MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT
(M. Sc. CM)

CURRICULUM

Faculty of Science and Technology
Pokhara University

2013
1. Program Objectives
The Master of Science in Construction Management (M.Sc. CM) program is designed to bring corporate change in Nepal through transformation of students into competent construction managers, executives, and entrepreneurs capable of becoming strategic change agents in the corporate and social world. The program focuses on developing social and developmental outlook and adequate skill in analysis, decision-making, implementation, leadership, and communication among the students.
The specific objectives of the program are as follows:
- To provide students a firm grasp of broad-based and integrated fundamentals of construction management with real-life applications.
- To develop professional construction managers who can effectively lead construction projects in a highly dynamic and competitive global construction business environment.

2. Curricular Structure
The curriculum is designed to equip students with the competencies, knowledge, skills, and attitudes needed for success in construction project management positions. The course work gives students a broad and holistic view of the complexity of issues in today’s construction business environment. The curriculum comprises the following five distinct components:
- **Foundation & Analytical Courses:** The foundation and analytical courses provide the necessary academic background and analytical tools for M. Sc. study and are pre-requisite to advanced core courses.
- **Core and Functional Courses:** The core and functional courses provide students with the behavioral skills, analytical tools, and environmental considerations necessary for making decisions in a construction business organization.
- **Capstone Courses:** The capstone courses require students to integrate the skills and knowledge they have acquired in various functional areas of construction management and apply them in making decisions.
- **Electives:** A student is required to take two courses of three credit hours each as electives. The objective of elective courses is to provide flexibility to the students in selecting course in which they have special interest. S/he can choose any course from the areas offered.
- **Thesis:** Students are required to undertake a research project that involves fieldwork and empirical analysis of the information collected from the field. Students are also required to prepare a thesis on a prescribed format. This research project covers 15 credit hours.

3. Program Features
The features of the M. Sc. CM program are competitive learning environment, market-driven courses, and program flexibility. The M. Sc. CM is a two-year program spread over four semesters. A student needs to successfully complete 45 credit hours of course work and 15 credit hours of research project.

The regular M. Sc. program is to be completed within four semesters. The duration of each semester will be 15 weeks excluding examinations.

The program will use a range of pedagogical inputs that includes on-campus learning through classroom discussions, presentations, group work, case analysis and guest lecture series, and off-campus learning through research project work.
4. The Semester System
In the program, each course has a certain number of credits assigned to it depending on its lecture, tutorial and practical work hours in a week. One lecture hour per week per semester is assigned one credit. That is, for a theory course, a three-credit hour course has 45 contact hours in a semester.

The prominent features of the semester system are the process of continuous evaluation of a student's performance and the flexibility to allow the students to progress at a pace suited to his/her individual ability, subject to the regulation of credit requirements.

5. Entry Requirements and Admission Procedures

Eligibility
Graduates from relevant field of engineering are eligible to join the program. However, the applicant must have a minimum of 15 years formal education (12 years of schooling plus three years of undergraduate). Furthermore, the applicant must have secured a minimum CGPA of 2.0 or 45 percent in Bachelor’s level.

The following are the relevant field of engineering: Civil engineering, Electrical Engineering, Mechanical Engineering, Geotechnical Engineering, Hydropower Engineering and Architecture.

Documents Required
The applicant is required to submit the following documents with the application form made available by the concerned college by paying a predetermined fee:

- Completed and signed application form
- Letter of reference from two referees
- Official transcripts from all the academic institutions attended.
- Certificate of experience

Certificates of all degrees and experience should be photocopied and submitted with proper attestation. Enrolment is conditional upon completion of all admission formalities including payment of all fees as determined by the college. Incomplete applications shall not be processed.

Admission Procedures
A notice inviting applications for admission is publicly announced. Application forms and information brochures are provided, on request, after the payment of the prescribed fee. The concerned college scrutinizes the application. The eligible candidates are informed to take the entrance test. The date and time for the entrance test are informed to the applicants by the concerned colleges.

Final selection of students will be made on the basis of their aggregate scores in the entrance test, experience and their previous academic records. A college may, however, modify the selection procedure to suit its needs with prior approval of the Dean.

The final decision on admission is taken on the basis of selection procedure as below:

a) BE/ B Tech Score: 20 (Div I = 20, Div II = 10)
b) Experience Score: 20 (2 marks per year for maximum of 10 years)
c) Entrance test: 60
   Total: 100
The candidates, who are given provisional admission under special condition, are required to submit all necessary documents within a month of the beginning of regular classes. Otherwise, the admission will be canceled.

6. Academic Schedule and Course Registration
The academic session consists of two semesters. The admission to the program will be given twice a year as per the schedule published by the college.

Students are required to register courses at the beginning of each trimester. Since registration is a very important procedural part of the credit system, all students must present themselves at the college for registration. Registration in absence may be allowed only in rare cases at the discretion of the principal. A student’s nominee cannot register for courses but will only be allowed to complete other formalities.

7. Addition and Withdrawal from Courses
A student would have the option to add or drop from the course. This can, however, be done only during the first week of the semester. A student wishing to withdraw from a course, should apply on the prescribed from within two weeks from the starting date of the semester. A full time student has to take a minimum of 12 credits in a semester.

8. Attendance Requirements
The students must attain every lecture, tutorial and practical class. However, to accommodate for late registration, sickness and other such contingencies, the attendance requirements will be a minimum of 80% of the classes actually held. Students will get NOT QUALIFIED (NQ) status if s/he fails to maintain 80% attendance in any course.

9. Normal and Maximum Duration of Study
The normal duration and the maximum duration for the completion of the requirements for the various programs are as follows:

   Normal duration: 24 months (4 semesters)
   Maximum duration: 4+1 years from the date of registration.

(All the courses have to be completed within 4 years, and additional 1 year can be given to thesis work on special request upon the approval of concerned authority)

10. Evaluation System
A student’s academic performance in a course is evaluated in two phases as:
   - Internally by the concerned faculty member and
   - Externally by the Office of the Controller of Examinations through semester-end examinations.
A sixty percent weight is given to internal evaluation and forty percent weight is given to external evaluation. The pass mark for both the internal evaluation and external evaluation is sixty percent. A student must qualify in both evaluations separately to get a pass grade in a particular course. The final grade awarded to a student in a course is based on his/her consolidated performance in both internal and external evaluations.

The internal evaluation may consist of various components like project works, quizzes, presentations, written examinations, reflection notes preparation, and the like. A student will get NOT QUALIFIED (NQ) status in the internal evaluation if his/her performance falls below the minimum requirement. Such students will not be allowed to appear in the semester-end examination of that particular course.
11. Grading System
Pokhara University follows a four-point letter grade system. The letter grades awarded to students will be as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
<td>Excellent</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
<td>Good</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>Fair</td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
<td>Pass in Individual Course</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>Pass in Individual Course</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>Fail</td>
</tr>
</tbody>
</table>

If a student cannot finish all the assigned works for the course, he/she will be given an incomplete grade ‘I’. If all the required assignments are not completed within the following semester, the grade of ‘I’ will automatically be converted into ‘F’.

The performance of a student is evaluated in terms of two indices: (a) Semester Grade Point Average (SGPA) which is the grade point average of the particular semester, and (b) Cumulative Grade Point Average (CGPA) which is the grade point average of all the semesters.

\[
SGPA = \frac{\text{Total honor points earned in a semester}}{\text{Total number of credits taken in a semester}}
\]

\[
CGPA = \frac{\text{Total honor points earned}}{\text{Total number of credits completed}}
\]

Where,
Honor Point = Grade point earned in a subject × Number of credits assigned to that subject

12. Degree Requirements
To graduate from the M.Sc. program, a student should have
- a ‘C’ or better grade in each of the courses as specified in the curricular structure section;
- completed all the courses, and research project work as specified in the curricular structure section within the maximum time period specified in the normal and maximum duration of the study section;
- a final CGPA of 3.0 or better on the University’s 4.0 grade scale.

13. Distinction and Dean’s List
A student who obtains a cumulative GPA of 3.75 or better will receive the M.Sc. degree with distinction. The Dean’s list recognizes outstanding academic performance in the program. To qualify to this list, a student must have a CGPA of 3.80 or better.

14. Repeating a Course
A course may be taken only once for grade. Since passing of all courses individually is a degree requirement, students must retake the failing course when offered and must successfully complete the course. A student will be allowed to retake maximum of two courses to achieve a minimum CGPA of 3.0. The grade earned on the retake examination will substitute the earlier grade earned by the student in that course. A student can retake a course only when it is offered by the college/university.
15. Credit Transfer and Withdrawal
A maximum of 25% of the total credit hours of course work completed by a student in an equivalent program of a recognized university/institution may be transferred/waived for credit by the Dean on the recommendation of the principal/head of the school/college. However, for such transfer of credit, a student must have received a grade of 'B' or better in the respective course. Courses taken more than two years earlier than the date of application will not be accepted for transfer of credit.

Credit transfers will also be allowed from different programs of Pokhara University. In such cases, all credits earned by students in compatible courses with a minimum grade of B may be transferred to the new program.

The student may apply for withdrawal from the entire semester only on medical grounds. However, partial withdrawal from courses registered in a semester will not be considered.

16. Code of Conduct
Students are strictly forbidden from adopting unfair means in class assignments, tests, report-writing, final examination and thesis work. The following would be considered as adoption of unfair means during examination:

- Communicating with fellow students for obtaining help.
- Copying from another student’s script/report/paper.
- Copying from disk, mobile, palm of hand or other incriminating documents and equipment.
- Possession of any incriminating documents, whether used or not.
- Any approach in direct or indirect form to influence teacher concerning grade.
- Unruly behavior which disrupts academic program.

If the instructor detects a student using unfair means, the student may be given an ‘F’ grade at the discretion of the Examination Board. Adoption of unfair means may result in the dismissal of the student from the program and expulsion of the student from the college and as such from Pokhara University.

17. Dismissal from the Program
A student is normally expected to obtain a GPA of 3.0 in the semester-end examinations of the M. Sc. program. If a student’s performance falls short of maintaining this CGPA continuously over the semesters, he/she may be advised to leave the program or dismissed from the program.

18. Detailed Curricular Structure
The M. Sc. CM students are required to complete 15 courses (equivalent to 45 credit hours), and a research project (equivalent to 15 credit hours).

The first semester is focused on developing the foundation required for learning the core/functional area and integrative courses. Students are required to attend classes in the college and take written examinations conducted by Pokhara University to be held at the end of the semesters.
Curricular Structure and Course Cycle

<table>
<thead>
<tr>
<th>Semester I</th>
<th>Course Code</th>
<th>Course Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGT 511</td>
<td>Project Planning and Control</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MGT 512</td>
<td>Human Resource Management</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STT 505</td>
<td>Statistical Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECM 521</td>
<td>Professional Ethics and Liability in Construction</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECO 501</td>
<td>Economics for Construction Managers</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM 522</td>
<td>Construction Policies, Environment and Law</td>
<td>3</td>
</tr>
<tr>
<td>FIN 521</td>
<td>Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>ECM 523</td>
<td>Construction Project Management</td>
<td>3</td>
</tr>
<tr>
<td>ECM 524</td>
<td>Management of Construction Plant and Equipment</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective – I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester III</th>
<th>Course Code</th>
<th>Course Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM 621</td>
<td>Construction Project Engineering and Administration</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECM 622</td>
<td>Construction Safety Engineering</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>RCH 601</td>
<td>Research Methodology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECM 623</td>
<td>Construction Management in Developing Countries</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elective – II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester IV</th>
<th>Course Code</th>
<th>Course Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM 625</td>
<td>Thesis</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Electives

The following courses have been identified for electives. These courses offer students the flexibility to customize their needs and meet their career interests and goals. These are basically sectorial and application courses which address the systematic integration across construction business disciplines. Hence, a wide range of elective options may be offered by a college/school. A college/school can also develop and offer such sector-focused elective courses with the prior approval of the Subject Committee and the Dean.

Elective – I (3 credits)
1. IEE and EIA
2. GIS
3. Operation Research
4. Concrete Technology
5. Bridge inspection and maintenance engineering

Elective – II (3 credits)
1. Water Resource engineering
2. Mountain Risk Engineering
3. Conservation management
4. Hydropower systems and management
5. Power plant systems
Thesis (Research Project)
In the fourth semester of their study period, participating students are required to undertake a research project and prepare an integrative research report in any areas of construction management as approved by the college/school. Students are required to attend the viva-voce examination and give a seminar presentation of their report as organized by the college/school. Detailed evaluation scheme of the research project work is as below. For the evaluation of the research report, the college/school shall appoint internal and external examiners. The external examiner shall be appointed from the list approved by the Office of the Dean.

Evaluation Scheme:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mark Allocated for Scheduled Submission or Delayed Submission</th>
<th>Marks Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On Schedule</td>
<td>Late by One Week</td>
</tr>
<tr>
<td>1. Thesis proposal draft final submission</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>2. Thesis proposal defense and final submission</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>3. Literature review submitted for evaluation</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>4. Primary and secondary data collected and submitted for evaluation</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>5. Midterm report submitted for evaluation and presentation</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>6. Draft final report submission and evaluation</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>7. Thesis defending evaluated</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>8. Final Report submission and evaluation after incorporating comments</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>480</td>
</tr>
</tbody>
</table>

Evaluation system:
1. Serial number 1 to 4 shall be evaluated by the program director/coordinator and the research guide. Average of the two shall be taken.
2. Serial number 5 to 7 shall be evaluated by an external evaluator 50%, thesis guide 25% and program director/coordinator 25%.
3. Serial number 8 shall be evaluated by the program director/coordinator.
MGT 511: Project Planning and Control (3 – 1 – 0)

Course Objectives
The objective of this course is to equip the students with necessary tools for project planning and make the students capable to use the planning and controlling tools independently.

Course Contents

1. **Introduction:** (4 hrs)
   Review of concept, definition and characteristics of a project, project lifecycle and project phases.
   Project formulation and Project development. Project management. Project manager and skills required of a project manager.

2. **Project Planning:** (8 hrs)

3. **Project Planning Tools:** (8 hrs)

4. **Resource Allocation and Leveling:** (4 hrs)
   Concept of resource leveling, Method of resource leveling, Exercise on resource leveling.

5. **Project Monitoring and Control:** (6 hrs)
   Introduction to project monitoring, Project control cycle, Project schedule control, Project cost control and Project quality control.

6. **PMIS:** (4 hrs)
   Need of PMIS, Designing the PMIS for a construction project, Use of PMIS software: Benefits, Features, Fitting the PMIS to the project. Errors in using PMIS software. Using PMIS for resource requirement.

7. **Use of Computer in Project Planning:** (5 hrs)
   Use of word processing, spread sheet and project management software in planning and control.

8. **Individual Assignments in Planning and Control and Class Room Presentation:** (6 hrs)
   Students will individually prepare detailed working plan of a project and present in various formats.
References:

**MGT 512: Human Resource Management (3 – 0 – 0)**

**Course Objectives**

The objective of this course is to enable the students to apply the principles and practices of organization behavior and human resource management in the work situation.

**Course Contents**

1. **Evolution of Management Thought:** (4 hrs)
   - The concept of modern management, Frederick W Taylor: Scientific Management, Administrative and Functional Management (Classical theory), Max Weber and Bureaucracy, Chester Bernard, Neoclassical theory, Contingency Theory.

2. **Principles and Types of Organization:** (4 hrs)
   - Need of an organization, Formal organization structures, Departmentalization, Departmental Characteristics, Span of Control, Line and Staff: Checks and balance within the organization, Organization design, Understanding organization: Developing a Linear Responsibility Chart (LRC), The LRC and job description, Difficulty in using LRC. Line Organization, Staff Organization, Matrix organization (Project organization), Pure Project organization. Selecting an Organization form for Projects. Organization of the future.

3. **Motivation and Leadership:** (4 hrs)

4. **Communication:** (4 hrs)
   - Meaning of communication, Individual perception and communication, Effective communication network, Organizational communication and the grapevine, Improving the communication process: the linking pin. Communication breakdown. Barriers to communication.

5. **Group dynamics, Team Building and Conflict Management:** (6 hrs)

6. **Organizational Change and Development:** (2 hrs)
   - The field of organizational change and development. The organizational interventions. Complex issues facing organizational development.
7. **Decision Making:** (2 hrs)
   Management and decision making. The process of decision making. Organizational framework for decision making. Factors influencing decision making. Decision making styles by managers. Decision making styles and implementation of decisions.

8. **Human Resource Management:** (7 hrs)

9. **Employee Performance, Wage and Incentive:** (4 hrs)

10. **Industrial Relations Management:** (4 hrs)

11. **Productivity Management:** (4 hrs)
    Introduction, The productivity spiral, Benchmarking, Cycle time management, Productivity improvement program, Job design for improving productivity.

**References:**
13. Related Legislations and ILO Convention papers.

12
STT 505: Statistical Analysis (3 – 2 – 0)

Course Objectives

The objective of this course is to equip the students with tools and techniques of statistical analysis that are applicable in conducting research work and or fact finding process and decision problems.

Course Contents

1. **Review of Introduction and Descriptive Statistics:** (2 hrs)
   Measures of central tendency and location; Measures of variability.

2. **Theory of Probability:** (7 hrs)
   Introduction; Basic terms used in probability; Approaches to probability; Theorems of probability; Baye’s theorem; Random variables; Mean or expectation of random variable; Variance and standard deviation of a random variable.

3. **Theoretical Probability Distributions:** (6 hrs)
   Binomial distribution; Poisson distribution; Hyper geometric distribution; Concept of continuous distribution; The normal distribution; Fitting of normal distribution.

4. **Sampling and Sampling Distribution:** (4 hrs)
   Introduction to sampling, Random sampling; Introduction to sampling distribution of sample mean proportion; Central limit theorem; Relationship between sample size and standard error.

5. **Estimation:** (3 hrs)
   Basic concept, point estimate and interval estimate; Interval estimate and confidence intervals; Calculating interval estimate of mean and proportion; Determining sample size in estimation.

6. **Hypothesis Testing:** (11 hrs)
   Basic concepts to the hypothesis testing; Hypotheses testing of means; Hypothesis testing of proportions; Test for equality for population means; Test of difference between proportions; The t-test; Testing equality of variances of two normal populations; Confidence internal; Chi-square as a test of goodness of fit, Test of independence of attributes and test of population variance; Analysis of variance: One way classification and two way classification.

7. **Nonparametric Test:** (4 hrs)
   Introduction to nonparametric Statistics; The sign test for paired data; Mann- Whitney U Test; Kruskal – Wallis Test; Kolmogorov – Smirnov Test.

8. **Correlation and Regression:** (8 hrs)
   Scatter diagram; Simple correlation analysis; Simple regression analysis; Multiple correlations; Multiple regressions; Curvilinear Regression; Quadratic function regression; Exponential function regression; Power function regression.
References:

2. Sthapit, A. B., Gautam, H., Joshi, P. R., & Dongol, P. M. *Statistical Methods*. Kathmandu: Buddha Academic Publisher.
ECM 521: Professional Ethics and Liability in Construction (3 – 0 – 0)

Course Objectives
The objective of the course is to develop students’ ability in analyzing and interpreting the real life situation and to enhance the student’s moral/ethical integrity for the practice of engineering profession.

Course Contents

1. **Introduction:** (2 hrs)
   General Introduction on morale and professional ethics:

2. **Ethics:** (4 hrs)

3. **Engineering Profession and Code of Ethics:** (6 hrs)

4. **Law and Contract:** (9 hrs)

5. **Tort and Crime:** (5 hrs)
   Introduction to criminal law and tort law. Type of tort and professional negligence. Tort and third party liability. Tort and the project manager.

6. **Duty and Liability of Engineer/Architect and Delegation of Authority:** (6 hrs)

7. **Insurance:** (7 hrs)
   Introduction. Role and scope of insurance in construction. Third party liability insurance. Contractor’s all risk (CAR) insurance. Validity of insurance and claiming. Statutory requirements.

8. **Case Studies and Seminar:** (6 hrs)
   Students will study a real life insurance policy of a construction project insurance and prepare a detailed individual commentary of the policy to present in seminars.
References:

ECO 501: Economics for Construction Managers (3 – 1 – 0)

Course Objectives
This course aims at imparting the engineering students with knowledge of micro-economics, contemporary economic issues, base financial concept and helping them to develop proficiency with the methods and the process for making rational decisions regarding situations they are likely to encounter in professional practice.

Course Contents

1. **Introduction:** (4 hrs)
   Concept and principles of economics; approaches to economics; origins and principles of engineering economics; Scope of engineering economics; engineering economy and the design process; economic systems; applied economics; production possibilities; economizing problem; concept of economic efficiency: productive and allocative efficiency.

2. **Fundamentals of Demand and Supply:** (3 hrs)
   Demand function and variables influencing demand; law of demand and changes in demand; demand analysis; cardinal and ordinal approaches; types of demand; elasticity of demand; factors influencing elasticity of demand; supply, variables affecting supply; equilibrium of demand and supply.

3. **Demand Forecasting:** (4 hrs)
   Estimation of demand function; demand forecasting; need; types of forecasts; steps in forecasting; techniques of forecasting.

4. **Cost Concepts and Cost-Output Analysis:** (11 hrs)
   Cost concepts; economic; explicit and implicit costs; direct and indirect costs; opportunity cost; historical and replacement costs; private and social costs; incremental and sunk costs; total cost, fixed cost and variable cost; average costs; separable and common costs' marginal cost; relationship of MC and AVC, ATC and AFC; long-run and short-run costs; cost function, economics of scale; concept of production and revenue; returns to scale; an applications of cost analysis; estimation of cost function; difficulties in empirical determination of cost functions.

5. **Price-Output Decisions:** (4 hrs)
   Concept of price; determinants of price – volume decisions; market and its structure; profit and break-even analysis; pricing under competition and monopolistic competition; price-output decisions under monopoly and oligopoly.

6. **Profit Concepts and Analysis:** (4 hrs)
   Concept of profit; accounting versus economic profit; functions of profit; economic theories of profit; profit measurement; planning and control of profit; profit policies.

7. **Prices and Price Indices:** (4 hrs)
   Meaning and its uses; steps and problems in the construction of price indices; unweighted and weighted index members; consumer price index numbers; construction of cost of living in the numbers.
8. **Project Appraisal and Breakeven Analysis:** *(8 hrs)*
   Appraising project profitability; Internal Rate of Return; Payback period; Net present value; Cost benefit analysis; Appraisal process: technical feasibility, economic feasibility, financial feasibility and breakeven analysis; Breakeven chart; Managerial use of breakeven analysis.

9. **Managerial Economics:** *(3 hrs)*
   E – business; Business cycle; Monetary policy; Fiscal policy

**References:**

ECM 522: Construction Policies, Environment and Law (3 – 0 – 0)

Course Objectives
Objective of this course is to enhance the students’ practical skill in competing for a project, successfully completing a project and in settling a project related issues.

Course Contents

1. **Contract strategy, Concept, Choices and Methodology:** (4 hrs)
   Construction Business strategy: Stay in the market, Profit maximization, Gain reputation.
   Concept of construction business development and growth, Goal for growth, Continuous improvement, Research and development, Corporate resources and personnel, Financial management, Project slicing and packaging: preparing contract packages, Setting up contracts, Engaging the contractors.

2. **Concept of Construction Business Environment:** (4 hrs)
   Economic factor, The government factor, Technological factor, Socioeconomic and demographic factor, Competition factor, Supplier factor.
   Forces driving Industry competition: Introduction, Various forces driving competition,

3. **Business Environment:** (4 hrs)
   The company environment, Social environment, Political environment, Economic environment, Fiscal environment, Trade union and relation with management, Governance and effect to construction business, Government policy and its effect

4. **Introduction to Eco-system and Environment:** (4 hrs)
   Elements of environment and ecology, Environmental pollution, Environmental degradation, Consequences of development activities.

5. **Law and Policies Governing Environment, Ecology, Forests, Habitat and other Matters Having Direct Bearing on Construction Industry:** (4 hrs)

6. **Codes and Bylaws:** (4 hrs)
   National building code, building bye-laws, labor law and other regulatory requirements applicable in construction industry.

7. **Intellectual Property Rights:** (4 hrs)

8. **Ownership and Transfer of Ownership Rights:** (2 hrs)
   Introduction, Ownership issues in developing countries, Transfer of ownership, legal provisions related to ownership and transfer of ownership.
9. **Types of Engineering Contracts:** (4 hrs)
   EPC, Turnkey, Design build, Item rate, Cost plus, Sub contract and specialist sub-contract, Labor contract

10. **Various Forms of Conditions of Contract:** (6 hrs)
    General contents in various forms of contract document: ICE, JCB, ADB, WB, FIDIC harmonized, PPMO.

11. **Seminar and Classroom Presentations:** (5 hrs)
    Students will study prevailing policies and laws related to construction industry and present them in classroom seminars.

**References:**

3. WB, ADB, Procurement guidelines.
4. FIDIC, WB, ADB, GoN, Model conditions of contract.
FIN 521: Financial Management (3-2-0)

Course Objectives
The objective of this course is to make the student s able in planning, analyzing and controlling finance related problems in a construction projects.

Course Contents

1. **Introductions and Overview of Financial Management:** (4 hrs)

2. **Financial statements, Analysis and Taxes:** (6 hrs)

3. **Time Value of Money:** (8 hrs)
   - Concept of time value of money, Types of cash flows, Present value and future value of a single sum of money, regular annuity and an annuity due, uneven cash flows, present value of perpetuity, semiannual and other compounding periods, nominal interest rate and the effective interest rate, loan amortization schedule, Applications of Time Value of Money.

4. **Strategic Financial Decision:** (4 hrs)
   - Introduction to Debt, Preferred and Common Stock, Sources of Financing, Importance of issue of long term sources of Financing, Initial public offering, Right issues, Financial markets; Primary vs Secondary markets, Dealer vs Auction markets.

5. **Cost of Capital:** (5 hrs)
   - Concept of cost of Capital, Component cast of capital, Weighted average cost of capital and its significance, Marginal cost of capital.

6. **Long Term Investment Planning:** (8 hrs)
   - Concept and Importance of Capital Budgeting, Project classification, Ranking the Investment Proposal, NPV Vs IRR, Scenario and Sensitivity analysis, Capital budgeting in Practices.

7. **Introduction to Working Capital Management:** (6 hrs)
   - Concept and importance of working capital, Working capital cash flow cycle, Short term financing policy and planning in Nepal, Importance of cash, inventory management; economic order quantity and receivable management, Types of floats, and credit terms.

8. **Divided Policy:** (4 hrs)
Note: At least one case will be administered at the end of each unit. The students will also complete a project work and a few other assignments as specified by the course tutor.

References:

ECM 523: Construction Project Management (3 – 1 – 0)

Course Objectives
The objective of this course is to prepare students to manage a construction project considering all the aspects involved in a construction project execution process.

Course Contents

1. **Pre-bid Activities:** (4 hrs)
   Concept and introduction. Pre-bid activities of owner or the client – from conceiving of the project to receiving the bids from the bidders. Pre-bid activities of a consultant: for offering services to the owner, for organizing consultant to receive bids from contractors – from the date of consultant agreement to date of receiving contractor’s bids. Pre-bid activities of contractors – from date of tender notice to the date of submission of bids. Proactive contractors.

2. **Role of Various Agencies in a Construction Project:** (6 hrs)
   Parties involved in a construction project – The client, the consultant, the contractor, sub-contractors, labor suppliers, material suppliers, transporters, clearing and forwarding agents, insurance companies, environmental activists, local government, journalists, political parties, user community. Role of Client – project developer, project owner. Role of the Consultant – information gathering, design delivery, implementation supervision, planning and scheduling, reporting to owner, motivating the work team, taking measures for project control, working as Project Management Consultant(PMC). Role of Contractor – project implementation, quality delivery, timely delivery. Role of other Parties – supportive role, less supportive role. Provisions in the contract document.

3. **Construction Documentation and Report Writing:** (8 hrs)
   Introduction – Documentation defined, need for good documentation and purpose of documentation. Documentation During Various Phases of Project Lifecycle – conceptual phase, design phase, construction phase, post construction phase. Construction Period Documentation – Kickoff meeting agenda and minutes, mobilization monitoring and reporting, cash flow forecast, work schedule, resource deployment plan, daily progress report, periodical inspection/ walk down report, materials control report, progress control documentation, monthly progress report, quality control report, material testing report, equipment deployment report, manpower report, safety implementation records, safety training records, reports of accidents, third party certification of equipment condition, work measurement record, progress payment records, site instructions, letters, VOs, regular communication records. Post Construction Documentation – project completion report, as built drawings, operation manuals, maintenance manuals, project handing over certificate, project close out records.

4. **Specifications in Construction Projects:**  
   (4 hrs)  

5. **Project Commissioning, Start up and Operation:**  
   (5 hrs)  
   Project Start up - Plan for start up, preparation needed, setting up team for start up, start up process, start up records, start up report.  
   Project Operation – Handing over to operation department, operation planning, monitoring of operation, operation reporting.

6. **Materials Management:**  
   (10 hrs)  
   Inventory Management – Introduction, the cost of inventory, economic order quantity.  
   ABC analysis in material management.

7. **Project Evaluation and Auditing:**  
   (8 hrs)  
   Evaluation: Needs and importance of project evaluation, project evaluation myths, types of project in terms of degree of success, reasons for project success and failure, types of evaluation based on time, evaluator and purpose, inputs to project evaluation, methods of evaluation.
   Audit: Need of project audit, types of audit, depth of audit, timing of audit, major tasks of a project audit, components of audit, types of project audit, life cycle of project audit, auditor’s responsibilities, steps of project audit, financial audit, technical audit, environmental audit, social audit.

   **Note:** After completing each unit, students will be given real life examples for their individual analysis and presentation in the class room.
References:

ECM 524: Management of Construction Plant and Equipment (3 – 1 – 0)

Course Objectives
The objective of this course is to enable the students to make appropriate choice of various equipments, construction plant by considering their pros and cons and related safety measures.

Course Contents

1. **Introduction to Construction Plant and Equipment:** (2 hrs)

2. **Review of Familiarization with Construction Plant:** (4 hrs)

3. **Classification of Construction Equipment:** (2 hrs)
   Various standards available, the CIB classification.

4. **Selection of Construction Plant and Equipment:** (4 hrs)

5. **Monitoring and Controlling of Equipment Operation:** (6 hrs)
   Monitoring of operation. Controlling the equipment operation. Monitoring tools in use.

6. **Cost of Equipment:** (4 hrs)

7. **Life of Equipment:** (2 hrs)

8. **Plant Hiring:** (5 hrs)

9. **Plant Maintenance:** (4 hrs)
10. **Equipment Safety:** (4 hrs)

11. **Estimating Production Rates of Some Equipment:** (8 hrs)

**References:**

ECM 621: Construction Project Engineering and Administration (3 – 0 – 0)

Course Objectives

The objective of this course is to make the students capable to decide on setting up of contracts and selecting the contractors in any construction projects. The students will also be able to handle variations and change order as the project progresses. After completing this course the students will also understand managing project risk and uncertainties and be able to administer the project independently as per the provisions of the conditions of contract.

Course Contents

1. **Introduction to Construction Project Engineering:** (2 hrs)
   Overview of various fields of civil engineering contract work, Functions of construction management, Becoming a successful construction entrepreneur.

2. **Working with Consultant:** (4 hrs)
   The business of a consultant; Engaging a consultant; Consultant’s personnel; Accepting replacement; Consultant moves in – kick off meeting, communication with the consultant, contributing to the consultant; Handling change in the scope of the work; Bad consultant and good consultant; Consultant’s reporting – content, frequency, and distribution.

3. **Project Gets Started:** (6 hrs)
   Contractor moves in; Consultant moves in; The employer’s role to get project started; The kick-off meeting with the contractor; Contractor’s submissions; Schedules and plans reviewed; Safety and security related plans approved; Safety management system installed; Quality management system designed and installed; Material testing facilities agreed and installed. Copy of contract document made available at site.

4. **Managing Risk and Uncertainties in Construction Projects:** (6 hrs)
   Concept of risk; Source of risk; Risk identification – various techniques of identification; Risk assessment – likelihood, impact and consequence; Risk response planning – risk transferring, risk reducing, and contingency planning; Risk management principles; Risk analysis.

5. **Construction Contract Administration:** (7 hrs)
   Explaining ambiguities; Supply of drawings and instructions; Review and approve contractor’s work program; Approval of materials and quality certificates; Replacement of contractor’s personnel; Suspension of work and determine extra payment arising out of such suspension; Determining EOT for completion of the work; Documenting reasons for EOT; Certifying interim payments; Valuation of VO and getting it approved; Fixing of new rates; Control and expenditure of provisional sums; Approval of nominated sub-contractor; Determining whether work is substantially completed; Measurement and valuation of work completed; Giving decisions on contractor’s claims and quarries; Taking action on unacceptable performance – termination of contract, forfeiture of guarantees and other assets of the contractor; valuation of work done and final account after termination; Setting up new contract.
6. **Claims, Disputes and Dispute Settlement:** (6 hrs)
   Introduction to claims, Reasons for claims, Source of claims, Preparing claims, analysis of claims, preparing defense.


7. **Procurement of Works, Services and Equipment:** (8 hrs)


8. **Motion and Time Study:** (6 hrs)
   Method Study: Introduction; Recording; Examining and developing; The flow and handling of materials; Movement of workers; Method of movement at work place; Define, install and maintain method.

   Work Measurement: Introduction; Time study equipment; Selecting a job and making time study; Time study rating; From study to basic time; Setting time standard.

**References:**

ECM 622: Construction Safety Engineering (3 – 0 – 0)

Course Objectives
After completing this course students will be able to identify problem and issues related to safety at construction site. Students will be able to independently manage safety at construction site.

Course Contents

1. **Introduction:**
   (2 hrs)
   Construction industry and safety; Meaning and scope of construction safety; Various aspects of construction safety; Scope for improvement.

2. **Modern Safety Concept:**
   (4 hrs)
   Introduction; The British Safety Legislation; Growth of safety laws and legislation; Legislation, penalties or standards; Concern over health and safety of workers; Concern for general people and property; Educating the mass.

3. **Accidents and Their Causes:**
   (6 hrs)
   Software causes, Hardware causes; Accidents at construction sites; Losses due to accidents, Calculation of lost hour and lost resources.

4. **Attending the Emergency:**
   (4 hrs)
   Introduction; Fire emergency; Drowning, Electric shock; Burn with Acids and chemicals; Attending a person fallen from height; First aid at construction site. The first aid centre.

5. **Prevention of Accidents:**
   (5 hrs)
   Introduction; Role of legislation; Implementation of safety plan at construction site; Awareness and self-discipline– discipline at work; Design provisions for reducing accidents; Eliminating the accidents at construction sites.

6. **Documentation for Safety Management:**
   (6 hrs)
   Preparation of an EHS plan; Fire safety plan; Emergency dealing plan; Site security plan; Machine inspection records; Daily observation records; Meeting minutes; Test certificates, Manufacturer’s instruction manual for storage and handling of hazardous substances; Site activity records.

7. **Work Place Safety Management:**
   (10 hrs)
   Organization safety policy – its content; Review of contractor’s safety policy; Approval of contractor’s EHS plan; Safety signal and signage; Awareness generating slogans; Equipment safety – third party inspection, licensed operator, training of operator; Ensuring electrical safety – installing correct circuit breakers, training of electrician; Housekeeping; Training of workers – Induction, tool box talk, skill training, periodical safety briefing; Safety walk down at site; Safety meetings; Safety reporting; Method statement and job safety analysis (JSA); Near miss reporting; Accidents reporting; Report of property loss; Safety performance chart. Safety supervision – qualification and competence of safety personnel, role of safety engineers and safety stewards.
8. **Motivating for Safety:**
   Introduction; Motivating the workers; Motivating the supervisors and managers; Motivating the planners and designers; Motivating the contractors; The safety committee.

9. **Safety Cost:**
   Introduction; Cost to the contractor; Cost to the employer; Cost of managing safety at construction site; Calculating the cost of safety; Provision in the tender document.

   **Note:** Students will prepare individually (a) a safety plan as home assignment and (b) method statements and JSA of some construction activities as class work. They are required to present their work in the classroom.

**References:**

RCH 601: Research Methodology (3 – 0 – 0)

Course objectives
The objective of this course is to equip the students with tools and techniques of social research work. Students after completing this course will be able to conduct a research work independently.

Course Contents

1. **Introduction:** (1 hr)
   Conceptualization of research; Nature and types of research; Qualities of researcher; Place of theory in research; Relationship of theory and facts; Research process.

2. **Methods of Research:** (3 hrs)

3. **Formulation of Research Problem:** (2 hrs)
   Anticipation of problem; Subject matter identification; Defining research object; Formation of Hypothesis; Design of study; Tools of data collection; Universe of study.

4. **Selection of Research Problem:** (4 hrs)
   Topic of research; Consumers of research; Components of a research problem; Conditions conducive for formation of research problem; Research resources and research problem; Organizational and individual research; Determinants of individual research; Approaches to starting points; Research proposal writing.

5. **Review of Hypothesis:** (4 hrs)
   Concept of hypothesis; Nature of hypothesis; Is hypothesis unavoidable? Problems in formulating hypothesis; Types of hypothesis; Origin of hypothesis; Characteristics of usable hypothesis; Formulating hypothesis; Utilities of hypothesis.

6. **Variables and Scales:** (4 hrs)
   Variables and parameters; Variables and their levels of measurement; Converting qualitative variables into quantitative variables; Scales and scaling techniques.

7. **Research Design:** (4 hrs)
   Understanding research design, Purpose of research design, Need of research design, Idealized research design, Interdependence of design, problems of research design, Typologies of research design, Design of exploratory or formulation studies, Design for descriptive or diagnostic studies, Difference between descriptive and diagnostic designs, Experimental study design, charity of research design.
8. **Some Methodological Issues:** (3 hrs)
   Problem orientation Vs method orientation, Types of problems, Extent of use of methods, Quantitative approach in social research, Scientific methods, Components of scientific approach.

9. **Measurements and Problems:** (2 hrs)
   Understanding measurements, Problem of measuring data, Sources or variation, Problems of validity, Reliability of measurement, Method of testing reliability, and Suggestions for effective measurement.

10. **Methods and Techniques of data collection:** (2 hrs)
    Library method; Questionnaire method, development of questionnaire; Checklist and Interview method, Case-study method and Statistical method.

11. **Sampling and its Importance:** (4 hrs)
    Understanding Sampling, and need for Sampling, Basis of Sampling, Good Sample, Constructing Sample design, Disadvantage of Sampling method, Types of Sampling methods, Random sampling, Stratified sampling, Deliberate or purposive Sampling, Repetitive sampling, Quota sampling, Duster sampling, Self selected sampling, Sample by regular interval, Area sampling, Universe, Indefinite universe, Red universe, Hypothetical universe, Sample size, Reliability of Sampling, Generality of Sampling procedure.

12. **Classification, Tabulation and Management of Data:** (4 hrs)
    Classification and its characteristics, objective of classification, Basis of classification, Types of classification, classification according to attributed, classification according to variables, Category set, Discrete and continuous series. Tabulation, Objective of tabulation, Steps towards tabulation, Simple and complex tables, Arrangement of columns, Drawing tables, Mechanical methods of tables, Advantages and limitations of tabulations. Data management; Coding.

13. **Analysis, Interpretation and Presentation of Data:** (4 hrs)
    Need for interpretation; Precaution in interpretation; Process of Graphic presentation; Descriptive presentation; Diagrams; Pictures and maps; Tabular presentation; Difficulties in presentation; Interpretation of data; Techniques of data analysis; Hands on practice using computer software.

14. **Research Report Writing:** (4 hrs)
    Problems of report writing; Target group in report writing; categories of research report; Contents of a research of report; Qualities of a good research report; Chapterization of report; Comprehensive report writing; Fore word of a report; Inclusion of summary; What to avoid? Minimum to be included, Presentation of report; Referencing.
References:

ECM 623: Construction Management in Developing Countries

Course Objectives

The objective of this course is to help the students in understanding the differences between developed and developing countries in terms of their practices in construction management, and in developing higher degree of flexibility in order to prepare the students to work globally.

Intended Learning Objectives

The following are the intended learning objectives of this course.

Incorporate social, cultural, environmental, political and economic factors in design and implementation of construction projects in developing countries.

Make decisions on the type of technology to be used in the implementation of infrastructure development projects in remote areas in developing countries.

Ensure effective participation of all the stakeholders, especially the marginalized ones, in all the phases (conceptualizing, planning, designing, mobilizing, implementing, operating and maintaining) of development of construction projects.

Select proper personnel for project evaluation and project audit based on the qualification and skill of the evaluator and auditor.

Course Contents

1. Concept of Development: (6 hrs)
   - Definitions of development, Core value of development, Objectives of development, Sources of underdevelopment, Measures of development, Classification of countries based on levels of development, Similarities (common characteristics) and differences in developing countries, Characteristics of developed and developing countries

2. Linkage Between Developed and Developing Countries: (3 hrs)
   - Ways developed and developing countries are linked: Global Village, Environmental, Population, Migration, Debt, Job, Education, Trade/Transit, Tourism, Terrorism, Politics, Peace, Supranational Institutions, International Business, Multinational Corporations, Outsourcing, Foreign Direct Investment, World Trade Organization
   - Interdependence of developed and developing countries: Socio-economic interdependence, Environmental interdependence, Political interdependence

3. Needs of the Developed and Developing Countries: (2 hrs)
   - Needs of Developed Countries from Developing Countries: Human Resources, Natural Resources, Investment Opportunities, Climate Change, Dump site for obsolete technology, waste dump, medicine testing
   - Needs of Developing Countries from Developed Countries: Education and training, infrastructure project, funding, technology, humanitarian assistance, loan, management system, health needs, water need, information need

4. Culture, Attitudes and Beliefs: (2 hrs)
   - Culture: Definition of culture, elements of culture, safety culture, impact of culture on construction management, Attitude: positive, negative and neutral attitude, functions of attitude, changing attitude, impact of attitude in construction management, Beliefs: religious belief, predestination, accident, social belief, impact of belief system on construction management
5. **Project Environment in Developing Countries:** (4 hrs)
   Project participants: Client, Consultants, Contractors, Construction materials and allied industries, funding agencies, journalists, Environmental activists, end users.
   Management Aspect of Project Environment in developing countries: top level, middle level and operational level management and their characteristics, Legal, Socio-cultural, economic, political and demographic factors. External factors affecting construction project

6. **Choice of Technology:** (3 hrs)
   Concept of construction technology; labor intensive technology, capital intensive technology, and Labor based technology; Merits and demerits of Capital intensive technology; Merits and demerits of Labor intensive technology; Factors determining choice of technology; Transfer of technology: positive and negative aspects, Objectives of transfer of technology; Issues related to transfer of technology; Channels of transfer of technology; Methods of transfer of technology; Provisions of the Foreign Investment and Technology Transfer Act 1992. Impact of technology transfer in construction industry.

7. **Participatory Approach in Infrastructure Development:** (3 hrs)
   Practices of infrastructure development in Nepal; Traditional development approaches: state led, market led, NGO led and community led; Modern approach: State – users cooperation (participatory) and developers – community cooperation (participatory); Participatory approach versus central planning approach; Benefits of participatory approach in infrastructure development; Levels of participation; Stages of participation
   Elements of participative approach; Ways to ensure effective participation.

8. **Project Operation and Maintenance in Developing Countries:** (4 hrs)
   Meaning and objectives of project operation; Importance of O&M; Reasons for poor project operation; Activities involved in project operation; Inspection and inspector’s check list; Importance and objectives of maintenance; Types of maintenance: Planned maintenance, unplanned maintenance, emergency maintenance, preventive maintenance and corrective maintenance; Regular, Recurrent, and Periodic maintenance; Project downtime.
   Design aspect of O&M; Community aspect of O&M; Capacity building for O&M; O&M manual: content and style; Steps in the preparation of O&M manual; Check list of O&M, common types of O&M manual

9. **Society and Construction Project Management:** (6 hrs)
   **Project Investment models:** Increase in private investment; Investment models – BOT, BOOT, PPP and others; Bank and financial institutions – Rate of interest, public project investment, private project investment.
   **Pre construction activities:** Social considerations, bidding complexities and e-bidding; Bid bond and their conditions; Site visit by the bidders; Bid preparation by the bidders; Study of tender document; Completeness of tender document and ambiguities.
   Increasing expectations: Employer’s expectations - universal knowledge, stringent environmental parameters; Meeting project objectives; Expectation of high quality and accepting low bids; Hope for zero accident and willingness to spend; Involvement of user’s community during project planning and development.
Land acquisition: Introduction, procedure, cost of land; Issues associated with land acquisition – forest, public utilities. Valuation of private properties – houses, other structures, trees and plants; Land acquisition complexities.

Construction period: Contractor’s mobilization – modern trend. Material supply – involvement of local youths; Incorporating people’s demand – feasible vs unfeasible; Role of local youth organizations (LLYOs)– how organized are the organizations. Project control process – challenges to the engineer’s staff. Labor issues - EHS issues and awareness, minor labor, gender and equity considerations; Labor unions: highly politicized, interest in higher wage only, poorly organized; Application of project management tools – current status, selection of tools, frequency of updating.

10. **Project Evaluation and Auditing:** (6 hrs)
Evaluation: Needs and importance of project evaluation, project evaluation myths; Types of projects in terms of degree of success; Reasons for project success and failure; Types of evaluation based on time period and purpose of evaluation; Inputs to project evaluation; Methods of evaluation.
Audit: Introduction and need of project audit; Types of project audit: financial audit, technical audit, environmental audit, social audit; Depth of audit; Timing of audit; Major tasks of a project audit; Components of audit; Life cycle of project audit; Auditor’s responsibilities; Steps of project audit; Audit report.

11. **Case Studies/Seminars:** (6 hrs)
Issues of construction industry in the developing countries shall be identified; cases shall be studied and presented in classroom seminars.

References:

4. Books on economics and development planning.
6. Journal, papers and reports.