marks

**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

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

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Module 1
Introduction of Abacus, addition & subtraction with help of 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
SEMESTER III

601 036 Seminar – II

Teaching Scheme:  
Lectures: 4 Hours/Week  
Credits: 4

Examination Scheme:  
TW: 50 Marks  
Oral/Presentation: 50 marks

The student is required to deliver a seminar in second semester on the topic relevant to latest trends in Civil Engineering preferably on the topic of sub specialization based on the Electives selected by him/her by authority. This report shall be based on the field training aspects with respect to the electives chosen. Minimum of 15 days field training to be done before submitting this report. The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/ Institute.

601 037 Project Stage I

Teaching Scheme  
Practical: 8 Hours/week  
Credits: 8

Examination Scheme  
Term Work: 50 Marks  
Oral: 50 Marks

Project Stage-I is the integral part of the dissertation project. The project should be based on the knowledge acquired by the students during the coursework and should contribute to the needs of the society. The project aims to provide an opportunity of designing and building complete system or subsystems in an area where the students like to acquire specialized skills.

The student shall complete the part of the project that will consist of problem statement, literature review: project overview, scheme of implementation (Mathematical Model/block diagram/PERT chart, etc) and Layout & Design of setup. As a part of project stage I, the student shall deliver a presentation on advancement in Technology pertaining to selected topic.

The student shall submit the report of project work completed partly in standard format approved by the University.
### SEMESTER IV

#### 601 038 Seminar – III

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<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td>Lectures: 5 Hours/Week</td>
<td>TW: 50 Marks</td>
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<tr>
<td>Credits: 5</td>
<td>Oral/Presentation: 50 marks</td>
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Seminar III: Shall preferably be an extension of seminar II, based on an additional field training of 15 days. The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

#### 601 039 Project Work Stage II

<table>
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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td>Lectures: 20 Hours/Week</td>
<td>TW: 150 marks</td>
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<tr>
<td>Credits: 20</td>
<td>Oral/Presentation: 50 marks</td>
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</tbody>
</table>

Project Work Stage-II: In Project Work stage –II, the student shall complete the remaining part of the project which will consist of the fabrication of set up required for the project, work station, conducting experiments and taking results, analysis and validation of results and conclusions. The student shall prepare the duly certified final report of the project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.