### UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

### COURSE STRUCTURE FOR M.E. (2008 COURSE)

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
<th>CREDITS</th>
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<tr>
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<tr>
<td></td>
<td>a) New Construction Materials</td>
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<td>b) Disaster Management</td>
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<td>c) Repairs, Rehabilitation, Retrofitting of Structures</td>
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<td>d) Construction Safety</td>
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<td>c) Value Engineering</td>
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# SEMESTER II

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**Note:** The Contact Hours for the calculation of load of teacher & Seminar - 1 Hr / week / student & Project - 2 Hr / week / student
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501101
Mathematics

Teaching Scheme:      Examination Scheme:
Lectures : 3 Hrs./Week    Theory Paper : 100 Marks
Credits  : 3
Duration : 4 hours


3. 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.


5. Simulation – Types, case studies in construction using simulation techniques, simulation softwares used.

6. Use of mathematical models based on probabilistic and statistical methods, simulation in risk identification, analysis and mitigation of project risks.

Reference Books
1. Probability and Statistics for Engineers –Miller, Freund-Hall, Prentice India Ltd.
UNIVERSITY OF PUNE  
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501102

MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION

Teaching Scheme : 
Lectures : 3 Hrs./Week

Examination Scheme:
Theory Paper : 100 Marks
Credits : 3
Duration : 4 hours

General Management – Comparison between traditional management and modern scientific management, roles of Taylor, Fayol, Mayo and Megregor. Management functions, Management styles.

Project Management – Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, safety requirements of projects, project feasibility reports based on socio-techno-economic-environmental impact analysis, project clearance procedures and necessary documentation for major works like dam, multi-storeyed structures, ports, tunnel, Qualities. Role, responsibility of projects Manager, Role of PMC (Project Management Consultants) on major projects, Web based project management.


Construction Management – Site mobilization – demobilization aspects, various Resources management based on funds availability, organizing and monitoring of the construction work with respect to cost-time schedules, co-ordinating – communicating- reporting technique Application of MIS to construction, monitoring and control mechanisms, Training of Construction Managers.

Work Study : Definition. Objective, basic procedure, method study and work measurement work study applications in Civil Engineering.
Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.

Work measurement – Time and motion studies, Concept of standard time and various allowance, time study equipment performance rating. Activity sampling time-tapse photography technique. Analytical production studies.

Administration of Incentive Schemes – Necessity, Merit rating, job evaluation, installation, modification and maintaining and incentive scheme based on implementation experience.

Minimum 2 case studies covering the above contents.

Reference books
3. Work study – Currie.
7. Construction Management – Roy, Pilcher
University of Pune  
M.E. (Civil) (Construction and Management)  

Semester I  

Subject Code 501103  
CONSTRUCTION TECHNOLOGY  

Teaching Scheme          Examination Scheme  
Lect. 3 hrs./week          Theory Paper: 100 Marks, Credits 3  
Duration: 4 hours.  

Construction of under deep water-concrete diaphragm walls  

Concrete – Various methods of shuttering, Ready Mix Concrete, Pumped Concrete  

Grouting Methods  

Dewatering – Dewatering of shallow and deep open excavations. Effect of ground water movement. Methods of groundwater control. Shallow and deep well points. Horizontal drainage, vacuum dewatering by electro-osmosis, single and multiple well system, group of wells. Draw down factors, vertical sand drains, pressure relief beneath excavation, well point pumps, headers discharge lines control of surface water. Installation and operation of well point system.  

Piling – Behaviour of single pile and a group piles during driving, under loads-ultimate loads on driven and cast in Situ piles. Construction details of precast piles, prestressed piles, and steel piles, friction piles. Driven and bored piles, large diameter piles, negative and positive skin friction, multiple under reamed piles, raker piles, sand piles. Anchor piles, load on piles – Static. Vibrating loads, cyclic loading, safe bearing load, methods of pile driving by vibration above and under water through different strata, micro piles.  

Cofferdams and Caisson  

Minimum 1 Case study in each topic covered above.  

Reference Books  
2. Construction Equipment Planning and Applications – Dr. Mahesh Verma  
3. Brochures Published by various agencies associated with construction.  
NEW CONSTRUCTION MATERIALS

Material composition and properties, production, storage, distribution, testing, acceptance criteria applications, limitations of use, economic consideration, recent development related to the following materials to be studied.

1. Various construction chemicals/admixtures.
2. Flyash and its use in concrete
3. Silica fume concrete
4. Self compacting concrete
5. Fibre Reinforced plastics and concrete
6. High performance concrete
7. Smart materials
8. Materials used in nuclear-containment structures
9. Glenium Concrete
10. Crumb modified bitumen Rubber

Reference Books
1. Concrete Technology by Neville
2. Concrete Technology by M.S.Shetty
3. Building Materials by Ghosh
4. New Building Materials and Construction World magazine
5. Civil Engineering and Construction Review magazine
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501104 (Elective I)

DISASTER MANAGEMENT

Teaching Scheme     Examination Scheme
Lect. 3 hrs./week     Theory Paper : 100 Marks, Credits 3
Duration : 4hours.

Disasters – Natures and extent of disasters, natural calamities such as earthquake, floods, drought volcanoes, forest 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. Casually management, risk management.

Emergency Management programme – 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 programme.

Reference Books
1. Construction Engineering and Management – Seetharaman
2. CECR’s Journals
3. NICMAR Publications
4. Different sites on internet on disaster management
5. Project Management – K Nagarajan – New Age International Ltd.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501104 (Elective I)

(c) REPAIRS, REHABILITATION, RETROFITTING OF STRUCTURES

Teaching Scheme  Examination Scheme
Lect. 3 hrs./week  Theory Paper : 100 Marks, Credits 3
Duration : 4 hours.

Importance of rehabilitation as a part of construction engineering.

Rehabilitation studies of buildings, underground construction, bridges, streets and highways, sewage treatment plants – masonry work, R.C.C. works, steel structures- types of distress. Numerical condition surveys for foundation, structural and functional deterioration, design criteria, materials and techniques.

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)

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.
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.

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

Various safety equipment and gear used on site. First aid on site.

Labour laws, legal requirement and cost aspects of accidents on site.

Study of safety policies, methods, equipment, training provided on any ISO approved construction company.

Reference Books
(I) Materials Management
1. Importance of materials management and its role in construction industry—scope, objectives and functions, Integrated approach to materials management, Role of materials manager.


3. 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.

4. 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.


6. Use of (MMS)—Materials Management Systems in materials planning, procurement, inventory, control, cost control etc.

(II) Equipment Management—Working out number of construction equipment required based on the individual equipment work cycle, and based on the total time available and quantum of work. Working out the total hourly cost and the cost per unit of item for the various construction machinery. Concept of equipment log book. Concept of equipment selection based on optimal used.

(III) Two case studies involving major construction projects to study their equipment management.

(IV) Need for development of human resource, flow diagram of human resource development and human resource management. Training, competency development, capacity building of resources required at grass root level and at the managerial level in construction. OLDES programme of CIDC—IGNOU.

Reference Books
1. Purchasing and Inventory Control—by K.S.Menon, Wheeler Publication.
2. Construction equipment planning and applications—Dr. Mahesh Verma
4. Human Resource Management by Biswajeet Pattanayak
5. Managing Human Resources by Bohlander & Snell

2. Concept of Quality Control, Quality Assurance, Quality Management and Total Quality Management (TQM)

3. Study of various Quality Standards in Construction: Related to building materials and other inputs for construction processes, methods and techniques for construction outputs, products and services, such as BIS, BS, Indian standard, British, American, German & Japanese standards. Managing Quality in various projects stages from concept to completion by building quality into design of structures, Inspection of incoming material and machinery, in-process quality inspections and tests.

4. Designing of quality manuals, checklists and inspection reports, installing the quality assurance system, monitoring and control.

5. Quality Assurance Department and quality control responsibilities of the line organization. Quality in foundations and piling work, structural work. Concreting, electrical system building facilities, waste recycling and maintenance.


7. Study of ISO 9000, ISO 14000 and QS 9000 standards and certification procedures.
# UNIVERSITY OF PUNE  
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

## SEMESTER I

Subject Code 501105 (Elective II)  

**VALUE ENGINEERING**

<table>
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<th>Teaching Scheme</th>
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<td>Lect. 3 hrs./week</td>
<td>Theory Paper : 100 Marks, Credits 3</td>
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<td>Duration : 4 hours.</td>
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Value : Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic : identifying reasons or unnecessary costs :

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.

Life cycle costing – Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501105 (Elective II)

PROJECT RISK ANALYSIS AND MITIGATION TECHNIQUES

Teaching Scheme | Examination Scheme
---|---
Lect. 3 hrs./week | Theory Paper: 100 Marks, Credits 3
Duration: 4 hours.

General – Importance of Risk, types of risks, quantifiable and unquantified risks.


Risk Mitigation – by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of unquantified 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

1. Industrial Engineering and Management of manufacturing systems.- Dr. Surendra Kumar Satya Prakashan
2. RAMP Handbook by institution of Civil Engineers and the faculty and Institute of Actuaries- Thomas Telford publishing, London.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER I

Subject Code 501106

Lab Practice – I

Teaching Scheme          Examination Scheme
Pract. 6 hrs./week        TW : 50 Marks, Credits 3

Term work should consist of any (six) exercises from the following:

1. 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.

2. Collection of techno-commercial information as regards new construction materials, new construction methods, new type of construction equipment.

3. Performing and reporting on time and motion study work measurement of any one construction activity

4. Field exercise on EOQ and bulk purchase.

5. Preparation, crashing and updating of precedence-network for a major construction work.


7. Exercise on Cash Flow analysis.

8. Preparation of models/charts related to various construction techniques, equipment, organizational structures of existing companies etc. (Group Activity to generate interest and explore creativity-Group of 4 students per model/chart).

Seminar I

Teaching Scheme          Examination Scheme
1 contact hour per student per week        Term work : 50 marks. Credits -2
Pract. -4 hrs/week
UNIVERSITY OF PUNE  
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)  

SEMESTER II  

Subject Code 501108  

CONSTRUCTION CONTRACTS, ADMINISTRATION AND MANAGEMENT  

Teaching Scheme  
Lect. 3 hrs./week  

Examination Scheme  
Theory Paper: 100 Marks, Credits 3  
Duration: 4 hours. 


2. Arbitration Awards & Dispute Resolving oards – Indian Arbitration Act, arbitration agreement, conduct of arbitration, power and duties of arbitrator, rules of evidence/ preparation and publication of awards, methods of enforcement, impeding and award. Limitations of arbitration in the Indian context (DRB’s)Dispute resolving boards-necessity, formation, functioning advantages.  


4. Injunctions – Types, Temporary, perpetual, mandatory, when referred.  

5. Indemnity and Guarantee- Difference between the two contracts of Guarantee and Indemnity. Consideration for guarantee, surety’s liability, discharge of surety.  


Reference Books  
2. Construction contrat management-NICMAR publication  
3. handbook of estimating & costing for Quanity Surveyors-P.T.Joglekar  
4. Estimates and contracts B.S.Patil
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER II

Subject Code 501109

PROJECT ECONOMICS & FINANCIAL MANAGEMENT

Teaching Scheme                   Examination Scheme
Lect. 3 hrs./week            Theory Paper : 100 Marks, Credits 3
Duration : 4 hours.


Capital – Analysis of need working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Managing payments to suppliers and out standings.

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.


Problems of expansion and merger of companies, Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction, CIDC-IRA grading of construction entities.

Construction Accounts – Accounting process, preparation of profit and loss account and balance sheet as per the companies Act, 1956, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office.

Case study of how project appraisal is done, funds are raised, accounts are kept for execution of a major construction project.

Reference Books

17
10. DeMello 'Cases in Finance' McGraw
11. Oliver, Lianabel 'The cost management toolbox; A Managers guide to controlling costs and boosting profits.' Tata McGraw Hill.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER II

Subject Code 501110

OPERATIONS RESEARCH

Teaching Scheme
Lect. 3 hrs./week

Examination Scheme
Theory Paper : 100 Marks, Credits 3
Duration : 4 hours.

System Concepts, system parameters and objectives, system classification, system cycle, open and closed systems. Identification of Civil Engineering, Systems and their methods of analysis. Mathematical representation of a system.

Optimization techniques, various models, objectives functions and constraints, convex and concave functions, regions and sets.


Non-Linear programming : unconstrained programming, One dimensional search techniques Dichotomous, Fibonacci and Golden section. Multivariable problems, unconstrained, Gradient techniques, steepest ascent/descent technique, Newtons method, DFP method.

Constrained optimization Lagrangian multiplier technique, Kuhn Tucker’s conditions. Penalty functions method.

Dynamics programming, principle of optimality.

Stochastic methods : Queuing theory, simulation, sequencing.

Capitalization, Annuity, Selection of project based on Benefit-cost Analysis. NPV, IRR, PBP etc.

Games Theory and its application to construction Management.

Replacement models.

Reference Books

1. Operation’s Research- schaum
2. Optimization techniques –S.S.Rao
3. Quantitative technique – L.C.Jhamb
ADVANCED CONSTRUCTION TECHNOLOGY

Construction of power generating structures – Atomic Power stations, Thermal power stations. Windmills, transmission towers.

Bridges, types construction of special type of bridges such as cable stayed bridge, suspension and prestressed bridge, construction of foundation and super structure.

Off shore structure, types, methods of construction and maintenance.

Construction, maintenance of underground railways.

Construction of diaphragm walls

Principles and construction of machine foundations.

Principles, methods of fast track construction projects.

Minimum 1 case study to be covered for each of the above topics.

Reference Books
1. Same as those for Construction Technique.
2. Manuals brochures publications from construction companies, firms etc.
3. Reports of actual works executed.
4. NICMAR Publications on Construction Engineering.
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.

Status of Infrastructure in India- Indian government policy, Roads and buildings, communication, water supply, irrigation, power energy sectors, ports and aviation, health and educational services, rural development.

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.

Reference Books
1. India Infrastructure Report – Rakesh Mohan
2. Infrastructure Today - Magazine
3. Document of five year plans, published by Govt. of India.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER II
Subject Code 501111 (Elective III)

INTERNATIONAL CONTRACTING

Teaching Scheme     Examination Scheme
Lect. 3 hrs./week     Theory Paper : 100 Marks, Credits 3
Duration : 4 hours.


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.

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

Selection of personnel to suit socio-economic-environmental culture in other countries, suitable organisational structure.

Disputes Resolving – International Courts, formation of DRB’s (Dispute resolving boards) functioning and experiences in India and abroad, Advantages of DRB’s

CASE studies of any 2 major project executed/functioning under International contracting.

Reference Books
4. FIDIC documents
6. Unified Contract Documents by CIDC
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER II

Subject Code 501112 (Elective IV)

Open Elective

Teaching Scheme
Lect. 3 hrs./week

Examination Scheme
Theory Paper : 100 Marks, Credits 3
Duration : 4 hours.
Termwork should consist of any (6) exercises from the following.

1. 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.
2. Study and use of various computer softwares, use in the field associated with
   i) Project Management
   ii) Estimating, Costing, Tendering (Atleast one software package in each)
3. Collection and study of tender notices, tender documents of contract document associated with Civil Engineering works.
4. Exercise on contract document associated with Civil Engineering works.
5. Exercise on Valuation: Valuation of land and building using various methods report to be submitted on O-1 format.
6. Elective 1: Any 2 assignments
7. Elective 2: Any 2 assignments
8. Web based project management.
UNIVERSITY OF PUNE
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)

SEMESTER II

Subject Code 501114

SEMINAR II

Teaching Scheme
Pract. 4 hrs./week

Examination Scheme
TW : 50 Marks, Credits 2

Seminar II report and the examination shall be based on the literature survey and work for the dissertation in the IIIrd semester.
SeMINAR III

Teaching Scheme
Pract. 4 hrs./week

Examina tion Scheme
TW : 50 Marks, Credits 2

Seminar III report and the examination shall be based on the analysis and findings of the work done for the dissertation in the IIIrd semester.
The project work will start in semester III, and should preferably be a live problem in the industry or macro-issue having a bearing on performance of the construction industry and should involve scientific research, design, collection, and analysis of data, determining solutions and must preferably bring out the individual's contribution.

The dissertation should be presented in a standard format.

The term work should be continuously evaluated as per the norms/guidelines set up by the BOS for its assessment of 200 marks.

The oral examination shall be conducted with the help of approved external examiner.
UNIVERSITY OF PUNE  
M.E. (CIVIL) (CONSTRUCTION AND MANAGEMENT)  

SEMESTER IV  
Subject Code  

PROJECT STAGE II  

Teaching Scheme  
Pract. 18 hrs./week/project Stage  

Examination Scheme  
Project : 150 marks  
Oral : 50 Marks, Credits 12  

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

The dissertation should be presented in a standard format.  

The termwork should be continuously evaluated as per the norms/guidelines set up by the BOS for its assessment of 200 marks.  

The oral examination shall be conducted with the help of approved external examiner.