ECO 411 Engineering Economics (3-2-0)

Evaluation:

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

Course Objective:

After completing this course, students will be able to

- understand and describe the basic concept of economics, engineering economics, cost accounting and time value of money,
- assist in the valuation of engineering projects in the public and private sector to take investment decisions,
- analyze the project risk and understand the concept of ecological limit and economic development,
- calculate depreciation, taxation and its application in analysis and
- identify different financing options and general accounting procedures.

Course Contents:

1. **Basics of Engineering Economics** **(3 hrs)**
   - 1.1. Definition of Economics, Demand, the Law of Demand, Law of Diminishing Utility, Marginal Utility, Supply, Law of Supply, Law of Supply and Demand
   - 1.2. Engineering Economics, Principles of Engineering Economy and its application

2. **Cost Concept and Fundamentals of Cost Accounting** **(3 hrs)**
   - 2.1. Cost Terminology: Manufacturing Cost and Non-Manufacturing Cost
   - 2.2. Cost for Business Decision: Differential Cost and Revenue; Opportunity Cost,Sunk Cost and Marginal Cost

3. **Time Value of Money** **(4 hrs)**
   - 3.1. Interest, Simple Interest, Compound Interest, Nominal Rate of Interest, Effective Rate of Interest
   - 3.2. Economic Equivalence: Present Worth, Future Worth and Annual Worth
   - 3.3. Development of Formulas for Equivalence Calculation

4. **Basic Methods of Engineering Economic Studies** **(7 hrs)**
   - 4.1. Minimum Attractive Rate of Return - MARR
   - 4.2. Payback Period Method – Simple and Discounted
   - 4.3. Equivalent Worth Methods; Present Worth Method, Future Worth Method and Annual Worth Method
   - 4.4. Rate of Return Methods: Internal Rate of Return (IRR) MethodandExternal/Modified Rate of Return(ERR/MIRR) Method
   - 4.5. Benefit Cost Ratio Method

5. **Comparative Analysis of Alternatives** **(6 hrs)**
   - 5.1. Comparing Mutually Exclusive Alternatives having Same useful life by Payback Period Method, Equivalent Worth Method; Rate of Return Methods and Benefit Cost Ratio Method
   - 5.2. Comparing Mutually Exclusive Alternatives having different useful lives byRepeatability Assumption, Co-terminated Assumption, Capitalized Worth Method

6. Risk Analysis (4 hrs)

6.1. Origin/Sources of Project Risks.

6.2. Methods of Describing Project Risks; Sensitivity Analysis, Breakeven Analysis, Scenario Analysis

7. Ecological Limits and Economic Development (3 hrs)

7.1. Economic Theory and Ecological Limit,

7.2. Concept of sustainable development,

7.3. Ecological Footprint and

7.4. Overcoming Ecological Limits

8. Depreciation and Corporate Income Taxes (5 hrs)

8.1. Depreciation and its causes, Asset Depreciation and Accounting Depreciation

8.2. Basic Methods of Depreciation; Straight line method, Declining Balance Method, Sinking Fund Method, Sum of the Year Digit Method, Unit of Production Method, Modified Accelerated Cost Recovery System (MACRS)

8.3. Introduction to Corporate Income Tax. Taxation Law, Depreciation Rates Personal Tax, Corporate Tax, VAT

8.4. After Tax Cash flow Estimate, General Procedure for Making After Tax Economic Analysis

9. Enterprise Financing and Capital Investment (4 hrs)

9.1. Method of Financing: Equity Financing, Debt Financing and Capital Structure

9.2. Cost of Capital: Cost of Equity, Cost of Debt and calculating cost of capital

9.3. Project Funding Mechanism: Government budget, Public Private Partnership and Private Investment

9.4. FIRR, EIRR and Return on Equity

10. Basic Accounting Procedure (6 hrs)

10.1. Accounting Terminologies; Asset and liabilities: Fundamental equation of accounting

10.2. Financial statements: The Balance Sheet, Income Statement and Cashflow Statements

10.3. Using Ratios to make Decisions: Debt Ratio, Current Ratio, Quick Ratio – Acid Test Ratio, Inventory Turnover Ratio, Total Asset Turnover, Profit Margin on Sales, Return on Total Assets, Price Earnings Ratio and Book Value per Share

Tutorials:

Two assignments and 1 case study.

Text Book:

1. Chan S. Park. *Contemporary Engineering Economics*.PHI Learning Private Limited.

References:

1. E. Paul De Garmo, William G. Sullivan and James A. Bontadelli. *Engineering Economy*. MC Milan Publishing Company.
2. James L. Riggs, David D.Bedworth and Sabah U. Randhawa.*Engineering Economics*. Tata MCGraw Hill Education Private Limited.
3. N.N. Borish and S. Kaplan.*Economic Analysis for Engineering and Managerial Decision Making*. MC Gran Hill Publishing Company.
4. Adhikari, D.*Principle's of Engineering Economic Analysis*.Nepal: Global Publication.
5. SenGupta, Ramprasad.*Ecological Limits and Economic Development*.Oxford University Press.

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CMM 420 Mobile and Wireless Communication (3 – 1 – 0)

Evaluation:

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

Course Objectives:

- To provide overall knowledge of wireless communication systems and technologies.
- To be able to design basic wireless communication systems

Course Contents:

1. Introduction **(4 hrs)**

1.1 Definition, advantages and disadvantages of Wireless Communication System
1.3 Evolution of Mobile Radio Communications (1G to 4G and beyond)
1.4 Wireless Systems and comparisons (CDMA, GSM & DECT)

2. Principles of Cellular Concept **(6 hrs)**

2.1 Introduction to Cellular Terminology
2.2 Cell structure and Cluster
2.3 Frequency Re-use , Planning, Spectrum Utilization and Channel Assignment Strategies
2.5 Handoff Strategies, types and practical considerations
2.6 Interference and System Capacity
2.7 Trunking and Grade of Service (GOS)
2.8 Improving Capacity and Coverage in Cellular System

3. Mobile Radio Propagation **(8 hrs)**

3.1 Introduction to Radio Wave Propagation
3.2 Large scale path loss
  3.2.1 Concept of Free Space Propagation Model
  3.2.2 The Three Basic Propagation Mechanism (Concept of Reflection, Diffraction & Scattering)
  3.2.3 Link Budget Design
  3.2.4 Indoor Propagation Models (partition loss, log-distance model, multi breakpoint model & attenuation factor model)
  3.2.5 Outdoor Propagation Models (Okumura, Hata Model & Longley-Rice)
3.3 Small Scale fading and multipath
  3.3.1 Parameters of Mobile Multipath Channel (time dispersive, Coherent bandwidth, Doppler spread and Coherent time)
  3.3.2 Types of Small Scale Fading (flat, frequency selective, fast and slow)
  3.3.3 Rayleigh and Ricean fading distribution

4. Modulation Technique, Channel and Speech Coding **(10 hrs)**

4.1 Review of Modulation Technique (Analog and Digital Modulation)

4.1.1 Linear Modulation Technique (BPSK, DPSK, QPSK's)
4.1.2 Non linear Modulation Techniques (BFSK, MSK, GMSK)
4.2 Spread Spectrum Modulation Technique (direct sequence and frequency hopped)
4.3 Orthogonal Frequency Division Multiplexing (OFDM)
4.4 Concept of Channel coding
4.4.1 Review of Block, Cyclic, Convolutional, Hamming, Hadamard
4.5 Characteristics of speech signal and its significance
4.6 Significance of Vocoders and its types (Channel, Formant, Linear predictive coders)
4.7 The GSM Codec

5. Equalization and Diversity **(4 hrs)**

5.1 Introduction and Fundamental of Equalization
5.2 Linear and Non linear equalizers
5.2 Introduction to Diversity and its Technique
5.3 RAKE Receiver
5.4 Interleaving

6. Multiple Access in Wireless Communications **(4 hrs)**

6.1 Review of Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), principle and applications
6.2 Spread Spectrum Multiple Access (SSMA) principle and applications
6.2.1 Frequency Hopped Multiple Access (FHMA)
6.2.2 Direct Sequence Multiple Access (eg. CDMA)
6.3 Space Division Multiple Access (SDMA)
6.4 Hybrid Spread Spectrum Multiple Access Techniques

7. Wireless System and Standards **(9 hrs)**

7.1 Global System for Mobile (GSM): Service and Feature, System and Architecture. Example of GSM Call
7.2 Code Division Multiple Access (CDMA): Frequency and Channel Specifications. Forward CDMA Channel, Reverse CDMA Channel
7.3 Recent development (Compare Global trends with that of Nepal)
7.4 Basic Overview of DECT, WLAN, WiFi, WiMAX, LTE
7.5 Overview of Mobile Operating System(e.g. Android, iOS)

Practical:

Case Study (Mobile service operation, Network service operation, Internet Service Operation)

Text Books:

1. *Wireless Communications Principles and Practice*, Theodore S Rappaport
2. *Modern Wireless Communications*, Simon Haykin & Michael Moher, Pearson Education, 2007.

Reference Books:

1. *Wireless Communications*, Andreas. F. Molisch, John Wiley.
2. *Mobile Communication*, J. Schiller.

3. *Wireless Communications and Networks*, William Stallings, Pearson Education Asia.
4. *Modern Digital and Analog Communication System*, B. P. Lathi.
5. *Digital Communication system*, J. Proakis.
6. *Mobile Phone Operating Systems*, By Books Llc

CMP 484 Social & Professional Issues in IT (2 – 1 – 0)

Evaluation:

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

Course Objectives:

The objective of this course is to provide the knowledge to handle social, professional and leg issues that arise in the professional working environment.

Course Contents:

1. History of Computing **4 hrs**

- 1.1. Prehistory of Computing
- 1.2. History of Computer Hardware
- 1.3. History of Software: Programming Languages and Operating Systems
- 1.4. History of Networking
- 1.5. Pioneers of Computing

2. Social Context of Computing **5 hrs**

- 2.1. Society and Technology
  - 2.1.1. Impact of Technology on Society and Vice Versa
  - 2.1.2. Using Technology for Poverty Alleviation
  - 2.1.3. Health Related Issues for an IT Professional
- 2.2. Internet and Society
  - 2.2.1. Digital Divide and Bridging the Digital Divide
  - 2.2.2. Governance of Internet
- 2.3. E-Governance and E-Government Systems

3. Computer Ethics and Ethical Theories **3 hrs**

- 3.1. Philosophical and Professional Ethics
- 3.2. Moral and Legal Issues
- 3.3. Descriptive and Normative Claims
- 3.4. Ethical Relativism
- 3.5. Utilitarianism and Deontological Theories
- 3.6. Rights

4. Professional Ethics **3 hrs**

- 4.1. Profession
  - 4.1.1. Job and Occupation
  - 4.1.2. Characteristics of Profession
  - 4.1.3. Engineering and Computing as a Profession
- 4.2. Professional Responsibilities and Rights

4.2.1. Conflict of Interests and Whistleblowing
4.2. Professional Code of Ethics
4.3. Code of Ethics of Nepal Engineering Council
4.3.1. Code of Ethics of IEEE and ACM
4.3.2. Hacker Ethics and Netiquette
4.4.

5. Risk and Responsibilities **3 hrs**

5.1. Computer Liability
5.1.1. Malfunction of Computers
5.1.2. Safety in Critical Systems
5.1.3. Accuracy vs. Democracy in Internet
5.1.4. Misinterpretation of Information and its Liability
5.2. Values in Design
5.2.1. Software and Design Problems
5.2.2. Hardware Design Issue
5.2.3. Elimination of Hardware
5.3. Professional Responsibilities of Computer Users
5.3.1. Responsibility and Accountability

6. Privacy **3 hrs**

6.1. Privacy and its Value
6.2. Privacy Risks
6.2.1. Government Information
6.2.2. Consumer Information
6.3. Privacy of Consumer Information
6.3.1. Databases and Personal Records
6.3.2. E-mail Privacy
6.3.3. Web Privacy
6.4. Protecting Privacy
6.5. Offensive Speech and Censorship in Cyberspace
6.6. Anonymity

7. Computer and Cyber Crimes **4 hrs**

7.1. Introduction to Computer Crime and Cyber Crime
7.2. Types of Computer Crimes
7.2.1. Traditional Computer Crimes and Software Piracy
7.2.2. Computer Frauds and Digital Forgery
7.2.3. Phishing
7.2.4. Unauthorized Access: Hacking, cracking
7.2.5. Denial of Service
7.2.6. Computer Invasion of Privacy
7.2.7. Harmful Content Crime
7.2.8. Online Pornography
7.2.9. Online Harassment
7.2.10. Cyber Stalking and Online Scams
7.2.11. Spams

7.2.12. Malicious Programs: Viruses, Worms, Trojan Horses
7.2.13. Cyber Terrorism
7.3. Introduction to Digital Forensics

8. Intellectual Property and Legal Issues **5 hrs**

8.1. Intellectual Properties
8.1.1. Copyright
8.1.2. Patent
8.1.3. Design
8.1.4. Trademark
8.1.5. Trade-secrets
8.1.6. IPR in Nepal: "Copyright Act", and "Patent, Design and Trademark Act"
8.2. IT Related Laws in Nepal
8.2.1. IT Policy of Nepal
8.2.2. Right to Information Act
8.2.3. Electronics Transaction Act and Rules
8.2.4. Secure Password Practices Issued by GoN

Text Books:

1. Johnson, D. G., *Computer Ethics*, Pearson Education Asia, Third Edition, 2001, ISBN: 7808-306-X.
2. IT Policies, Laws and Acts of the Government of Nepal. Available www.lawcommission.gov.np and www.cca.gov.np

Reference Books:

1. Hussain, K. M., and Hussain, D. S., *Computers; Technology, Applications, and Soc Implications*, PHI, New Delhi, ISBN: 81-203-0620-1.
2. Sara Baase, *A Gift of Fire: Social, Legal, and Ethical Issues for Computers and t Internet*, latest Edition, Prentice Hall
3. Articles collected from various Journals and Periodicals, such as IEEE-Computer, BYT ACM Periodicals, etc.
4. IT Policies and Laws of the local government
5. International IT Policies and Laws (Source: ISO, SEI, IEEE, etc.)