

SEMESTER-I

Paper: Fundamental of Computing

Code: DSI-101

Contacts Hours / Week: 3L

Credits: 3

Module 1-Computer fundamentals: Computing systems: hardware & software, Architecture & organization history: von Neumann Architecture: memory, processor, I/O; Data vs Information: Bit, byte number system: binary, octal, hexadecimal, 1's, 2's complement arithmetic, digital logic: AND, OR etc. BIOS, Booting, Application software, system software, Introduction of Operating systems, program, process; introduction of programming languages: brief overview of Pascal, FORTRAN, and BASIC. [6L]

Module 2- General problem Solving concepts: Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops, time & space complexity; Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). [4L]

Module 3- Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation [4L]

Module 4- Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming [4L]

Module 5- Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Preprocessor, Standard Library Functions and return types [4L]

Module 6- Arrays and Pointers: Arrays, Pointers and address, Pointers and Function Arguments, Pointers, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated. [8L]

Module 7- Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields [4L]

Module 8- Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, stdout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous

functions, scope of advance C, a brief introduction of VDU basics, Mouse programming, C-assembly. [6L]

Paper: Fundamental of Computing Lab

Code: DSI-191

Contacts Hours / Week: 2P

Credits: 1

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

Programming Method: Debugging, macro, User defined Header, User defined Library Function, make file

Competitive Programming Laboratory

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
 - a. Small but tricky codes
 - b. Proper parameter passing
 - c. Command line Arguments
 - d. Variable parameter
 - e. Pointer to functions
 - f. User defined header
 - g. Make file utility
 - h. Multi file program and user defined libraries
 - i. Interesting substring matching / searching programs
 - j. Parsing related assignments
 - Familiarization of Computer Hardware & components

Text Books:

1. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
2. B. Gottfried, "Programming in C", Second Edition, Schaum Outline Series.
3. R.S. Salaria, "Problem Solving & Programming in C", Revised Edition, Khanna Books

Reference Books:

1. B. W. Kernighan and D. M. Ritchi, The 'C Programming Language', Second Edition, PHI.
2. Yashavant Kanetkar, "Let Us C", BPB Publications.
3. R.S. Salaria, "Computer Fundamentals and Programming in C" Khanna Publishing House

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
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Syllabus for B.Sc.in Data Science (Industry Induced)
(Effective for Students Admitted in Academic Session 2019-2020)

Paper: Mathematics for Data Scientists-I

Code: DSI-102

Contacts Hours / Week: 3L + 1T

Credits: 4

Module-1: Boolean algebra: Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map. [10L]

Module-2: Calculus: Basic concept of Differential calculus and integral calculus, application of double and triple integral. [10L]

Module-3: Abstract algebra: Set, relation, group, ring, field [8L]

Module-4: Combinatorics: Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle. [12L]

Text Books:

1. I. N. Herstein, "Topics in Algebra", John Wiley and Sons.
2. M. Morris Mano, "Digital Logic & Computer Design", Pearson
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.

Reference Books:

1. Gilbert Strang: Introduction to linear algebra
2. Peter V. O'Neil, "Advanced Engineering Mathematics", Seventh Edition, Thomson Learning.
3. M. D. Greenberg, "Advanced Engineering Mathematics", Second Edition, Pearson Education.
4. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics". Vol. I & II, Vidyarthi Prakashan.
5. Chandrika Prasad & Reena Garg, "Advanced Engineering Mathematics" Khanna Publishing House, 2018.

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Syllabus for B.Sc.in Data Science (Industry Induced)
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Paper: English Communication
Code: DSI(HU)-103
Contacts Hours / Week: 3L+1T
Credits: 4

Unit/ Module 1: Vocabulary Enhancement –Synonyms, Antonyms, Prefixes and suffixes. Understanding the proper way of letter writing. Comprehension, Passage reading and question answer handling. Noun, Verb, Adjective. Construction of sentences and passages with proper grammar.(8L)

Unit/ Module 2: Spelling and Punctuation/ Spelling Pitfalls, Grammar Revisited - Review of parts of speech. Proper pronunciation from language lab. Hearing fluent English and identifying and answering questions. Understanding the proper way to utilize punctuation and spelling Pitfalls. (8L)

Unit/ Module 3: Functional English - Language functions: descriptive, expressive and social, Types of language functions: to inform, enquire, attract, influence, regulate and entertain. Understanding the importance of communication. Communication in an organization. Types of communication (8L)

Unit/ Module 4: Reading Skills - Strategies for developing reading skills, Skimming and scanning, Predicting, Inferring, Reading critically. Reading passages, comprehension and letters. Reading with proper pronunciation. (6L)

Unit/ Module 5: Book reading, Shakespearian Literature reading. Reading silently, sub-vocalization, Reading at speeds of at least 250 words per minute, Inferring meaning or content after reading the heading, Guessing meaning of unfamiliar words from context, Identifying the central idea as well as supporting ideas, Spelling pitfalls, Preparing notes in diagrammatic form after reading a text, showing the central idea and supporting ideas and the relationships between them. (10L)

Text Books:

1. Scot Ober, Contemporary business communication, fifth edition, biztantra.
2. Lesiler & Flat lay, Basic Business communication. Tata McGrawHill.

Reference Books:

1. Alan Mc'Carthy and O'dell-English vocabulary in use
2. APAART: Speak Well 1 (English language and communication)
3. APAART: Speak Well 2 (Soft Skills)
4. Dr. Saroj Hiremath-Business Communication
5. Kulbhushan Kumar, Effective Communication Skills

Paper: Introduction to Data Science

Code: DSI-104

Contacts Hours / Week: 3L

Credits: 3

Module-1: Introduction to data science, Exploratory data analysis, Linear regression and regularization, Model selection and evaluation (12L)

Module-2: Classification: kNN, decision trees, SVM; Ensemble methods: random forests, Naïve Bayes and logistic regression (12L)

Module-3: Feature engineering and selection, Clustering: k-means, hierarchical clustering, Dimensionality reduction: PCA and SVD (10L)

Module-4: Text mining and information retrieval, Network Analysis, Recommender systems (8L)

Paper: Introduction to Data Science (with tool based excel Lab)

Code: DSI-192

Contacts Hours / Week: 2P

Credits: 1

Laboratory:

Measuring association between variables: Topics include types of data, data cleaning, recoding and sorting, data visualization, summarizing data and an introduction to analysis of relationships between variables (Excel).

Pricing analytics: focuses on utilizing Excel to estimate demand curves and determine profit maximizing pricing strategies that result in higher sales and improved profitability.

Turning customer feedback into actionable insight: analysis will begin with a sales forecast using historical data (Excel)

Text Books:

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
2. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
3. Hastie, T., Tibshirani, R., Friedman, J. The Elements of Statistical Learning, 2nd edition. — Springer, 2009.

Reference Books:

1. Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012.
2. F. Provost, T Fawcett, "Data Science for business", 2013
3. V.K. Jain, Data Science & Analytics (with Python, R and SPSS Programming), 2018

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Paper: Computational Statistics-I
Code: DSI-105
Contacts Hours / Week: 3L
Credits: 3

Module-1: Probability: Concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem. Probability distributions: discrete & continuous distributions, Binomial, Poisson and Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions. Expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function. (15L)

Module-2: Introduction to Statistics: Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample. Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution. Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. (15L)

Module-3: Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling (10L)

Text Books:

1. S. M. Ross, "Introduction of Probability Models", Academic Press, N.Y.
2. A. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I & II, World Press.

Reference Books:

1. S. M. Ross, "A first course in Probability", Prentice Hall.
2. I. R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition, PHI.
3. A. M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill Education.
4. Manish Sharma & Amit Gupta, "The Practice of Business Statistics", Khanna Publishing House

Paper: Computational Statistics-I (R Lab)
Code: DSI-193
Contacts Hours / Week: 2P
Credits: 1

Laboratory: Programming Method—Implementation using R & R-studio-- Debugging, Library Function, file