

## Construction Project Management (3-2-0)

### Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objectives:

After completion of this course, students will be able to:

- describe the fundamental concepts of project,
- handle construction project administration and
- plan, monitor and control construction projects by choosing appropriate tools.

### Course Contents:

- 1. Introduction (2 hrs)**
  - 1.1 Project and program definition
  - 1.2 Characteristics of projects and programs
  - 1.3 Project life cycle
  - 1.4 Phases in construction project lifecycle
- 2. Project Planning, Monitoring and Control (8 hrs)**
  - 2.1 Introduction to planning, monitoring and control
  - 2.2 Introduction to project planning tools –Gantt chart, milestone chart, linked bar-chart, CPM, PERT, line of balance
  - 2.3 Use of Gantt chart and CPM network for project planning and monitoring
  - 2.4 Resource planning and leveling by using Gantt chart
  - 2.5 Preparing construction schedule, labor schedule, material schedule and equipment schedule by using Gantt chart
  - 2.6 Earned value analysis (EVA)
  - 2.7 Time-cost trade off
  - 2.8 Introduction to cost-control and technical auditing
- 3. Contract Administration (6 hrs)**
  - 3.1 Method of work execution
  - 3.2 Contract-definition
  - 3.3 Types of construction contract
  - 3.4 Tender and tender document
  - 3.5 Tender notice
  - 3.6 Preparation before inviting tender
  - 3.7 Consultant's/Contractor's pre-qualification
  - 3.8 Bid evaluation and selection of a consultant and contractor
  - 3.9 Contract agreement
  - 3.10 Conditions of contract (PPMO and FIDIC)
  - 3.11 Public Procurement Act and Public Procurement Regulation
  - 3.12 Duties and responsibilities of a site supervisor
  - 3.13 Supervising work of a contractor
  - 3.14 Site order books
  - 3.15 Procedure to prepare a bill – running bills and final bill
  - 3.16 Muster roll, Measurement books

3.17 Progress reporting

- 4. Construction Plant and Equipment (8 hrs)**
- 4.1 Introduction to construction tools, machines, plants and equipment
  - 4.2 Advantages of using construction equipment
  - 4.3 Equipment for excavation, transportation and compaction
  - 4.4 Aggregate handling equipment
  - 4.5 Concrete batching, mixing and compacting equipment
  - 4.6 Pile foundation construction equipment
  - 4.7 Equipment for construction of caisson foundation
  - 4.8 Equipment for lifting of materials and parts
  - 4.9 Tunneling equipment
  - 4.10 Equipment for hydraulic construction
  - 4.11 Equipment for highway pavement construction
  - 4.12 Criteria for selection of equipment
- 5. Quality Control / Assurance (4 hrs)**
- 5.1 Introduction to quality control / assurance
  - 5.2 Objectives of QC/QA
  - 5.3 Factors affecting quality of construction
  - 5.4 Quality control technique
  - 5.5 Preparing QC plan, approval of material source, material sampling and testing at on-site laboratory and off-site laboratory
  - 5.6 Quality control of works – checking, setting out, earth work, form work, reinforcement, concrete construction, masonry construction, curing
  - 5.7 Preparing quality assurance plan (QAP)
  - 5.8 Quality control tools – checklists for checking various activities at work site
  - 5.9 Role of specification
- 6. Material Management (3 hrs)**
- 6.1 Importance of material management
  - 6.2 Classification of materials
  - 6.3 Purchase management
  - 6.4 Inventory management
  - 6.5 Construction garbage
  - 6.6 Surplus materials
- 7. Construction Site Preparation (2 hrs)**
- 7.1 Factors affecting construction site planning
  - 7.2 Layout of site-office, material storage, POL storage and garbage storage
  - 7.3 Layout of fabrication yard
  - 7.4 Fencing and barricading
  - 7.5 Access to work place
  - 7.6 Labor camp and resting area
- 8. Environmental Health and Safety at Construction Site (4 hrs)**
- 8.1 Introduction to EHS at construction site
  - 8.2 Causes of accidents in construction projects
  - 8.3 Minimizing the construction accidents
  - 8.4 Safety planning
  - 8.5 PPE as a safety measure at site



- 8.6 Training to improve safety standard at construction site – induction, tool-box talk, skill training
- 8.7 Role of safety engineer and safety steward

**9. Project Maintenance (2 hrs)**

- 9.1 Meaning and importance of maintenance
- 9.2 Objective of maintenance management
- 9.3 Types of maintenance
- 9.4 Maintenance planning
- 9.5 Issues of project maintenance with special reference to projects/systems under operation in Nepal

**10. Organization and Management (6 hrs)**

- 10.1 Definition of organization and management
- 10.2 Principles of management
- 10.3 Types of organization – line organization, line and staff organization, functional organization and project organization
- 10.4 Leadership and motivation
- 10.5 Project communication
- 10.6 Meaning and importance of HRM
- 10.7 Recruitment & selection
- 10.8 Training
- 10.9 Trade union in Nepal

**Assignment:**

Students are required to prepare a project report related to construction project planning or administration (on group basis).

**Tutorials:**

1. Prepare a work schedule of a given project by using Gantt chart and CPM network.
2. Prepare a quality control procedure by using PPMO conditions of contract.
3. Use standard specification for civil works (yellow book) to prepare list of IS and BS codes that is required in quality control process.
4. Prepare a site layout plan for the construction of 100 meter long RCC bridge.
5. Prepare a quality assurance plan (QAP) for a given project.

**Textbooks:**

1. Chitkara, K.K. *Construction Project Management*. Tata McGraw Hill Education Limited.

**References:**

1. Bhattarai, D. *Construction Plant Management*. Nepal Engineering College.
2. Adhikari, Rajendra. *Construction Management*.
3. Barrie, Donald, S. and Paulson Jr., Boyd C. *Professional Construction Management*. USA: McGraw Hill Book Company.
4. Modi, P.N., Rajeev and Modi, Sanjeev. *PERT and CPM*. Delhi: Standard Book House.
5. Bhattarai, Deepak. *An Introduction to Construction Management practices in Nepal*.
6. Shrestha, Santosh K. & Adhikari, Ishwor. *A text book of Project Engineering*.
7. Panta, Khem R. *Organization Behaviour in Nepal*.



## Engineering Professional Practice (2-0-0)

### Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objectives:

The main objective of this course is to introduce the students to the professional, ethical and legal environment in engineering practice. After successful completion of this course the students are expected to be able to:

- a) analyze the role of engineers in a society,
- b) analyze ethical and unethical behaviors in professional practice,
- c) make professional decisions by following existing regulatory and professional frameworks,
- d) select appropriate dispute and conflict resolution methods, and
- e) analyze professional engineering issues related to ethics, code of conduct, conflict of interest, norms and standards and to render decisions on appropriateness of steps taken and assign degree of responsibility in specific cases.

### Course Contents:

1. **Society and Technology** (6 hrs)
  - 1.1 Definition, types, and essential elements of a society
  - 1.2 Factors and classical theories of social change (cyclical, evolution, functional and conflict)
  - 1.3 Impacts and consequences of technology on socio-economic parameters (agriculture, communication, construction methods, information storage, generation and dissemination, dispute resolution, family structure, culture and livelihood)
  - 1.4 Effects of major technological developments (2D and 3D printing, dynamite, automation, mechanization, organic chemistry, transportation, internet, communication, and satellites) on practice of engineering profession
  - 1.5 Role of engineers in society
2. **Ethics and Professionalism** (3 hrs)
  - 2.1 Moral, ethics and professionalism
  - 2.2 Characteristics of ethical decision making
  - 2.3 Liability of engineers in design, construction and implementation of projects
  - 2.4 Loss of professionalism
  - 2.5 Ethical issues in professional engineering in dealing with other professions (accounting, banking, law, journalism and management)
3. **Roles of Professional Organizations in Regulation and Professional Development** (4 hrs)
  - 3.1 Regulation of the practice of engineering profession
  - 3.2 Objectives of NEC and its licensing provision
  - 3.3 Codes of ethics and guidelines for professional engineering practice – the NEC code of conduct
  - 3.4 Roles of professional organizations in induction of new entrants into the profession
  - 3.5 Upgrading and maintaining the professional and technical competence of members of professional associations



- 3.6 Providing technical expertise to public authorities in developing policies, acts, standards, project implementation procedures and international agreements and negotiations
  - 3.7 Ensuring occupational health, safety and general welfare of the public
  - 3.8 Role of professional societies in environmental protection
- 4. Legal Aspects of Professional Engineering in Nepal (9 hrs)**
- 4.1 Introduction to Nepalese legal system
  - 4.2 Essentials of a valid contract
  - 4.3 Void and voidable contracts
  - 4.4 Significance of a contract
  - 4.5 Factors to be considered in preparing a contract document
  - 4.6 Interpretation of contractual clauses
  - 4.7 Liability under contract, criminal law and tort
  - 4.8 Duties and Liabilities of designers and professionals
  - 4.9 Conditions for establishment of professional negligence (duty, breach, proximity cause and damage)
  - 4.10 Types of business enterprises: sole, partnership, and limited company
  - 4.11 Intellectual property right (Copy right, patent, design and trademark )
- 5. Conflict and Dispute Management (2 hrs)**
- 5.1 Levels and sources of conflict
  - 5.2 Conflict resolution methods: avoidance, diffusion, containment, confrontation, conciliation, mediation, arbitration and litigation
  - 5.3 Dispute resolution methods: adjudication and arbitration
- 6. Case Studies Related to Practice of Engineering Profession (6 hrs)**
- 6.1 Cases involving public safety, industrialization and protection of environment
  - 6.2 Cases involving conflict of interest, personal integrity and personal privacy
  - 6.3 Cases involving professional negligence (duty, breach, proximate cause and damage)
  - 6.4 Cases involving breach of duty, criminal law and tort
  - 6.5 Cases involving breach of NEC's code of conduct
  - 6.6 Cases involving breach of Public Procurement Act and Public Procurement Regulation
  - 6.7 Cases involving breach of intellectual property rights and copyrights
  - 6.8 Cases involving abuse of position and authority

**Textbook:**

1. Whitbeck, C. *Ethics in Engineering Practice and Research*. Cambridge University Press.

**References:**

1. Shrestha, S. K. and Shrestha, R. K. *Engineering Professional Practice*. Heritage Publishers and Distributors Pvt. Ltd.
2. Adhikari, R. P. *Engineering Professional Practice*. Pashupati Publishing House, ISBN: 978-9937-8249-03
3. Galami, T. B. *Engineering Professional Practice*. AkshalokPrakashan, ISBN: 978-99946-779-1-7
4. Morrison, Carson and Hughes, Philip. *Professional Engineering Practice - Ethical Aspects*. Toronto: McGraw-Hill Ryerson Ltd.



## Transportation Engineering II (3-2-1)

### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

After successful completion of this course, the students will be able to:

- conduct traffic studies;
- design traffic control devices, road intersections, lighting systems;
- design pavement structure for highways;
- supervise the construction, maintenance and rehabilitation works of highway project;
- understand basic knowledge of the bridge and tunnel.

### Course Contents:

- 1. Traffic Engineering (15 hrs)**
  - 1.1. Introduction and Scope of Traffic Engineering
    - 1.1.1 Definition and Scope of Traffic Engineering
    - 1.1.2 Traffic Characteristics
  - 1.2. Traffic Studies
    - 1.2.1 Traffic Volume Study
    - 1.2.2 Speed Study
    - 1.2.3 Origin and Destination Study
    - 1.2.4 Traffic Flow Characteristics
    - 1.2.5 Traffic Capacity Study
    - 1.2.6 Parking Study
    - 1.2.7 Accident Study
  - 1.3. Traffic Control Devices
    - 1.3.1 Traffic Signs
    - 1.3.2 Traffic Signals
    - 1.3.3 Road Markings
    - 1.3.4 Traffic Islands
  - 1.4. Road Intersections
    - 1.4.1 Basic Requirements of Intersections
    - 1.4.2 Types of Intersections and their Configuration
    - 1.4.3 Channelized and Unchannelized Intersections
    - 1.4.4 Rotary Intersection
    - 1.4.5 Grade Separated Intersections: Types with Sketches
  - 1.5. Road Lighting
    - 1.5.1 Importance of Road Lighting
    - 1.5.2 Factors Influencing Night Visibility
    - 1.5.3 Requirements of Level of Illumination in Roads
    - 1.5.4 Lighting System: Selection of Height and Spacing of Light Poles and Layouts
- 2. Pavement (10 hrs)**
  - 2.1 Definition and Types of Pavements
  - 2.2 Factors Controlling Pavement Design
  - 2.3 Differences between Flexible and Rigid Pavement Structure



- 2.4 Design Methods of Flexible Pavements: Overseas Rode Notes - 31, IRC 37-2001, AASHTO, Asphalt Institute; DoR Guidelines
- 2.5 Westergaard's Theory for rigid pavement
- 2.6 Stress due to Load, Temperature and Sub-grade Friction
- 2.7 Design of Rigid Pavement: IRC, DoR Guidelines
- 3. Road Construction Technology (8 hrs)**
- 3.1 Activities and Techniques used in Road Construction
- 3.2 Tools, Equipment and Plants used in Road Construction
- 3.3 Execution of Earth Work
- 3.4 Construction of Low Cost Roads: Earthen, Gravel and Water Bound Macadam
- 3.5 Construction of Prime Coat, Tack Coat and Seal Coat
- 3.6 Construction of Surface Dressing
- 3.7 Construction of Otta-seal
- 3.8 Construction of Grouted or Penetration Macadam
- 3.9 Construction of Different Types of Bituminous Premixes: Premix Carpet, Bituminous Bound Macadam, Asphalt Concrete
- 3.10 Construction of Cement Concrete Pavement
- 4. Highway Maintenance, Repair and Rehabilitation (5 hrs)**
- 4.1 Classification of Maintenance Activities
- 4.2 Planning of Maintenance Operations
- 4.3 Evaluation of Pavement Distress and Pavement Condition
- 4.4 Types of Road Failure and its Causes
- 4.5 Types and Methods of Pavement Repairs
- 4.6 Types of Overlay and Strengthening of Existing Pavement
- 5. Green Road Concept (2 hrs)**
- 5.1 Basic Principles
- 5.2 Steps of Green Road Construction
- 6. Introduction to Bridge and Tunnel Engineering (5 hrs)**
- 6.1 Bridge Site Selection
- 6.2 Classification of Bridges and Components
- 6.3 River Bank Protection Structures
- 6.4 Introduction to Tunnel
- 6.5 Component Parts of Tunnel and Tunnel Cross-Section
- 6.6 Survey for Tunnel Alignment
- 6.7 Requirements for Tunnel: Drainage, Lighting, Dust Control and Ventilation
- 6.8 Tunneling in Firm Soil, Soft Soil and Hard Rock

**Laboratories:**

1. Spot Speed and Data Analysis
2. Deflection of Pavement Surface: using Benkelman Beam
3. Skid Resistance
4. Roughness Index

**References:**

1. Kadiyali, L.R. *Traffic Engineering and Transport Planning*. Delhi: Khanna Publishers.
2. Sharma, S.K. *Principles, Practice and Design of Highway Engineering*. New Delhi: S. Chand and Co. Publishers Ltd.
3. Khanna, S.K. & Justo, C.E.G. *Highway Engineering*. Roorkee (U.P.): Nem Chand & Bros.
4. Flaherty, C.A. *Highway Engineering*. Edward Arnold (Publishers) Ltd.



5. Huang, Yang H. (2012). *Pavement Analysis and Design*. Pearson Publication.
6. Relevant publications by Department of Roads and Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR)

