Tribhuvan University

Institute of Science and Technology

School of Mathematical Sciences

Bachelor in Mathematical Sciences (BMathSc)

Course of Study

Code No.: MSMT 101 *Full Mark*: 75

Paper: Calculus with Analytic Geometry I *Pass Mark*: 30

Nature: Theory and Lab. work *Credit*: 3

Course Description:

This course begins with a revisit to the concepts of limits, differentiation and integration of algebraic, trigonometric and transcendental functions, L'Hospital's rule, and Newton's method studied in + 2 mathematics and is followed by a comprehensive treatment of applications of differentiation and integration.

Objectives

Learning Objectives:

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

- Define precisely a limit and continuity
- Evaluate a limit at infinity and use it to locate horizontal asymptotes
- Find derivatives.
- Use L'Hospital rule.
- Solve nonlinear equations by Newton's method.
- Solve Growth and Decay problems.
- Use differential approximation.
- Use the methods of calculus to analyze the qualitative behavior of graphs of two-dimensional functions at the mastery level.
- Construct and solve an integral to determine the area between two curves.
- Construct and solve an integral to determine the volume of a solid of revolution using the Disk and Shell Methods.
- Construct and solve an integral to determine arc length and the area of a surface of revolution.
- Solve applications of integration problems involving work, moments and centers of mass, and fluid force.

Mode of Delivery:

The course will be taught by lecture, class discussion. In some cases the use of spreadsheet software for problem solving and computers/laptops will be encouraged. The medium of instruction will be English.

Contents:

Unit 1 Limits and Continuity 7 hr

Limit, Continuity, Limits at Infinity, Horizontal Asymptotes.

Unit 2 Derivatives 9 hr

Derivatives and Rates of Change, The Derivative as a Function, Derivatives of Polynomials and Exponential Functions, The Product and Quotient Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Derivatives of Logarithmic Functions, Hyperbolic Functions

Unit 3 Application of Derivatives 12 hr

Rates of Change in the Natural and Social Sciences, Exponential Growth and Decay Related Rates Linear Approximations and Differentials,
Maximum and Minimum Values, The Mean Value Theorem How Derivatives Affect the Shape of a Graph , Limits at Infinity; Horizontal Asymptotes, Summary of Curve Sketching, Optimization Problems, Newton's Method

Unit 4 Integrals (revisit) 10 hr

Antiderivatives, Areas and Distances, The Definite Integral , The Fundamental Theorem of Calculus, Indefinite Integrals and the Net Change Theorem, The Substitution Rule

Unit 5 Application of Integrals 10 hr

Areas Between Curves, Volumes , Volumes by Cylindrical Shells, Work, Average Value of a Function

Text Book:

1. *Calculus – Early Transcendental Functions,* 7th edition, J. Stewart, Thomson Brooks/Cole

Reference Books:

1. *Calculus: Early Transcendental Functions*, Larson, et al, Houghton Mifflin, 2011
2. *Calculus* : *a complete course*, Robert A. Adams, Christopher Essex. Pearson, 2010

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Course of Study

Code No.: MSEN 101 *Full Mark*: 75

Paper: Communication skill I *Pass Mark*: 30

Nature of the course: Theory *Credit*: 3

Module Objectives

This module aims to develop students' skill in oral and written communication in English language.

Contents

Intensive practice to improve listening comprehension for both daily and academic needs: the focus shall be on development of active listening habit and utilizing oral information in a variety of contexts. Grammatical and structural review of English: review of standard grammatical forms and their application in a variety of writing formats. Development of reading comprehension proficiency.

Detailed Course

Unit 1: Poems **7 hr**

- Piano
- Great Scott! Gadzooks!
- On the Eve of His Execution
- Stopping by Woods on a Snowy Evening
- Where the Mind Is Without Fear

Unit 2: Short Stories **14 hr**

- Yudhisthira's Wisdom
- The Brave Little Parrot
- If Not Higher
- The Library Card
- Marriage is a Private Affair
- Who was to Blame?
- Third Thoughts
- Mr. Know-All
- The Telegram on the Table
- The Great Answer
- A Tale

Unit 3: Essays **10 hr**

- Why Go to University?
- Curbing the One-eyed Monster
- How Sane Are We?
- The Burden of Skepticism
- Keeping Errors at Bay
- We Are Breaking the Silence about Death

- The Savage Male

Unit 4: Technical Writing **6 hr**

- Chapter – 18 – Grammar, Punctuation, Mechanics and Spelling

Unit 5: Daily English Newspapers **8 hr**

References

1. ***Joys of Reading,*** Compiled & edited by Shreedhar Lohani and R. Adhikari, M.K. Publishers and Distributors.
2. ***Technical Writing,*** Gerson and Gerson (Unit II and IV), Pearson Education Inc.
3. ***Daily English Newspapers***

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Course of Study

Code No.: MSCS 101 *Full Mark*: 75

Paper: Fundamentals of Computer Science *Pass Mark*: 30

Nature: Theory and Lab. work *Credit*: 3

Course Description:

This course covers the basic concepts of computers and information technology including introduction, hardware, software, memory, input/output, data representation, database, networks and data communication, multimedia, and computer security.

Course Objective:

The main objective of this course is to provide students knowledge of fundamental concepts of computers and information technology.

Unit 1. Introduction to Computer [3 Hrs.]

Introduction; Digital and Analog Computers; Characteristics of Computer; History of Computer; Generations of Computer; Classification of Computer; The Computer System; Application of Computers

Unit 2. The Computer System Hardware [4 Hrs.]

Introduction; Central Processing Unit; Memory Unit; Instruction Format; Instruction Set; Instruction Cycle; Microprocessor; Interconnecting the Units of a Computer; Performance of a Computer; Inside a Computer Cabinet

Unit 3. Computer Memory [4 Hrs.]

Introduction; Memory Representation; Memory Hierarchy; CPU Registers; Cache Memory; Primary Memory; Secondary Memory; Access Types of Storage Devices; Magnetic Tape; Magnetic Disk; Optical Disk; Magneto-Optical Disk; Using the Computer Memory

Unit 4. Input and Output Devices [3 Hrs.]

Introduction; Input-Output Unit; Input Devices; Human Data Entry Devices; Source Data Entry Devices; Output Devices; I/O Port; Working of I/O System

Unit 5. Data Representation [6 Hrs.]

Introduction; Number System; Conversion from Decimal to Binary, Octal, Hexadecimal; Conversion of Binary, Octal, Hexadecimal to Decimal; Conversion of Binary to Octal,

Hexadecimal; Conversion of Octal, Hexadecimal to Binary; Binary Arithmetic; Signed and Unsigned Numbers; Binary Data Representation; Binary Coding Schemes; Logic Gates

Unit 6. Interaction of User and Computer [3 Hrs.]
Introduction; Types of Software; System Software; Application Software; Software Acquisition

Unit 7. Operating System [3 Hrs.]
Introduction; Objectives of Operating System; Types of OS; Functions of OS; Process Management; Memory Management; File Management; Device Management; Protection and Security; User Interface; Examples of Operating Systems

Unit 8. Data Communication and Computer Network [4 Hrs.]
Introduction; Importance of Networking; Data Transmission Media; Data Transmission Across Media; Data Transmission and Data Networking; Computer Network; Wireless Networking

Unit 9. The Internet and Internet Services [4 Hrs.]
Introduction; History of Internet; Internetworking Protocol; The Internet Architecture; Managing the Internet; Connecting to Internet; Internet Connections; Internet Address; Internet Services; Uses of Internet

Unit 10. Fundamentals of Database [5 Hrs.]
Introduction; Database; Database System; Database Management System; Database System Architectures; Database Applications

Unit 11. Multimedia [3 Hrs.]
Introduction; Multimedia: Definition; Characteristics of Multimedia System; Elements of Multimedia; Multimedia System; Multimedia Applications

Unit 12. Computer Security [6 Hrs.]
Introduction; Security Threat and Security Attack; Malicious Software; Hacking; Security Services; Security Mechanisms; Cryptography; Digital Signature; Firewall; Users Identification and Authentication; Other Security Measures; Security Awareness; Security Policy

Laboratory Work:
After completing this course, students should have practical knowledge of operating systems like DOS and Windows, Word Processors, Spreadsheets, Presentation Graphics, Database Management Systems, and Internet and its services.

Recommended Books:
1. Computer Fundamentals, Anita Goel, Pearson Education India, 2010
2. Computer Fundamental, Pradeep K. Sinha and Priti Sinha
3. fundamentals of computers, V. Rajaraman and Neeharika Adabala, Sixth Edition

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Course of Study

Code No.: MSCS 102 *Full Mark*: 75

Paper: Mathematics Software (MATLAB) *Pass Mark*: 30

Nature: Theory *Credit*: 3

Course Contents:

Simple Calculations with MATLAB, Writing Scripts and Functions, Loops and Conditional Statements, Root Finding, Interpolation and Extrapolation, Matrices, Numerical Integration.

Textbooks/Reference Books:

1. S.R. Otto and J.P. Denier: An Introduction to Programming and Numerical Methods in MATLAB, Springer-Verlag London Limited 2005.

2. Stormy Attaway: MATLAB A Practical Introduction to Programming and Problem Solving, Second edition, 2012 Elsevier Inc.

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Course of Study

Code No.: MSST 101 *Full Mark*: 75

Paper: Statistics & Data Analysis I *Pass Mark*: 30

Nature: Theory and Lab. work *Credit*: 3

Objectives:

The main objective of the course is to acquaint students with basic Statistics and elementary methods of data analysis techniques.

1 Introduction to Statistics (2)

Meaning of Statistics as a Science: Definitions, subdivisions of statistics: descriptive and inferential statistics, applied statistics; Importance of Statistics: In data analysis and decision making; Scope of Statistics: In physical, biological, actuarial, social, management and other sciences

2 Variable and Data (4)

Types of variables: Qualitative (attributes), quantitative, discrete and continuous variables, entities; Scales of measurement: Nominal scale, ordinal scale, interval scale, ratio scale; Types of data: Primary data, secondary data and their sources, cross-sectional data, time series data and panel data; Methods and problems of collecting primary and secondary data, advantages and disadvantages of primary and secondary data; population and sample data

3 Presentation of Data (12)

Organization of Data: Raw and processed data, data editing, coding and data management, data consistency and assessing quality of the data; Classification and tabulation : Raw data and its classification, discrete frequency distribution, construction of class interval (Sturge's rule),

continuous frequency distribution, inclusive and exclusive methods of classification, open end classes, cumulative frequency distribution and relative frequency distribution, tabulation, construction of bivariate frequency distribution; Diagrammatic presentation: Simple bar diagram, multiple bar diagram, sub-divided bar diagram, pie-chart; Graphical presentation: Histogram, frequency curve, frequency polygon and ogive

4 **Descriptive measures** **(18)**

Concepts of central tendency, dispersion and nature of frequency curve, characteristics of a good statistical average

Measures of central tendency: Arithmetic mean, geometric mean and harmonic mean and their uses in descriptive analysis, computational methods for ungrouped and grouped data, their merits and demerits; Median and mode: Computations for ungrouped and grouped data, graphical methods, uses, merits and demerits; Empirical relation between mean, median and mode; relationships between arithmetic mean, geometric mean and harmonic mean, choice of an appropriate average; Partition values: Quartiles, deciles and percentiles; weighted and un-weighted averages

Measures of Dispersion: Concept of dispersion, characteristics of good measure of dispersion; absolute and relative measures of dispersion; Range,semi-interquartile range (quartile deviation), mean deviation, mean square deviation, variance and standard deviation (SD), their definitions, merits and demerits, properties, and uses, combined variance and standard deviation, computations for ungrouped and grouped data; Relative measures of dispersion: Coefficient of range, coefficient of quartile deviation, coefficient of mean deviation and coefficient of variation (C.V.); Choice of an appropriate measure of dispersion

5 Moments, Skewness and Kurtosis **(12)**

Moments: Raw moments for grouped and ungrouped data, moments about an arbitrary constant for grouped and ungrouped data, central moments for grouped and ungrouped data, effect of change of origin and scale, relations between central moments and raw moments

Skewness and Kurtosis: Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, absolute and relative measures, Bowley's coefficient of skewness, Karl Pearson's coefficient of skewness, measures of skewness based on moments, Choice of an appropriate measure of skewness; Concepts of kurtosis, leptokurtic,

mesokurtic and platykurtic frequency distributions, measures of kurtosis using partition values, measures of kurtosis based on moments

References

1. Miller and Fruend (2007): *Modern Elementary Statistics*, Pearson Publishers.
2. Neil Weiss (2010): *Introductory Statistics, 5th edition* : Pearson Publishers
3. Snedecor and Cochran (1980): *Statistical Methods*, Oxford and IBH Publishers.
4. Gupta S.C. and Kapoor V.K.(2012): *Fundamentals of Mathematical Statistics,* Sultan Chand and Sons, New Delhi.
5. Mukhopadhyay, P. (1996): *Mathematical Statistics* , New Central Book Agency, Calcutta, Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York.
6. Shrestha H.B., Statistics and Probability: Concepts and Techniques, EKTA Books.
7. Sthapit Azaya, Yadav Rashinder, Khanal Shankar. (2012): Fundamentals of Statistics, Asmita Publication, Kathmandu, Nepal