
**TRIBHUVAN UNIVERSITY**

**INSTITUTE OF ENGINEERING**

**PULCHOCK CAMPUS**

**DEPARTMENT OF MECHANICAL ENGINEERING**

# CURRICULUM

**MASTER OF SCIENCE (M.Sc.)**
**IN**
**TECHNOLOGY AND INNOVATION MANAGEMENT**

**2010**

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## 1. INTRODUCTION

The Institute of Engineering (IOE), Tribhuvan University is initiating a full-time, two years (4-semesters) master program in **Technology and Innovation Management (TIM)** from July 2010 in collaboration with Norwegian University of Science and Technology (NTNU), Trondheim, Norway. Norwegian Agency for Development Cooperation (Norad) is the responsible agency and financier of this NOMA (Norad Programme for Master Studies) Program and the Norwegian Centre for International Cooperation in Higher Education (SIU) is responsible for the management of this NOMA program (NOMA PRO 2010/13643). The Norwegian funding will be from 2010 to 2014.

The 2-year (4-semester) Master of Science program consists of a package of courses covering important areas for managing and mapping technology and innovation management and entrepreneurship. This Master program is designed to give students a focused, relevant and utilizable body of knowledge in technology and Innovation management, suitable for people with an interest in starting and managing innovative projects either within existing structures or by realizing new economic endeavors. Graduates from the program will be prepared to work for corporations/industries and entrepreneurial firms in the knowledge economy with capabilities to be innovative and successful either as entrepreneurs starting new companies or as intrapreneurs generating and managing new technical business opportunities within existing corporations. It will also create an arena for collaboration between faculty and people from industries and businesses to enhance the productivity of their organizations. In this context, the Institute of Engineering (IOE) has recently signed a Memorandum of Understanding (MOU) with the Federation of Nepalese Chambers of Commerce and Industries (FNCCI).

## 2. ADMISSION REQUIREMENTS

**Program entry requirements**

In order to be eligible for admission for the Master of Science Program in Technology and Innovation Management (TIM), a candidate must:

- Have a Bachelors' Degree in Engineering (normally from a Four Year Program) from Tribhuvan University or its equivalent from an institution of recognized standing.
- Have undergraduate grades significantly above average and not less than prescribed by the Faculty Board of the Institute of Engineering.
- Have at least 2 years of relevant working experience after graduation.
- Submit a recommendation made by two referees who should be from among the employer where the candidate worked and/or from the concerned teaching faculty from where the candidate received the Bachelor's Degree in Engineering.

**Selection**

Candidates fulfilling the Program Entry requirements will be selected for admission on the basis of merit based on TIM Entrance Test.

**Categories of students**

Four categories of students are envisaged in this course and they are:

1. NOMA (Norwegian Government)/Institute of Engineering sponsored Students. These scholarships will only be given in the year 2010, 2011 and 2012.
2. Regular Fee paying students.
3. Full Fee paying students.
4. Sponsored students.

## 3. COURSE STRUCTURE/SYSTEM

This Master Course focuses on the design, management and improvement of Technology and Innovation strategies. It is multidisciplinary and builds on several scientific and engineering disciplines. The courses, project works and Master's thesis include different pedagogical ideas and teaching and learning methods. The program is organized with an objective to produce graduates who will have an understanding of technology and innovation management techniques so that they have the capability to accept broader and more responsible roles, both technical and managerial, within an atmosphere of continual change. An important influence in our program is problem-based learning including case studies and problem solving with quantitative and qualitative models. The most important part of the study program is the project work, which runs throughout the 2 and 3 semesters. Wherever possible, the project work should be industry-based requiring students to investigate live problems.

In the first semester, four core courses (technology and management based) and one technology and innovation laboratory work will help students to develop an understanding of how technological innovation works within the organization and how it is shaped from the outside. Familiarity with a range of practical tools for managing the innovation process is also introduced. Then, in the second semester, more in-depth treatment of the strategic issues in technology and innovation management is covered. In this semester, 2 electives are also offered through a choice of elective courses (both departmental electives and technology and innovation management electives). A group Project Work is also undertaken this semester.

In the third semester, students will complete a directed study related to the research dissertation, (thesis) which offers the opportunity to pursue selected issues in greater depth, and to integrate these with broader theoretical and analytical work. In this semester, one core and one elective course will also be offered. Students should also complete a 2nd Project work in this semester. The final fourth semester will be completely devoted to the individual research work (masters' thesis).

## 4. COURSE OVERVIEW

| Semester 1 | Semester 2 | Semester 3 | Semester 4 |
|---|---|---|---|
| Applied Probability and Statistic (4 Credit)<br>Core Technology Course | Marketing Management (4 Credit)<br>Core Management Course | Strategic Management (4 Credit)<br>Core Management Course | |
| Financial Management (4 Credit)<br>Core Management Course | Operations Research (4 Credit)<br>Core management Course | Directed Study (2 Credit)<br>Compulsory | |
| Innovation and Technology Management (4 Credit)<br>Core Technology Course | Technology Course (TIM-1)* (4 Credit)<br>Elective | Technology Course (TIM-2)* (4 Credit)<br>Elective | |
| Research Design and Methodology (4 Credit)<br>Core General Course | Technology Course (D-1)** (4 Credit)<br>Elective | Technology Course (D-2)** (4 Credit)<br>Elective | |
| Innovation and Technopreneurship Workshop (4 Credit) | Group Project - I (2 Credit) | Group Project - II (2 Credit) | Master Thesis (16 Credit) |

# Course work, directed study and projects = 54 Credits
# Thesis = 16 Credits
TOTAL = 70 Credits

* TIM-1 & TIM-2 are the electives offered by TIM
** D-1 & D-2 are the existing electives offered in MSc. programs in various department of Pulchowk Campus.

**Notes:**

1. 4 electives are offered in TIM-1 (Semester 2) and other 4 electives are in TIM-2 (Semester 3) and the students have to choose one of them in each term. Depending on the interest of students only 2 electives are offered in each term. Minimum number of students in each elective should be 6.

2. **There will be industrial internship of 4 weeks after the term 2 (1st year).**

**Core and elective courses**

The course consists of two types of courses, the Core Courses deal with the fundamental, whereas the electives courses (departmental electives – D1 and D2 and Technology and Innovation Management electives– TIM 1 and TIM 2) deal with specific details of the course.

The core courses of the Technology and Innovation Management program emphasizes the fundamentals of technology and innovation management in theory and practice. Elective courses, chosen will enable students to focus their courses to their technical interests and to specific topics in technology innovation management processes, policies or organizations. In addition, required project works will provide hands-on real world experience.

Overall, we will try our level best to equip our students to drive value creation from technical innovation based on their understanding of technical concepts, innovation management fundamentals and real world implications.

**Group Project Work**

The purpose of the group project in semester II and semester III is to provide an opportunity for the group of student to investigate, analyze and is possible provide solution to an existing industrial/business problem. The group project must be completed in the allocated term. The group project may be done in small groups (2-3 students per group).

**Master's Thesis**

The main objective of the Master's Thesis is to apply and deepen theories and skills to study and solve problems in an industrial or business context. It is encouraged that during the thesis work, feedback sessions in small groups (industry and academic) should be organized to keep track of progress, exchange experiences and discuss methodological issues.

## 5. CREDIT SYSTEM

The course curriculum is organized in the overall framework of Credit System. Each course has a certain number of credits, which indicates the weightage. The number of credits depends on the contact hours for the course and its work load. Course with one credit weightage will have at least 15 lecture hours in a semester. The tutorial, consulting and assessment hours will vary depending on the nature of the course. The total Credit for the masters' program is 60 and this program has 70 credits in total.

## 6. COURSE CODES

Each course is identified by a code. Each course will have a **three digit number** with a **prefix** and **suffix set of two capital letters.** The prefix letters stand for the Institute (for example, EG signifies Engineering Faculty) and the suffix letters denote the department offering the course. In the three number central digits, the first digit denotes the level in which the course is offered. For example, the digit 8 and 9 indicates the first and second year respectively of the Master's level course. The second digit is used to designate the semester. The second digits from 1 to 50 are used for the course/s offered in the first and third semesters and 51 to 100 for the course/s offered in the second and fourth semesters respectively.

## 7. INSTRUCTIONAL METHODS

Conventional lectures and seminars in the taught course components (core and elective courses) of the program are reinforced by other approaches to teaching and learning:

- the use of case studies (video- and text-based) to highlight key issues and management practices
- training in the use of electronic information sources
- training in team work and project management

Each course is co-ordinated by a member of the faculty or the visiting faculty which is offering the course in a given semester. The course faculty has the full responsibility for the conduction of the particular course. The courses comprise of lectures, tutorials, laboratory works, group discussions and project works (as applicable). The course contents are designed in such a way that considerable self-learning efforts should be used by the students.

Each student will be assigned a counselor. The main function of the counselor will be to guide the student throughout the 2-year program.

## 8. REGISTRATION

Students must register for their courses every semester. They must seriously attempt to complete the masters' program in 2 years. In all the four semesters, a total of courses of total number of 48 credits will be offered which will consist of core courses and electives courses. A directed study of 2 credits and 2 project work of total number of 4 credits must be completed by all students. The credits for the thesis will be 16. The total credits for the complete program is 70.

## 9. EVALUATION SYSTEM

The evaluation system is based on the continuous assessment by the course teach and the final examination. The students have to pass individually in the assessment as well as the final examination. The minimum pass marks for the assessments and final examination is 50%.

The total percentage is calculated from the following relation:

$$\text{Total Percentage} = \frac{\sum(\text{Credit} * \text{marks obtained})}{\sum \text{Credits}}$$

Depending upon the total percentage of the marks obtained, the following division shall be awarded:

| Percentage | Division |
|---|---|
| **>=50%** | **Pass** |
| **50 - < 65** | **II** |
| **65 - < 80** | **I** |
| **80 and above** | **Distinction** |

## 10. QUALIFYING CRITERIA

To qualify for the Master of Science in Technology and Innovation Management the student must satisfactory complete the program consisting of course works, directed study, group projects of 54 credits and an individual thesis of 16 credits.

## 11. MARK DISTRIBUTION IN EACH COURSE PER SEMESTER

**Year: I** **Part: A**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Theory | | | Total | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| 1 | EG801ME | Applied probability and statistic | 4 | 3 | 1 | 0 | 4 | 40 | 3 | 60 | 100 | |
| 2 | EG802ME | Financial management | 4 | 3 | 1 | 0 | 4 | 40 | 3 | 60 | 100 | |
| 3 | EG803ME | Innovation and technology management | 4 | 3 | 1 | 0 | 4 | 40 | 3 | 60 | 100 | |
| 4 | EG804ME | Research design and methodology | 4 | 3 | 1 | 0 | 4 | 40 | 3 | 60 | 100 | |
| 5 | EG805ME | Innovation and technopreneurship | 4 | 3 | - | 3 | 6 | 80 | 1 | 20 | 100 | |
| | | **Total** | **20** | **15** | **4** | **3** | **22** | **240** | | **260** | **500** | |

**Year: I** **Part: B**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Theory | | | Total | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| 1 | EG851ME | Marketing management | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 2 | EG852ME | Operations research | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 3 | EG853ME | Group project | 2 | 2 | - | | 2 | 40 | 3 | 60 | 100 | |
| 4 | - | Technology course (TIM-1) | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 5 | - | Technology course (D-1) | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| | | **Total** | **18** | **14** | **4** | **0** | **18** | **200** | | **300** | **500** | |

L = Lecture, T = Tutorial, P = Practical

**Year: II** **Part: A**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Theory | | | Total | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| 1 | EG901ME | Strategic management | 4 | 3 | 1 | | 8 | 40 | 3 | 60 | 100 | |
| 2 | EG902ME | Directed study | 2 | 2 | - | | 4 | 40 | 3 | 60 | 100 | |
| 3 | EG903ME | Group project | 2 | 2 | - | | 4 | 40 | 3 | 60 | 100 | |
| 4 | - | Technology course (TIM-2) | 4 | 3 | 1 | | 8 | 40 | 3 | 60 | 100 | |
| 5 | - | Technology course (D-2)** | 4 | 3 | 1 | | 8 | 40 | 3 | 60 | 100 | |
| | | **Total** | **16** | **13** | **3** | **0** | **32** | **200** | | **300** | **500** | |

L = Lecture, T = Tutorial, P = Practical

**Year: II** **Part :B**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | Total | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Final Assessment Marks** | | |
| 1 | EG951ME | Master's thesis | 16 | | | | | 100 | 100 | Assessment through Project Work/Thesis and final Viva/thesis presentation |
| | | **Total** | **16** | | | | | **100** | **100** | |

*** As per the department rules and regulation*

L = Lecture, T = Tutorial, P = Practical

**Year: I** **Part: A**

| S.N. | Course Code | Course Title | Credit | L | T | P | Total | Examination Scheme | | | Total | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | | | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| **Electives: TIM-1*** | | | | | | | | | | | | |
| 1 | EG854ME | Energy economics | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 2 | EG855ME | Maintenance engineering and management | | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 3 | EG856ME | Project management | | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 4 | EG857ME | Production and operations management | | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |

L = Lecture, T = Tutorial, P = Practical

* TIM-1 & TIM-2 are the electives offered by TIM

**Year: II** **Part: B**

| S.N. | Course Code | Course Title | Credit | L | T | P | Total | Examination Scheme | | | Total | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | | | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| **Elective: TIM-2*** | | | | | | | | | | | | |
| 1 | EG904ME | Energy planning and modeling | 4 | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 2 | EG905ME | Industrial control system | | 3 | 1 | 1.5 | 5.5 | 40 | 3 | 60 | 100 | |
| 3 | EG906ME | Reliability and risk management | | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |
| 4 | EG907ME | Total quality management | | 3 | 1 | | 4 | 40 | 3 | 60 | 100 | |

**Year: I** **Part: B**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Theory | | | Total | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| **Electives: D-1**** | | | | | | | | | | | | |
| 1 | | | 4 | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 2 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 3 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 4 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |

** D-1 & D-2 are the existing electives offered in MSc. programs in various department of Pulchowk Campus.

**Year: II** **Part: A**

| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Course Code | Course Title | Credit | L | T | P | Total | Theory | | | Total | |
| | | | | | | | | Assessment Marks | Final | | | |
| | | | | | | | | | Duration, h | Marks | | |
| **Elective: D-2**** | | | | | | | | | | | | |
| 1 | | | 4 | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 2 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 3 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| 4 | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| | | | | 3 | 1 | 1.5 | 5.5 | *40 | 3 | 60 | 100 | |
| | | | | | | | | | | | | |

** This 40 marks includes 20 marks of Practical/project work/s.*

L = Lecture, T = Tutorial, P = Practical

# 12. COURSES

## 12.1 EG801ME: APPLIED PROBABILITY AND STATISTICS

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: A

### Course description

The professionals dealing with the systems possessing random variations require knowledge of probability concepts. Probability is generally used as a modeling tool and it can be applied to the solution of engineering problems. Persons involved in the study of probability and random processes also must analyze data and hence require a fair knowledge of statistics. The course is intended to provide fundamentals of probability and its applicability in engineering and science. This course also aims at providing an opportunity to learn how probabilistic analyses and statistical reasoning and testing can be applied to a wide range of problems of importance in the sciences, industry, and society.

### Objectives

The primary goal of the course is to build a fundamental understanding of statistical theory and its applications. After completing this course, students should be able to understand:

- Purposes and methods of acquiring data from a population, displaying and Summarizing them;
- Stochastic description of random phenomena and a number of well known distributions of discrete and continuous random variables;
- Statistical inference in estimation and hypothesis testing and their applications;
- Statistical tools in experimentation, modeling and analysis of qualitative data.

### Outline of Course

Basic probability concepts, random variables, moments of random variables, special probability distributions, multiple random variables, functions of random variables, sampling theory and distribution, estimation theory, hypothesis testing, curve fitting.

### References


1. Walpole, R. E., Myers, R. H., and Myers, S. L., Probability and Statistics for Engineers and Scientists, Prentice-Hall, 1998.
2. Ibe, O. C., Fundamentals of Applied Probability and Random Processes, Academic Press, 2005.

## 12.2 EG802M3: FINANCIAL MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: A

**Course description**
Successful business and industrial organizations have long recognized the need for effective financial management and for having significant financial expertise among their executives. Technical executives, executives in the sales and marketing, and operations and other fields of the organizations should have ample knowledge of financial management.

There are several reasons for the importance and scope of finance. First, the scale of operations of business and industrial firms has greatly increased. Second, the widespread diversification of products and geographical dispersion of operations have increased the complexity of managing a business. The effective management of such diverse operations requires strong knowledge of finance among all the executives and this knowledge will be very helpful in taking broad company and corporate strategy. Finally, financial decisions directly affect the risk and profitability of the firm and it has become much more important in the present context of economic uncertainties and globalization of business activities.

**Objectives**
The course is an introductory finance course for non-financial executives. The students will have understanding and introductory knowledge of the following financial management activities:

- Analysis and interpretation of financial results and projections, and effective communication of that information to internal and external stakeholders (understanding financial annual reports such as income statements, balance sheet and cash-flow statements and their analysis)
- Understanding financial and cost accounting principles
- Development of long and short range financial plans, and the measurement of performance against planned objectives
- Development and implementation of strategies for capital formation
- Understanding and implementing capital budgeting techniques, and
- Understanding financial risk management etc.

**Outline of course**
Types of firms, raising capital, financial markets, dividend policy and cost of capital; understanding financial statements and their analysis; financial and cost accounting; financial forecasting; financial strategic planning and management control; time value of money and capital budgeting techniques; overview of financial management; working capital management; understanding financial risk management such as futures, options and real options; knowledge about mergers, acquisitions and restructuring etc.

**Reference**

1. Chandra, Prasanna, 2003. Finance Sense: Finance For Non – Finance Executives. Second Edition,TATA McGraw Hill Publishing Company Limited, New Delhi.

2. Lusztig, Peter, Randal Morck and Bernard Schwab, 1994. Managerial Finance in a Canadian Setting. Fifth Edition, John Wiley and Sons Canada Limited, Canada.

## 12.3 EG803ME: TECHNOLOGY & INNOVATION MANAGEMT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: A

**Course description**

Management research confirms that innovative firms – those that are able to use innovation to improve their processes or to differentiate their products and services – outperform their competitors, measuring in terms of market share, profitability, growth or market capitalization. However, the management of innovation is inherently complex and risky: most new technologies, around 90 percent of them, fail to see the light and to be developed into products and services.

The management of innovation is inherently interdisciplinary and multifunctional rather than single dimensional like production management, operations management, marketing management, financial management and organizational development. Entrepreneurs, who actually realize innovation into practical and commercial products and services, should be able to integrate all these multifunctional activities to be successful and competitive in the market.

Innovations will become commercially successful when there is technology 'push' and demand 'pull'. Having new technology only will not be sufficient, but also there is a need for creating marketing pull and other activities as well.

After taking the course the students will be able to learn the following:

- key issues in technology and innovation management
- development of framework for an innovative strategy
- integration of strategic learning; learning from markets
- creation of innovative ventures and organization
- knowledge gained through interactions with Nepalese entrepreneurs
- development of a technical entrepreneur
- development of business plan
- growth and performance of innovative small firms
- assessing and improving TIM performance

***The course will have a series of interactions with Nepalese entrepreneurs. The entrepreneurs will be invited during the whole span of course to discuss how they developed their enterprises, what pitfalls/problems they had to face in the development of their organizations, and what knowledge they can share with the students.***

**Outline of course**

Key issues in technology and innovation management; innovation as a management process; development of framework for technology and innovation strategy; positioning innovation in competitive environment; learning from markets; building mechanism for effective internal and external process innovations; creating innovative firms and organizations; assessing and improving technology and innovation management performance.

**Reference**

1. Tidd, Joe, John Bessant and Keith Pavitt, 2001. Managing innovation. 2nd edition, John Wiley & Sons Ltd., New York, USA.

2. Katz, Ralph (ed.), 1988. Managing professionals in innovative organizations. A collection of readings. HarperCollins Publishers, USA.
3. Drucker, Peter, 2002. Management challenges for the 21st century. 7th edition, Butterworth-Heinmann, Oxford, MA, USA.
4. Corsi, Patrick, Simon Richir, Herve Christofol, and Henri Samier (ed.), 2007. Innovation engineering. 1st South Asian Edition, ISTE Ltd., London, UK.
5. Prahalad, C.K., and M.S. Krishnan, 2008. The new age of innovation. Driving co-created value through global networks. Tata McGraw-Hill, New Delhi, India.
6. Evans, Philip, and Thomas S. Wurster, 2000. Blown to bits. Harvard Business School Press, Boston, MA, USA.
7. Welch, Jack, 2001. Jack. Straight from the gut. Headline Book Publishing, London, UK.

There will be a lot of readings from Harvard Business Review and other journals on innovation and entrepreneurs.

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## 12.4 EG804ME: RESEARCH DESIGN AND METHODOLOGY

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: A

**Course description**

Research involves an eclectic blending of an enormous range of skills and activities. To be a good researcher, you have to be able to work well with a wide variety of people, understand the specific methods used to conduct research, understand the subject that you are studying, be able to convince someone to give you the funds to study it, stay on track and on schedule, speak and write persuasively, and on and on. The process of research can also be painstakingly time consuming. It can involve the overcoming of many obstacles and may unfortunately need to be revised several times as you progress through the steps.

Given the common interest to conducting useful and relevant research, it becomes very important to discuss how the design of research needs to be changed in order to ensure that the intended benefits indeed accrue.

Research design can be considered as a form of problem oriented practical scholarship. It is one of the key components in any study of social/management/technology/innovation issues. Design is the means to provide relevant information on a research question in an efficient way that meets the criteria of public accountability, in the sense of openness to public scrutiny.

Any research design is characterized by both opportunities and constraints, and the selection of the optimal design is always a tradeoff between the strengths and weaknesses of different options, viewed in the context of feasibility. Drawing on a variety of examples from relevant literature and context, this course will explore research design and methodology and method considerations and options, issues of data quality and analysis, and reporting.

**Objectives**

The broad objectives of the course are to:

- increase awareness of the role of research design and methodology in any inquiry process;

- introduce a range of research design and methodology and method options;
- foster an appreciation of the strengths and weaknesses of the different options for particular research objectives;
- analyze and critique a research report.

After attending the course, students will be able to bring a more critical reading to the literature and have acquired a basic knowledge of research design and methodology as a contribution to their projects and dissertation works.

**Outline of course**

Introduction, nature and types of research; language of research; building blocks of research (ontology, epistemology, methodology, methods, sources) research and criticism; the research process (applied and basic research); inductive and deductive logic; research methodology and methods; experimental designs, survey, case study, models; data analysis and interpretations; tools in statistical analysis (SPSS computer program included).

Research proposals, research reports: contents, formats and components, writing approaches, identification of topic, development of research problem, literature review and search, building theory for research, research objectives, research questions and hypotheses, designing methods and procedures, crediting and references and referencing systems.

**Note: Because this course is designed to focus on the design, methodology and methods of research, a basic understanding of statistics is assumed.**

**Reference**


1. Merriam B. Sharan, 1988. Case study research in education – a qualitative approach. Jossey-Boss Inc.
2. P Alasuutari, L Bickman, J Brannan & J. Brannen, 2008. The SAGE Handbook of Social Research Methods .Sage.
   Field, A. (2009). Discovering Statistics using SPSS. 3rd edition. Sage, London.
3. Anderson, D.R., D.J. Sweeney and T.A. Williams (2005). An Introduction to Management Science. Thompson, Mason, Ohio.
4. Lattin, J. M., P. E. Green and J. D. Carroll (2002). Analyzing Multivariate Data. Duxbury Press, Belmont, Calif.
5. Leik, R. K. (1997). Experimental design and the analysis of variance. Pine Forge Press, Thousand Oaks, CA.
6. Weisberg, S. (2005). Applied linear regression. Wiley, Chichester.
7. Miles, M. B., & Huberman, A. M. (1984). Qualitative data analysis: A sourcebook of new methods. Beverly Hills, CA: Sage.
8. Norman W. H. Blaikie, Approaches to Social Inquiry, Polity Press, UK,1993.
9. Norman W. H. Blaikie, Designing Social Research, Polity Press, UK, 2000.
10. Fowler, F. J., Jr. (1995). Improving Survey Questions: Design and Evaluation. Thousand Oaks, CA: Sage Publications.
11. MxGrath, R. E. (1997). Understanding Statistics: A Research Perspective. New York: Longman.

## 12.5 EG805ME: INNOVATION AND TECHNOPRENEURSHIP WORKSHOP

Lecture: 3 h
Practical: 3 h

Year: I
Part: A

**Concept**

This course carries a big ambition of transforming the way engineering students think so that they are inspired to innovate in their own capacity, creating a positive impact on lives of people locally or globally. It encourages the students to abandon believing in store and retrieve method of learning, which is not relevant anymore because information can be retrieved from internet anytime, in favor of "understand, apply and extend" approach.

**Objective**

At the end of the course, the student should be able to conceive an innovative product based on his/her own idea. Some of these products will be feasible for commercial production.

**Rationale**

Thinking differently and dynamically is essential since this information age is different than industrial age, and more importantly, technology is changing so rapidly.

**Benefits**

Students will benefit from:

- learning inspiring technology success stories, and technologies for future
- developing the skills of thinking, assessing and refining technological solutions
- knowing how to plan, protect and deploy new technology as commercially viable solution
- developing personal skills in communicating, presenting and report writing
- practicing the habit of working in a heterogeneous team

**Class Sessions**

Assessment of thinking habit and technology updates, Eye opening and inspiring lectures, Extensive participatory debates and discussions, Heavy internet based research, Rigorous presentations of ideas and plans, Rapid application development and prototyping, Personalized and selective industry visits if required, Proposal and report writing

**Student Evaluation**

Students will be loaded with group and individual assignments that needs to be presented and/or submitted, that includes review of reading materials, submission of their own ideas, writing patent application, business plan and even a thesis proposal. Individual student's attendance and continuous assessment of the submission and presentation (group as well as individual) will carry 80% and a final examination will carry 20% of weightage for the grade.

**Lab requirement**

Computers with internet access

**Textbook/References**

Mainly Internet

## 12.6 EG851ME: MARKETING MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

**Course description**
Marketing has become one of the vital functions of an organization – whether a business or an industry. Marketing activities focus on assessing and satisfying consumer needs. These activities help develop the customer – satisfying products or services required for the organization to survive and prosper in the competitive business environment. As consumer demands change continuously, firms need to develop innovative marketing activities to remain successful in the currently globalized business environment.

Marketing is essential part of management for innovators so that their new products, services and processes they develop become successful in the market. This course provides introductory knowledge on marketing to the students of TIM.

**Objectives**
The course will provide the following knowledge to students to:

- Learn and understand key marketing concepts
- Recognize consumers as the central and important in marketing
- Improve the ability of students to analyze marketing problems and challenges

**Outline of course**
Marketing: a focus on the consumer; marketing in the organization; the strategic marketing process; situation analysis; SWOT analysis; marketing objectives; the marketing mix; 4-Ps (place, product, price and promotion); the changing marketing environment; marketing and technology; consumer and industrial marketing; marketing research; market segmentation, targeting and positioning; branding; relationship marketing; developing new products and managing them; pricing and its relation to revenues and costs; marketing channels and wholesaling; advertisement; sales management.

**Reference**


1. Berkowitz, Eric, Frederick Crane, Roger Kerin, Steven Hartley and William Rudelius, 1995. Marketing.Times Mirror Higher Education Group, Inc., USA.

2. Kotler, Philip, and Kevin Lane Keller, 2006. Marketing management. Prentice Hall, 12th edition.


**Readings**
Several journal papers on marketing published in Harvard Business review.

## 12.7 EG852ME: OPERATIONS RESEARCH

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

**Course description**
Operations Research/Management Science (OR/MS) is the use of mathematical models and quantitative approaches for decision-making. It was originated some 70 years ago in the military applications in the 2nd Great World War. OR/MS is now being profusely used in managerial decision-making especially with the widespread application of personal computing in business, industrial and household sectors since 1990s.

This course is basically intended for introduction and application of OR/MS for engineer-managers with the help of spreadsheet software such as Microsoft EXCEL and its add-in software like SOLVER, CRYSTAL BALL etc. It is more application-oriented rather than teaching solving with mathematical models.

**Objective of the course**
This course aims to provide introductory knowledge of principles of OR/MS to students of engineering/management:

- To make capable of managing data, analyzing data such as sorting, pivoting tables, and applying statistical analysis in a spreadsheet environment
- To familiarize with forecasting methods such as time-series methods such as, models with trend components, seasonal components, regression models, and use of forecasting software CB PREDICTOR
- To familiarize with linear programming and multi-objective optimization models in production and manufacturing, transportation, and finance
- To help students to understand inventory models, and inventory models under risk
- To make familiar with simulation in decision-making under risk and uncertainty with the use of risk analysis software such as CRYSTAL BALL
- To familiarize with systems modeling and simulation such as queuing and inventory models
- To make capable in applying the knowledge gained during the course for solving real problems in decision-making

**Course Outline**
Introduction to modeling for decisions; data management and analysis; regression analysis; forecasting models for time-series; introduction to optimization; linear and multi-objective optimization models; interpreting Solver Results and Sensitivity Analysis; decision and risk analysis; expected value decision-making; Monte Carlo simulation; optimization and simulation; systems modeling and simulations; modeling and simulating dynamic inventory models.

**Reference**

1. Camm, Jeffrey D. and James R. Evans, “Management Science & Decision Technology”, South – Western College Publishing, A Division of Thompson Learning, USA, 2000.
2. Ragsdale, Cliff T., “Spreadsheet Modeling and Decision Analysis, A Practical Introduction to Management Science”, Course Technology Inc., A Division of International Thompson Publishing, Inc., 1995.
3. Wayne Winston, and S. Christian Albright, “Practical Management Science: Spreadsheet modeling and applications”, Thompson Learning, 1997.

## 12.8 EG853ME: GROUP PROJECT - I

Lecture: 2 h
Tutorial:

Year: I
Part: B

The purpose of the group project is to provide an opportunity for the group of student to investigate, analyze and is possible provide solution to an existing industrial/business problem. The group project must be completed in the allocated term. The group project may be done in small groups (2-3 students per group).

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## Elective (TIM-1)

## 12.9 EG854ME: ENERGY ECONOMICS

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

**Course description**
Energy sector is closely associated with the economy of the country and they have a two-way linkage. Besides, energy and economics are also linked with environmental externalities. Climate change and sustainable development have become key issues in the economic development of a country. Hence, this elective is meant for students who want to have career development in energy field. The course will provide knowledge about markets, consumers and producers. It will help the students understand the basics of price theory and its application to energy sector.

Understanding the project cycle is important because of lumpy nature of most energy projects and their wide socio-economic and environmental impacts. Its importance has increased in the era of deregulated and privatized energy industries, and in view of global concern about sustainable development of energy projects. The main objective of this course is to provide a comprehensive understanding of the concepts of economics with energy, and methodologies for energy project identification, project preparation, project evaluation and project financing.

**Objectives**
The course will provide the following knowledge to students to:

- To have knowledge about macroeconomic indicators in national accounts such as GDP, balance of payment, trade accounts etc.
- To build a good understanding of microeconomic theoretical concepts such as market equilibrium, consumer and producers' surpluses, elasticity and energy intensity.
- To provide knowledge on evaluation techniques of energy projects
- To expose the students to the foundations of price theory and their applications to energy pricing and policy analysis

**Outline of course**

Different types of energy and their conversion; perfect competition; energy demand and supply and their elasticities; monopoly; national accounts; GDP, balance of payment, trade accounts; externalities and energy pollutions; time value of money and project evaluation techniques; supply and cost curves; marginal costs; short term costs; long range marginal costs; energy derivatives: futures and options for managing price risks; electricity and economics; economic pricing mechanisms.

**Reference**


1. Samuelson, Paul A., and William D. Nordhaus, 2009. Economics. 18th Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India.

2. Dahl, Carol A., 2004. International energy markets. PenWell Corporation, Tulsa, Oklahama, USA.

3. Banks, Ferdinand E., 2000. Energy economics: a modern introduction. Kluwer Academic Publishers, MA, USA.

4. Webb, Michael G., and Martin J. Ricketts, 1980. The economics of energy. The Macmillan Press Ltd., Hong Kong.

5. Munasinghe, Mohan, and Jeremy J. Warford, 1982. Electricity pricing: theories and case studies. World Bank Publication.


**Reading**

Several journal papers in energy economics, energy, and energy policy and papers posted at web sites of the World Bank and the Asian Development Bank related to the energy sector.

## 12.10 EG855ME: MAINTENANCE ENGINEERING AND MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

**Course description**

Maintenance engineering is becoming a critical issue today for many organizations in achieving reduced operational costs. This course provides a practical and comprehensive overview of maintenance engineering from the product design and development to the field maintenance and in service systems engineering management of operational systems. The course covers maintenance engineering design methods, maintainability testing demonstration, and operational systems engineering principles and applications.

**Objectives**

After the completion of this course the student will be able to:

- Identify major problems of the plant or machine or components,
- Rectify the problems,
- Plan the maintenance work, and
- Carry out the required maintenance works.

**Outline of course**

Introduction to maintenance engineering, types of maintenance, maintenance tools (fault tree analysis and failure mode, effects and criticality analysis etc.), condition based maintenance, reliability- centred maintenance, total productive maintenance.

The lecture will be supplemented by case study assignments. A moderate knowledge of probability and statistics is a requirement.

**REFERENCE**


1. S.N. Bhattacharya, 1995, *Installation Servicing and Maintenance*, S. Chand & Company Ltd., New Delhi – 110055, India. ISBN: 81-219-0831-0.

2. Sushil Kumar Srivastava, 1998, *Industrial Maintenance Management*, S. Chand & Company Ltd., New Delhi – 110055, India. ISBN: 81-219-1663-1.

3. Moubray, J., 1997, Reliability-centred Maintenance, Second Edition, Butterworth-Heincmann, Oxford OX2 8DP, MA OI801-2041, Great Britain.

## 12.11 EG856ME: PRODUCTION AND OPERATIONS MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

**Course description**

This course aims to provide a comprehensive treatment of the major aspects of Production and Operations management of systems or processes that create goods and/or provide services. The focus is on the planning, scheduling, use and control of a manufacturing or service organization. Both traditional and modern methods are presented, including state-of-the-art techniques for inventory management, Material Resource Planning (MRP), forecasting and Enterprise Resource Planning (ERP). Some aspects of plant layout and plant location and supply chain and value chain networks are also included in the course.

**Objective**

After the completion of this course the student will be able to:

- Initiate product design and process selection process, design of facilities and jobs, and managing the supply chain.
- Develop tools that will help managers and engineers to do preliminary design of material resource planning, enterprise resource planning, inventory planning and forecasting.
- Understand the concept of supply and value chain networks in organizations.

**Course outline**

Elements of manufacturing and service production systems; production control, coordination of material and information flow, techniques for the design and implementation of distribution and supply chain and value chain networks, and how they relate to manufacturing and service production systems; inventory management, resource and capacity planning, material planning, forecasting and scheduling and plant location and layout; enterprise Resource Planning (ERP).

**References**


1. Operations Management,
   Prof Nigel Slack , Dr Stuart Chambers and Robert Johnston
2. Production and Operations Management:
   Manufacturing and Services, Richard B. Chase. McGraw-Hill. 1998
3 Production and Operations Management
   Joseph S. Martinich. Irwin Professional Publishing. 7th edition 1995
4 Production and Operations Management.
   Prof. Pushkar Bajracharya, Dr. Subarna L. Bayracharya and Buddha Ratna Maharjan. Quest Publibation (2007), Nepal.
5 Production Planning and Control: Text and cases
   S.K Mukhopadhayay, 2007, 2nd Edition, Prentice-Hall, New Delhi.

## 12.12 EG857ME: PROJECT MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: A

**Course description**
The approach of this course is to present the subject of Project Management as the planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve the project objectives on time and to specified cost, quality and performance. The course will also deliberate on the project management body of knowledge that can be readily utilized for storage and retrieval of all elements of project management, i.e. functions, processes, activities, tools and techniques. Network analysis tools and techniques will also be introduced in the course.

**Objective**

After the completion of this course the student will be able to:

- Understand what project management is, what it does and how it works.
- Plan, organize, direct and control activities in addition to motivating what is usually the most expensive resource on the project – people.
- Understand project management within the context of a life cycle and systems approach.

**Course outline**
Tools and techniques for project definition, work breakdown, estimating, resource planning, critical path development, scheduling, project monitoring and control, time management, conflicts, cost and resource control and tradeoff analysis, and scope management. These tools will be presented within the context of a life cycle and a systems approach. Responsibilities, skills and effective leadership styles of an effective and efficient project manager. Labor laws and role of labor union.

**References**

1. Andersen, E.S., Grude, K.V., and Turner, J.R. *Goal Directed Project management,* Kogan Page, 1987.
2. Baguley, Philip. Managing Successful Projects: *A Guide for Every Manager.* Pitman Publishing, London, 2008.
3. Kor, R and Wijnen, G. *50 Checklists for Project and Programme Managers.* Gower Publishing Limited, Hampshire, England, 2000.
4. Mayor, H. *Project management*. Financial Times, Pitman Publishing, London, 1999.
5. Turner, J.R. *The Handbook of Project-Based Management.* McGraw Hill International (UK) Limited, Berkshire, England, 1999.


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## 12.13 ELECTIVE (D-1)

Lecture: 3 h
Tutorial: 1 h

Year: I
Part: B

These are the electives offered in various master's program in the Departments of Pulchowk Campus. The student can choose, in consultation with his/her tutor/supervisor one elective related to his research work from the existing elective courses.

## 12.14 EG901ME: STRATEGIC MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: II
Part: A

**Course description**

Strategic management is one of the most exciting of all the management disciplines. It is about success and failure and about to plan wars and win in a competitive environment. Effective strategic management can transform the performance of an organization, increase shareholders' value, or change the structure of an industry, whereas ineffective strategic management can bankrupt companies and ruin the careers of chief executives. It is the formal and structured process by which an organization establishes a position of strategic leadership over its competitors.

It is essential not only for the chief executives but also equally important for executives and managers aspiring to climb the professional ladder. It instills the habit of reaching an identified goal by developing the necessary competence and seizing the available opportunities.

Core disciplines such as financial management, marketing management and operations management will be essential as prerequisite for this course.

**Objectives**

The course will provide the following knowledge to students:

- Familiarizing different strategic management principles
- Combining the best of the accepted theories in the subject with pragmatic viewpoints
- Providing an intellectual framework for the study and application of strategic management
- Making students able to apply a robust strategy making process taking into account of constant stream of new ideas and innovative opportunities
- Providing students an array of different concepts of strategic leaders so as to make them conversant with how the successful business leaders used innovative ideas to transform the business enterprises

**Outline of course**

Introduction to strategy and strategic management; business environment and its diversity; strategy formulation process; strategic intent; strategic assessment and principles; strategic choices; strategy content – business strategies and corporate strategy; strategy implementation process; strategic transformation

**Reference**

1. Macmillan, Hugh and Mahen Tampoe, 2000. Strategic management. Oxford University Press Inc., New York, USA
2. Several journal papers of reputed authors on strategy such as Henry Mintzberg, C.K. Prahlad, Sumantra Ghosal and Gary Hammel, Michael Porter, Ram Charan and etc. Published in Harvard Business Review.

**Readings**

A) Collins, Jim, 2001. Good to great. Harpercollins Publishers, New York, USA.
B) Welch, Jack and Suzy Welch, 2005. Harpercollins Publishers, London, UK.
C) Louis v. Gerstner, Jr., 2002. Who says elephants can't dance? Harper Business, USA.

## 12.15 EG902ME: DIRECTED STUDY

Lecture: 2 h | Year: II
Tutorial: | Part: A

The course is designed by the supervisor to meet the specific requirement of research of individual student. The purpose of a directed study is to give a student the opportunity to conduct research in an area of interest to him/her under the supervision of a faculty member. It will help him/her to pursue the subject matter of interest in more depth and will have an opportunity to work with a professor and study the issue or subject matter more fully than may be possible in a regular course. By taking this course the student can learn how to conduct research, use various research methodologies and arrive at meaningful conclusions.

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## 12.16 EG903ME: GROUP PROJECT - II

Lecture: 2 h | Year: II
Tutorial: | Part: A

The purpose of the group project is to provide an opportunity for the group of student to investigate, analyze and is possible provide solution to an existing industrial/business problem. The group project must be completed in the allocated term. The group project may be done in small groups (2-3 students per group).

## ELECTIVE (TIM-2)

### 12.17 EG904ME: ENERGY PLANNING AND MODELING

Lecture: 3 h
Tutorial: 1 h

Year: II
Part: A

**Course description**
The essence of energy planning as opposed to the more traditional sectoral planning activities – electric sector planning, refinery and petroleum sector planning, or industrial development planning – lies in the comprehensiveness of analysis; in the understanding of inter-fuel substitution; in the understanding of the interaction of energy with economic development and environmental externalities. Energy systems analysis covers the quantitative treatment of such problems. It rests on the integration of a number of disciplines such as economics, engineering, and mathematics into a coherent analytical framework.

This course tries to familiarize the students with different modeling frameworks used in energy planning and policy analysis and helps them develop the energy planning modeling framework using the prevalent modeling frameworks such as MAED, MARKAL, LEAP etc.

**Objectives**
The course will provide the following knowledge to students to:

- To familiarize with energy planning and modeling concepts such as energy balance, energy demand and energy supply
- To provide and review mathematical fundamentals such as matrix algebra, econometrics, linear programming concepts
- To expose students to different modeling framework for energy planning and systems analysis and develop a modeling framework for energy planning and policy analysis

**Outline of course**
Energy balance, energy demand and supply; energy systems analysis; a framework for national energy planning; knowledge on mathematical fundamentals on econometrics and optimization; familiarization with econometric models, input-output models; use of energy systems modeling framework such as LEAP, MAED, MARKAL, MESSAGE etc.

**Reference**

1. Meier, Peter, 1984. Lecture notes in economics and mathematical systems. Energy Systems Analysis for Developing Countries. Springer- Verlag, Berlin-Heidelberg, Heidelberg.
2. Munasinghe, Mohan and Peter Meier, 1993. Energy policy analysis and modeling. Cambridge University Press, New York, USA.


**Reading**
Several journal papers in energy economics, energy, and energy policy; and other relevant papers of World Bank and the Asian Development Bank

## 12.18 EG905ME: INDUSTRIAL CONTROL SYSTEM

Lecture: 3 h
Tutorial: 1 h
Practical: 1.5 h

Year: II
Part: A

**Course description**

This course introduces the fundamentals of control system components and operation. It will also deal with automation and applications of control systems in practice emphasizing the modern control technology in industry.

**Objectives**

Upon completion of this course the student will be able to:

- identify the various components of control system
- rectify their problems
- perform the repair and maintenance of these components

**Course outlines**

Sensors and transducers; Control system actuators; Op amps and signal conditioning; Switching devices; PID controllers; Relay logic and programming logic controllers; Servomechanism; Machine tool control; Introduction to computerized control.
This course will go along with hardware and simulation laboratories works as well.

**Reference**

1. K. Ogata, Modern Control engineering, Prentice Hall, Englewood cliffs, New Jersey

## 12.19 EG906ME: RELIABILITY AND RISK MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: II
Part: A

**Course description**

The management of technology and innovation involve methodologies on reliability and probabilistic risk assessment, which pertain to decision making in the presence of significant uncertainty. The issues of concern are: the risks associated with large engineering projects and critical infrastructures; the development of new products; the design of processes and operations with environmental externalities; and infrastructure renewal projects.

**Objectives**

Upon completion of this course the student will be able to:

- Demonstrate knowledge of history of risk analysis in various industries
- Demonstrate knowledge of probabilistic distributions for rare events
- Conduct fault tree and event tree analysis and analyze data from dependent failures
- Solicit and use expert opinions where objective data are not available
- Quantify human reliability and relationship between failure and complexity of the system
- Model uncertainty and measure risks in industry and technology
- Create influence diagrams and estimate expected cost of an adverse outcome
- Demonstrate knowledge of reliability and risk of a system

**Course outline**

Reliability concept: reliability function, failure rate, mean time between failures, mean time to failure, a priori and a posteriori concept, mortality curve, useful life availability, maintainability, system effectiveness.
Reliability data analysis: time to failure distributions, exponential, normal, gamma, Weibull, ranking of data, probability plotting techniques, hazard plotting.
Reliability prediction models: series and parallel systems, reliability based design approach, standby systems, application of Baye's theorem, cut and tie set method, Markov analysis, fault tree analysis, limitations.
Reliability management: reliability testing, reliability growth monitoring, non parametric methods, reliability and life cycle costs, reliability allocation, replacement mode, reliability methods.
Risk assessment: definition and measurement of risk, elements of risk assessment, analysis techniques, risk reduction resources, industrial safety and risk assessment.

**References**


1. Modarres, "Reliability and Risk Analysis ", Mara Dekker Inc., 1993.
2. John Davidson, "The Reliability Of Mechanical System ", Published by the Institution of Mechanical Engineers, London, 1988.
3. Smith C.O." Introduction to Reliability in Design ", McGraw Hill, London, 1976.

## 12.20 EG907ME: TOTAL QUALITY MANAGEMENT

Lecture: 3 h
Tutorial: 1 h

Year: II
Part: A

**Course description**

In recent years, quality has gone to the top of the management agenda. However, the quality revolution is not yet won - it is threatened by unacceptably high costs in implementing systems. These costs can be rationalized by adopting more systematic approaches to the design of total quality processes and systems. This course presents a systematic method encompassing the basic principles of total quality management. This course aims to provide a comprehensive treatment of the major aspects of using various tools and techniques for total quality control and improvement. Both traditional and modern methods are presented, including state-of-the-art techniques for statistical process monitoring and control, and statistically designed experiments for process characterization, optimization, and process robustness studies. Some aspects of quality management are also included, such as the six-sigma approach.

**Objectives**

After the completion of this course the student will be able to:

- Understand the meaning of quality in its totality and context and also look at its nature, characteristics and variety.
- Develop and apply tools and techniques to achieving quality and process improvement through the use of Quality Function Deployment, statistical process control, flowcharting, Pareto analysis and fishbone diagramming, process capability and process capability indices, design of experiments, six sigma and Taguchi methods.

**Course outline**

Principles and techniques of total quality management (TQM) with emphasis on their application to manufacturing and service organizations. TQM modeling and strategy. Quality function deployment, Design for cost, and cost of quality. Quality assurance and customer satisfaction related to TQM. Methodology and techniques of continuous process improvement. Six Sigma. Study and application of statistical tools and techniques for defining, monitoring and improving quality of products, processes and services: statistical control charts, process capability analysis, acceptance sampling of variables and attributes, application of design-of-experiments for product and process optimization, Taguchi methods.

**Reference**


1. L. Suganthi and Anand A. Samuel . Total Quality Management. Prentice-Hall of India Pvt.Ltd, 2004
2. Berry, Thomas H. Managing the Total Quality Transformation. New York, McGraw-Hill, 1991.
3. Capezio, Peter and Morehouse, Debra. Taking the Mystery Out of TQM: A Practical Guide to Total Quality Management. Hawthorne, NJ, Career Press, 1993.
4. Gitlow, Howard S. The Deming Guide to Quality and Competitive Position. Englewood Cliffs, NJ, Prentice-Hall, 1987.
5. Mahoney, Francis Xavier. The TQM Trilogy: Using ISO 9000, the Deming Prize, and the Baldrige Award to Establish a System for Total Quality Management. New York, American Management Association, 1994.
6. Miller, William C. Quantum Quality: Quality Improvement through Innovation, Learning, and Creativity. New York, AMACOM, 1993.

7. Ross, Joel E. Total Quality Management: Text, Cases, and Readings. Delray Beach, FL, St Lucie Press, 1993.
8. Juran, J.M. Juran on leadership for Quality. Free Press, 2005
9. Relyea, Douglas B. The practical Application of the Process Capability Study: Evolving from Product control to Process control. Productivity Press, 2009.

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## 12.21 ELECTIVE (D-2)

Lecture: 3 h
Tutorial: 1 h

Year: II
Part: A

These are the electives offered in various master's program in the Departments of Pulchowk Campus. The student can choose in consultation with his/her tutor/supervisor one elective related to his research work from the existing elective courses.

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## 12.22 EG951ME: MASTER THESIS (16 CREDIT)

Lecture: x h
Tutorial: x h

Year: II
Part: B

**Annex: List of electives offered in various MSc. program (Departmental Electives)**

**(1) M,Sc. in Environmental Engineering:**

| Course Code | Course Title | Credit |
|---|---|---|
| EG 816 CE | Modelling in Environmental Engineering | 4 |
| EG 862 CE | Water Quality Management | 4 |
| EG 863 CE | Air and Noise Pollution Fundamentals | 4 |
| EG 815 CE | Solid Waste Management | 4 |
| EG 912 CE | Advanced Water and Wastewater Treatment Processes | 4 |
| EG 865 CE | Industrial Wastewater Treatment | 4 |
| EG 913 CE | Resource Reuse Technology | 4 |
| EG 962 CE | Directed Studies | 2 |

**(2) M,Sc. in Structural Engineering:**

| Course Code | Course Title | Credit |
|---|---|---|
| EG 805 CE | Computer Aided Design | 4 |
| EG 806 CE | Construction Methods and Management | 4 |
| EG 854 CE | Design of Industrial Structures | 4 |
| EG 855 CE | Functional Planning and Building Services | 4 |
| EG 856 CE | Application of FEM in Structural Engineering | 4 |
| EG 901 CE | Rock Slope Engineering | 4 |
| EG 902 CE | Design of Bridges | 4 |

**(4) M,Sc. in Urban Planning:**

| Course Code | Course Title | Credit |
|---|---|---|
| **Second Semester :** | | |
| | Ecology and Resource Dev. | 1 |
| | Landscape Design | 1 |
| **Third Semester :** | | |
| | Urban Informal Sector | 1 |
| | Housing | 1 |
| **Fourth Semester :** | | |
| | Urban Dev. Management | 1 |
| | Urban Eco Management | 1 |
| | Urban Land Management | 1 |
| | Urban Fringe Management | 1 |
| | | |

**(5). M,Sc. in Renewable Energy Engineering :**

| Course Code | Course Title | Credit |
|---|---|---|
| **Elective A :** | | |
| EG 902 ME | Solar Thermal Technology | 4 |
| EG 903 EX | Solar PV Technology | |
| EG 904 ES | MIcro-hydro | |
| EG 905 ES | Bio gas Technology | |
| EG 906 ES | Bio fuel Technology | |
| EG 907 ES | Wood Energy Technology | |
| EG 908 ES | Wind Energy Technology | |
| EG 909 ES | New Renewable Energy Technologies (NRETs) | |
| EG 915 ES | Environmental Impacts and Climate Change | |
| **Elective B :** | | |
| EG 910 ES | Energy Planning and Management | 4 |
| EG 911 ES | Energy Auditing, Analysis and Conservation | |
| EG 912 ES | System Integration | |
| EG 914 ME | Design and Manufacturing | |

**(6). M,Sc. in Power System Engineering:**

| Course Code | Course Title | Credit |
|---|---|---|
| **A. CORE ELECTIVE COURSES :** | | |
| EG 871 EE / EG 921 EE | High Voltage DC Transmission Line (X) | 4 |
| EG 872 EE / EG 922 EE | Flexible AC Transmission System (*) | 4 |
| EG 873 EE / EG 923 EE | Power Electronics and Drives (*) | 4 |
| EG 874 EE / EG 924 EE | Advanced Switchgear and Protection (X) | 4 |
| EG 875 EE / EG 925 EE | Renewable Energy Technology (X) | 4 |
| EG 876 EE / EG 926 EE | Power System Communication (X) | 4 |
| EG 877 EE / EG 927 EE | Power System Reliability (X) | 4 |
| EG 878 EE / EG 928 EE | Extra High Voltage AC Transmission Line(*) | 4 |
| EG 879 EE / EG 929 EE | Electric Utility Management(*) | 4 |
| EG 881 EE / EG 880 EE | Project Appraisal Techniques(*) | |
| EG | Power System Operation Under Restructured Environment (*) | |
| **B. OPEN ELECTIVE COURSES :** | | |
| EG 922 CE | Water Resources Planning & Management | 4 |
| EG 910 ES | Energy Planning and Management | 4 |
| EG 911 ES | Energy Auditing, Analysis and Conservation | 4 |
| EG 903 ES | Solar PV Technology | 4 |
| EG 904 IC | Neural Network | 4 |
| EG 931 EE / EG 930 EE | Artificial Intelligences | |

Tribhuvan University
Institute of Engineering
Centre for Applied Research and Development (CARD)

च.नं. ११३

मिति : २०६७।११।२३

श्रीमान् अध्यक्षज्यू,
मेकानिकल विषय समिति,
इ.अ.सं., डीनको कार्यालय,
पुल्चोक ।

विषय :- पाठ्यक्रम परिमार्जन गरिएको बारे ।

उपरोक्त विषयमा M.Sc. TIM कार्यक्रम मेकानिकल इन्जिनियरिङ्ग विभाग अन्तर्गत सुचारु रुपले संचालन गर्न गठित Core Group को मिति २०६७।११।१९ मा बसेको बैठकको निर्णयानुसार M.Sc. (TIM) को Elective TIM – I मा संचालन गरिने EG857ME - Project Management विषय Elective TIM – II मा राखी संचालन गराउने र Elective TIM - II मा संचालन गरिने EG906ME - Reliability & Risk Management विषय Elective TIM - I मा राखी संचालन गराउने र तिनीहरुको हालको Code No. लाई निम्नलिखित अनुसार नयाँ Code No. मा परिमार्जन गर्ने निर्णय गरिएकोले सोही अनुसार अध्यापन कार्य भइरहेको हुँदा आवश्यक कार्यार्थ जानकारीको लागि अनुरोध गर्दछु ।

| हालको Code No. | विषय | परिमार्जन गर्ने नयाँ Code No. |
|---|---|---|
| EG857ME | Project Management | EG906ME |
| EG906ME | Reliability & Risk Managament | EG857ME |

( प्रा.डा. भक्त बहादुर आले )
निर्देशक

बोधार्थ तथा कार्यार्थ :

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