

**INTEGRATED M.Sc. PROGRAMME IN BASIC  
SCIENCES - STATISTICS**

**Programme Structure & Syllabus**  
**(2020-2021 Admission onwards)**

**(Under Mahatma Gandhi University – Integrated Post  
Graduate Programme Regulations 2020)**

**SEMESTER I**

| Course Code | Course Name   | Course Type              | Theory/ Practical | Hrs./ week | Total Credits |
|-------------|---|--------------------------|-------------------|------------|---------------|
| IEN1CC01    | English Paper I   | Common                   | Theory            | 5          | 4             |
| IST1CR02    | Basic Statistics  | Core                     | Theory            | 5          | 4             |
| IST1CR03    | An Introduction to statistical Computing Using Excel And R  | Core                     | Theory            | 4          | 3             |
| IST1CR04    | Statistical Computing Using Excel/R-I                       | Core                     | Theory            | 3          | 2             |
| IST1CM05    | Mathematics I - Logic, Set theory And Differential Calculus | Compl (Maths)            | Theory            | 4          | 3             |
| IST1CM06    | Computer Science I - Fundamentals of Computer Science       | Compl (Computer Science) | Theory            | 2          | 2             |
|             | Lab I   | ..                       |                   | 2          | -             |
|             |   |                          | Total             | 25         | 18            |

**SEMESTER II**

| Course Code        | Course Name   | Course Type              | Theory/Practical | Hrs./ week | Total Credits |
|--------------------|---|--------------------------|------------------|------------|---------------|
| IML2CC01/ IHN2CC01 | Second language- Malayalam/Hindi                          | Common                   | Theory           | 5          | 4             |
| IST2CR02           | Applied Statistics  | Core                     | Theory           | 4          | 4             |
| IST2CR03           | An Introduction to Probability Theory                     | Core                     | Theory           | 4          | 4             |
| IST2CR04           | Demography, Vital And Official Statistics                 | Core                     | Theory           | 4          | 3             |
| IST2CM05           | Mathematics II - Integral Calculus And Trigonometry       | Compl (Maths)            | Theory           | 4          | 3             |
| IST2CM06           | Computer Science II - Spreadsheet and Database Management | Compl (Computer Science) | Theory           | 4          | 2             |
|                    | Lab 2   | ..                       |                  | 2          | -             |
| IST2CMP07          | Computer Practical (Lab 1 & Lab2)                         | ..                       | Practical        |            | 2             |
|                    |   |                          | Total            | 25         | 22            |

**SEMESTER III**

| Course Code | Course name   | Course Type              | Theory/Practical | Hrs./week | Total Credits |
|-------------|---|--------------------------|------------------|-----------|---------------|
| IST3CR01    | Probability Distributions   | Core                     | Theory           | 5         | 4             |
| IST3CR02    | Estimation Theory   | Core                     | Theory           | 5         | 4             |
| IST3CR03    | Statistical Computing Using Excel/R-II  | Core                     | Theory           | 5         | 4             |
| IST3CM04    | Mathematics III - Vector Calculus, Differential Equations And Laplace Transform | Compl (Maths)            | Theory           | 5         | 4             |
| IST3CM05    | Computer Science III - Web Technology   | Compl (Computer Science) | Theory           | 3         | 3             |
|             | Lab 3   | ..                       |                  | 2         | -             |
|             |   |                          | Total            | 25        | 19            |

**SEMESTER IV**

| Course Code | Course name                              | Course Type              | Theory/Practical | Hrs./week | Total Credits |
|-------------|--|--------------------------|------------------|-----------|---------------|
| IEN4CC01    | English Paper2                           | Core                     | Theory           | 5         | 4             |
| IST4CR02    | Introduction to Sampling Theory          | Core                     | Theory           | 5         | 4             |
| IST4CR03    | Testing of hypothesis                    | Core                     | Theory           | 5         | 4             |
| IST4CM04    | Mathematics IV - Linear Algebra          | Compl (Maths)            | Theory           | 5         | 4             |
| IST4CM05    | Computer Science IV - Python Programming | Compl (Computer Science) | Theory           | 3         | 3             |
|             | Lab 4                                    | ..                       |                  | 2         | -             |
| IST4CMP06   | Computer Practical II - (Lab 3 & Lab4)   | ..                       | Practical        |           | 2             |
|             |  |                          |                  | 25        | 21            |

**SEMESTER V**

| Course Code | Course Name                        | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|------------------------------------|-------------|------------------|-----------|---------------|
| IST5CR01    | Real Analysis I                    | Core        | Theory           | 5         | 4             |
| IST5CR02    | Operations Research                | Core        | Theory           | 5         | 4             |
| IST5CR03    | Numerical Analysis                 | Core        | Theory           | 5         | 4             |
| IST5CR04    | Statistical Quality Control        | Core        | Theory           | 5         | 4             |
| IST5CR05    | Statistical Computing Using Python | Core        | Theory           | 5         | 4             |
|             |                                    |             |                  | 25        | 20            |

**SEMESTER VI**

| Course Code | Course Name                          | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|--------------------------------------|-------------|------------------|-----------|---------------|
| IST6CR01    | Real Analysis II                     | Core        | Theory           | 5         | 4             |
| IST6CR02    | Complex Analysis                     | Core        | Theory           | 5         | 4             |
| IST6CR03    | Markov Processes and Queueing Models | Core        | Theory           | 4         | 3             |
| IST6CR04    | Actuarial Statistics                 | Core        | Theory           | 4         | 3             |
| IST6EL05/06 | Elective 1                           | Elective    | Theory           | 5         | 4             |
| IST6CPR06   | Mini Project                         |             |                  | 2         | 2             |
|             |                                      |             |                  | 25        | 20            |

**SEMESTER VII**

| Course Code | Course Name  | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|--|-------------|------------------|-----------|---------------|
| IST7CR01    | Probability Theory                                 | Core        | Theory           | 5         | 4             |
| IST7CR02    | Theory of Bivariate and Multivariate Distributions | Core        | Theory           | 5         | 4             |
| IST7CR03    | Sampling Theory                                    | Core        | Theory           | 5         | 4             |
| IST7CR04    | Statistical Inference I                            | Core        | Theory           | 5         | 4             |
| IST7CR05    | Design And Analysis of Experiments                 | Core        | Theory           | 5         | 4             |
|             |  |             |                  | 25        | 20            |

**SEMESTER VIII**

| Course Code | Course Name                    | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|--------------------------------|-------------|------------------|-----------|---------------|
| IST8CR01    | Statistical Inference II       | Core        | Theory           | 5         | 4             |
| IST8CR02    | Stochastic Processes           | Core        | Theory           | 5         | 4             |
| IST8CR03    | Advanced Multivariate Analysis | Core        | Theory           | 5         | 4             |
| IST8CR04    | Data Analytics Using R         | Core        | Theory           | 5         | 4             |
| IST8EL05/06 | Elective II                    | Elective    | Theory           | 5         | 4             |
|             |                                |             |                  | 25        | 20            |

**SEMESTER IX**

| Course Code | Course Name                          | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|--------------------------------------|-------------|------------------|-----------|---------------|
| IST9CR01    | Time Series Analysis And Forecasting | Core        | Theory           | 5         | 4             |
| IST9CR02    | Regression Analysis and Econometrics | Core        | Theory           | 5         | 4             |
| IST9CR03    | Non-Parametric Inference             | Core        | Theory           | 5         | 4             |
| IST9CR04    | Bayesian Inference                   | Core        | Theory           | 5         | 4             |
| IST9EL05/06 | Elective III                         | Elective    | Theory           | 5         | 4             |
|             |                                      |             |                  | 25        | 20            |

**SEMESTER X**

| Course Code | Course Name                             | Course Type | Theory/Practical | Hrs./week | Total Credits |
|-------------|---|-------------|------------------|-----------|---------------|
| ISTXPR01    | Project (Major)                         |             |                  | 25        | 16            |
| ISTXVV02    | Comprehensive Viva Voce (Project based) |             |                  |           | 4             |
|             |   |             |                  | 25        | 20            |

**Electives**

| Elective I (Semester 6) |                        | Elective II (Semester 8) |                    | Elective III (Semester 9) |  |
|-------------------------|------------------------|--------------------------|--------------------|---------------------------|--|
| IST6EL05                | Mathematical Economics | IST8EL05                 | Reliability Theory | IST9 EL05                 | Statistical Genetics and Ecology             |
| IST6EL06                | Biostatistics          | IST8EL06                 | Survival Analysis  | IST9 EL06                 | Artificial Intelligence and Machine Learning |

IST 1 CR 01-

I- Integrated

ST-Statistics,

1- semester

CR- Core Course, CC- Common course, CM- Complementary EL- Elective, CMP

Complementary Practical, PR- Core project, VV- Core Viva, X- 10

01- Course Serial Number

# Semester I - Core course-1

## IST1CR02-Basic Statistics

Hours per week-5  
Number of credits-4

### Textbook:

1. Gupta S.P. (2014). *Statistical Methods*, Sultan Chand & Sons, New Delhi.

### Module 1: Basic Statistical methodology

Origin and growth of statistics, Statistics defined-Statistical data, Statistical methods, Functions of Statistics, Applications of Statistics, Limitations of Statistics, Collection of data- Primary and secondary data, Methods of collecting primary data, Drafting the questionnaire, Sources of secondary data, Census and Sample method, Classification and tabulation- types of classification, Formation of discrete frequency distribution, Formulation of continuous frequency distribution, Relative frequency distribution, Tabulation of data- Parts of a table, difference between classification and tabulation, types of tables. Diagrammatic and graphic representation-Types of diagrams (Bar diagrams, pie diagrams, pictograms and cartograms, stem and leaf diagrams), Graphs of frequency distribution. (28L)

### Module 2: Central tendency

Objectives of averaging, requisites of a good average, types of averages-Arithmetic mean, Merits and limitations of Arithmetic mean, Calculation of simple arithmetic mean, weighted arithmetic mean, median, calculation of median, graphical determination of median, merits and limitations of median, Mode, Calculation of mode, graphical determination of mode, Merits and limitations of mode, Relationship between mean, median and mode. Geometric mean - properties of geometric mean, calculation of geometric mean, Weighted geometric mean, Merits and Limitations of Geometric mean. Harmonic mean, uses of harmonic mean, weighted harmonic mean, Merits and limitations of harmonic mean. (22L)

### Module 3: Partition values and dispersion

Partition values (Quantiles)- Computation of Quartiles, Deciles, Percentiles. Dispersion: Methods of studying variation-Range, quartile deviation, merits and limitations, The mean deviation-calculation of mean deviation Merits and Limitations, The standard Deviation, Difference between mean deviation and standard deviation, calculation of standard deviation, Merits and limitations, Coefficient of variation, Lorenz curve, Box plot. (20L)

### Module 4: Moments, Skewness and Kurtosis

Moments-moments about arbitrary origin, conversion of moments about an arbitrary origin into moments about mean or central moments, moments about zero, Sheppard's correction for Grouping Errors, Difference between skewness and kurtosis, Measures of skewness, Absolute

measures of skewness, Relative measures of skewness, Karl Pearson's coefficient of skewness, Bowley's Coefficient of Skewness, Kelly's Coefficient of skewness, Measure of Skewness based moments, Measures of Kurtosis. (20L)

### Reference books

1. Gupta, S.C. and Kapoor, V.K. (2014). Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. Kapur, J.N. and Saxena, H.C. (2010). Mathematical Statistics, S. Chand
3. Mukhopadhyay, P., Mathematical Statistics, New central book agency Pvt. Ltd., Calcutta
3. Pillai, R.S.N. and Bagavathi (2015). Statistics: Theory and Practice, S. Chand.
4. Spiegel, M.R. and Stephens L.J. (2014). Statistics, (5<sup>th</sup> ed.) Schaum's outlines of Statistics, McGraw-Hill Education.

## Semester I - Core course 2

### IST1CR03- An introduction to Statistical Computing using Excel and R

Hours per week-4  
Number of credits-3

#### Textbooks

1. Schmuller J. (2013) Statistical analysis with Excel for Dummies, 3<sup>rd</sup> Edition, John Wiley & Sons, Inc.
2. Purohit, S.G., Gore, S.D. and Deshmukh S.R. (2019) Statistics using R, 2<sup>nd</sup> edition, Narosa publishing house.
3. Sandeep Nagar (2016) Introduction to OCTAVE for Scientists and Engineers

#### Module 1: Data Analysis with Excel

Worksheet functions, Quickly accessing Statistical function, Array function, Inserting a chart, stacking the columns, slicing the pie, Using data analysis tools, Accessing Commonly used functions. Drawing line, Passing the bar, AVERAGE and AVERAGEA, AVERAGEIF and AVERAGEIFS, TRIMMEAN, MEDIAN, MODE-SNGL and MODE-MULT, VAR.P and VARPA, VAR.S and VARA, STDEV.P and STDEVA, STDEVIF and STDEVIFS, SKEW and SKEW.P, KURT, FREQUENCY, data analysis tool: Histogram, Data Analysis tool: Descriptive Statistics, Instant Statistics. (20L)

#### Module 2: Introduction to R

Introduction, R as a statistical software and language, R as a calculator, R preliminaries, Methods of data input, Data accessing or indexing, some useful built-in functions Graphics with R, Getting help, Saving, storing and retrieving data. (15L)

### **Module 3: Descriptive Statistics using R**

Introduction, Diagrammatic representation of data, Graphical representation of data, Measures of central tendency, Measures of dispersion, Measures of skewness and kurtosis.  
(15L)

### **Module 4: Introduction to OCTAVE**

Introduction to numerical computing, Installation, Workspace, help, Variable.  
Working with Arrays: Introduction, Arrays and vectors, Operations on arrays and vectors, Matrix manipulations, Special matrices. Numerical Computing formalism: Introduction, Physical problems, Defining a model .  
(22L)

### **Reference books**

1. Dalgaard, P. (2008). Introductory Statistics with R, Springer.
2. Jason Lachniet, Wytheville Community College - Introduction to GNU Octave: A brief tutorial for linear algebra and calculus students (3rd Edition).
3. Hector Guerrero(2019) Excel data analysis-Modelling and Simulation, 2<sup>nd</sup> Edition, Springer
4. Hubert Selhofer (2016). Introduction to GNU Octave.
5. Rizzo, M.L. (2007). Statistical Computing with R, Chapman and Hall/CRC.

## **Semester I Core course - 3** **IST1CR04- Statistical Computing Using** **Excel/R– I**

### **Type of questions**

1. Drawing bar diagrams
2. Drawing pie diagrams
3. Representing frequency distribution using histograms
4. Computation of measures of central tendency
5. Computation of measures of dispersion
6. Computation of moments
7. Computation of measures of skewness
8. Computation of measures of kurtosis
9. Drawing Box diagram for given data

**Hours per week – 3 Number of credits -2**

10. Drawing Lorenz curve for a data and comparing dispersion/ inequality

## **Semester II -Core course 1** **IST2CR02-Applied Statistics**

**Hours per week-4**  
**Number of credits-4**

**Textbooks:**



1. Gupta, S.C. and Kapoor, V.K. (2014). **Fundamentals of Mathematical Statistics, Sultan Chand**
2. Gupta S.P. (2014). **Statistical Methods, Sultan Chand & Sons, New Delhi.**

### **Module 1: Correlation and regression (for two variables)**

Curve fitting, principle of least squares, Fitting of a straight line, Fitting of second degree parabola. Fitting of power curve, Fitting of exponential curves. Selection of type of curve to be fitted.

Bivariate distribution, Correlation, Scatter diagram, Karl Pearson coefficient of correlation coefficient, coefficient of determination, probable error, standard error, condition for significance of correlation coefficient, Rank Correlation, tied ranks, Regression, lines of regression, regression curves, regression coefficients. Properties of regression coefficients, Angle between two lines of regression. Correlation coefficient between observed and estimated value. Applications of correlation and regression in real life. (20L)

### **Module 2: Correlation and regression (for more than two variables)**

Multiple and partial correlation, Planes of regression, Properties of residuals, Coefficient of multiple correlation, Generalisation to n variables, Properties of multiple correlation coefficient, Coefficient of partial correlation, Generalisation to n-variables. Multiple correlation in terms of total and partial correlations, Expression for regression coefficients in terms of regression coefficients of lower order, Expression for partial correlation coefficient in terms of correlation coefficients of lower order (19L)

### **Module 3: Index numbers**

Meaning and definition-uses of index numbers, Classification of index numbers, Problems in the construction of index numbers, Methods of constructing index numbers, Test of adequacy of index numbers, factor reversal, time reversal and unit test, Chain base index numbers Base shifting-splicing and deflating of index numbers. Consumer price index numbers. (15L)

### **Module 4 : Time series analysis**

Concept of time Series, utility of time series, components of time series, additive and multiplicative models, measurement of trend using graphical, semi-average, moving average methods and least square method for straight line. Measurement of Seasonal Variation – method of simple average, Ratio to Trend method, Ratio to moving Average Method, Link relative

Method. Measurement of Cyclical variations- Residual Method, Measurement of irregular variations.

(18L)

### **Reference books**

1. Goon A.M, Gupta M.K. and Das Gupta (2005) Fundamentals of Statistics, Vol. II, The Worldpress, Calcutta.
2. Agarwal B.L.(2006 ) Basic Statistics, Wiley Eastern Ltd, New Delhi
3. Kapur, J.N. and Saxena, H.C. (2010). Mathematical Statistics, S. Chand

4. Mukhopadhyay, P., Mathematical Statistics, New central book agency Pvt. Ltd., Calcutta
5. Spiegel, M.R. and Stephens L.J. (2014). Statistics, (5<sup>th</sup> ed.) Schaum's outlines of Statistics, McGraw- Hill Education.

## **Semester II - Core Course - 2**

### **IST2CR03-An Introduction to Probability Theory**

**Hours per week – 4**  
**Number of credits -4**

#### **Textbooks:**

1. **Mendenhall, W., Beaver, R.J. and Beaver B.M. (2013) Introduction to probability and Statistics, Brooks/Cole Cengage learning.**
2. **Mood, A. M., Graybill, F.A. and Boes, D.C (2001). Introduction to the Theory of Statistics, Tata McGraw-Hill Publishing company Ltd.**

#### **Module 1: Probability**

The role of probability in Statistics, Events and sample space, mutually exclusive, equally likely and exhaustive events, Kinds of probability-Classical or A Priori probability, A posteriori or frequency probability, Probability-Axiomatic, Monotone property of probability, calculating probabilities using simple events, Useful counting rules, Event relations and probability rules-addition rule for any two events, three events and n-events, Boole's inequality and other theorems based on addition rule (Problems based on the above topics).  
(18L)

#### **Module 2: Conditional Probability and independence**

Independent and dependent events, The general multiplication rule, conditional probabilities, The multiplication rule for independent events, checking for independence, the difference between mutually exclusive and independent events, applications, Law of total probability, Bayes's rule (Problems based on above topics).  
(16L)

#### **Module 3: Random Variables and distribution functions**

Random variable, cumulative distribution function, Properties of cumulative distribution function. Discrete random variable, discrete density function of a discrete random variable, Continuous random variable, Probability density function of a continuous random variable, Change of variables- methods of Jacobian and cumulative distribution function (univariate case) (Problems based on above topics).  
(18L)

#### **Module 4: Joint distribution functions**

Joint cumulative distribution function, Properties of Bivariate cumulative distribution function, Marginal cumulative distribution function, Joint density functions for discrete random variables, Marginal discrete density, Joint density function for continuous random variables, Marginal probability density function, Conditional distributions and stochastic independence. (Problems based on above topics) (20L)

#### **Reference books**

1. Gupta, S.C. and Kapoor, V.K. (2014). Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta, S.P. (2014). Statistical Methods, Sultan Chand & Sons, New Delhi.
3. Medhi, J. (2006). Statistical Methods, 2<sup>nd</sup> edition, New Age International Publishes.
4. Ross, S. (2013). A First Course in Probability, (9<sup>th</sup> ed.), Pearson Education Publication

## **Semester II - Core Course - 3**

### **IST2CR04-Demography, Vital and Official Statistics**

**Hours per week – 4**  
**Number of credits -3**

#### **Textbook:**

1. **Goon, A.M., Gupta, M.K. and Dasgupta, B. (2008) Fundamentals of Statistics, Vol. II, 9th Edition, World Press.**

#### **Module 1: Population Theories**

Coverage and content errors in demographic data, use of balancing equations and Chandrasekaran-Deming formula to check completeness of registration data. Adjustment of age data, use of Myer and UN indices, Population composition, dependency ratio. (16L)

#### **Module 2: Vital statistics: Measurement of mortality, life tables and measurement of fertility**

Introduction, Rates of vital events. Measurements of Mortality-Crude Death Rate (CDR), Specific Death Rate (SDR), Standardized Death Rate, comparative mortality index, Cause of Death Rate, Maternal Mortality Rate (MMR), Infant Mortality Rate (IMR), Case Fatality Rate. Life table-description, construction of a life table, abridged life table, King's method, Greville's method and method of Reed and Merrell, uses of a life table. Measurement of fertility -Crude Birth Rate (CBR), General Fertility Rate (GFR), Age-Specific Fertility Rate, Total Fertility Rate (TFR). (20L)

#### **Module 3: Measurement of population growth and morbidity & Graduation formulae, population projection**

Measurement of population growth-crude rate of natural increase and vital index, Gross

Reproduction Rate (GRR), Net Reproduction Rate (NRR). Measurement of morbidity-morbidity incidence rate, morbidity prevalence rate, Graduation formulae used in vital statistics-graduation of population data, logistic curve, fitting a logistic curve, Graduation of mortality rates, Makeham's graduation formula, Fitting Makeham's formula, population projection. (20L)

#### **Module 4: Official statistics and present official statistical system in India**

Population Statistics, agricultural statistics, price statistics, industrial statistics, trade statistics, labour statistics, transport and communication statistics, miscellaneous statistics, Ministry of Statistics & Program Implementation (MoSPI), responsibilities of NSO, programme implementation wing and administration division, National Sample Survey (NSS), Central Statistics office (CSO), National Statistical commission, Indian statistical institute (16L)

#### **Reference books:**

1. <http://mospi.nic.in>
2. Mukhopadhyay, P. (1999). *Applied Statistics*, New Central Book Agency, Calcutta.
3. Cox, P.R. (1976) *Demography*, fifth edition, Cambridge University Press
4. Poston, D.L. and Bouvier, L.F (2010), *Population and society- an introduction to demography*, Cambridge University Press.
5. Keyfitz, N and Caswell. H (2005), *Applied Mathematical Demography*, 3rd edition, Springer.

# SEMESTER I

## IST1CM06

### Computer Science I – Fundamentals of Computer Science

**Theory: 2 hrs. per week**

**Credits: 2**

#### Course Objectives

1. Familiarize with the hardware components of a digital computer
2. Understand the basic idea of computer components
3. To get an overview of emerging technologies
4. Familiarize with operating systems and its types

#### Unit I

Introduction to computer system, uses, types Computers . Data Representation: Number systems and character representation, ASCII format, binary arithmetic. Human Computer Interface: Types of software-system software, application software .

#### Unit II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Computer Organization and Architecture: C.P.U., registers, memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, processors.

#### Unit III

Network and Communications: Computer Networks – Types of Networks: WAN, MAN, LAN – Benefits of Networks .

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, Mathematica, R etc.

#### Unit IV

Introduction to Operating system : Introduction and need of operating system Operating System, Evolution of Operating System, Types of Operating System, Functions of an Operating System,

Introduction to operating system for PCs –DOS Windows Linux. – Linux introduction , Basic Architecture of Unix/Linux system . Essential Linux commands .

## **Reference Books:**

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

## ***Software Lab I***

### ***2 hours per week***

### **Experiments**

I)The computer lab assignment must include connecting parts of a computer and assembling it to an extent, media formatting and installation of some software. Working experience with desktop, laptop, palmtop etc

II) Practice of internal and external commands of DOS.

Working practice on windows operating system : creating file, folder. Copying, moving, deleting file, folder.

III) Linux Lab:

Experiment with each of these commands: mkdir, rmdir, cd, ls, pwd , cat, head more rm, cp, who, date, cal, mail and whoami.

Linux lab to Create a new directory named lab2, . Change directories into lab2, . List all files even hidden files (directory should be blank), . Create a new file that contains the calendar for this month, . List all files again even hidden files (there should be just one file), Display the entire contents of that new file, . Delete the file and Ask the system for today's date .

## **SEMESTER II**

### **IST2CM06**

#### **Computer Science II - Spreadsheet & Database Management**

**Theory: 2 hrs. per week**

**Credits: 2**

#### **Course Objectives**

- 1:** To familiar with organized data collection.
- 2:** Able to design database.
- 3:** Capable to frame queries for various purposes.

This skill based course is structured to enhance database handling, data manipulation and data processing skills through SQL. The course will enable its beneficiaries develop data centric computer applications.

#### **Unit I**

MS-Excel- Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns Resizing rows and columns, selecting cells, Moving and copying cells, Macros – recording and running. Formatting cells – Formatting toolbar, Dates and times, Auto formatting.

#### **UNIT II**

Formula and Functions. Important formulas in Excel, Logical functions, Conditional formatting, Charts and data visualization. Filtering, Sorting, Pivot tables in Excel , V lookup etc.

#### **UNIT III**

Introduction-Purpose of database systems. View of data, Data Models- Relational Model- Relational Model Fundamentals, Database structure, Database Administrator, Database Users. Entity Attributes, E-R Diagram, Keys-Primary-Foreign and Candidate keys.

#### **UNIT IV**

Introduction to SQL: Basic Data Types, Working with relations of RDBMS: Creating relations ( use Create table statement). Modifying relations (alter table statement), Integrity constraints over the relation like Primary Key , Foreign key, NOT NULL to the tables, DDL- create, alter, Drop, DML -Insert into, Select, update, Delete, Aggregate Functions in SQL, Group By and Having, Joins (Inner and Outer) .

#### **References:**

1. Gruber, M(1990): Understanding SQL, BPB publication
2. Silberschatz, A, Korth, H and Sudarshan,S(2011) “Database System and Concepts”, 6th Edition McGraw-Hill.
3. Desai, B. (1991): Introduction to Database Management system, Galgotia Publications

## **Software Lab II**

### **Practical :2 hrs. per week**

1. Working with excel formula , different type of cell references and linking data

Logical functions – IF, AND, OR and Nested IF function.

2. Math functions – ROUND, RAND, CELING, FLOOR, INT, LCM, MOD, EVEN, SUNIF, SQRT and Trigonometric functions

3. Statistical functions- AVERAGE, AVERAGEA, AVERAGEIF, COUNT, COUNTA, COUNTBLANK, COUNTIF, SUM, SUMA, MIN, MINA, MAX and MAXA

4. Formatting cells

5. Creation of database and setting of properties and other attributes such as primary key, foreign key and relationships

6. SQL statement for creating, listing, dropping, checking, updating tables

7. Record manipulation using-insert, delete, update

8. Experiments that clarify the importance of keys (Except foreign key)

9. Queries with an Expression and a column alias

10. A simple query that aggregates (groups) over a whole table

11.A query with a literal string in the SELECT list

12.Queries with sub string comparison and ordering

13.Query using GROUP BY and Having

### **IST2CMP07**

**Computer Practical I - (Lab 1 and Lab 2)**

**credit :2**

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**INTEGRATED M.Sc. DEGREE PROGRAMME**  
**COMPLEMENTARY(MATHEMATICS) COURSE TO INTEGRATED M.Sc.**  
**STATISTICS**  
**FIRST SEMESTER**  
**IST1CM05**  
**LOGIC, SET THEORY AND DIFFERENTIAL CALCULUS**

Hours per week – 4  
Number of credits -3

**Text Books**

1. **Kenneth H. Rosen: Discrete Mathematics and its Applications (Sixth edition), Tata McGraw Hill Publishing Company, New Delhi.**
2. **George B. Thomas Jr., Maurice D.Weir, Joel R.Hass: Thomas' Calculus 12<sup>th</sup> Edition, Pearson, 2010.**

**Module I: Logic And Set theory**

**(25 L)**

Propositional logic, Propositional equivalences, Predicates and quantifiers, Rules of inference, Introduction to proofs.

Sets, set operations, functions

Text 1: Chapter – 1, Sections 1.1-1.3, 1.5-1.6,

Chapter – 2, Sections 2.1-2.3

**Module II: Differential Calculus**

**(22 L)**

Rates of change and tangents to curves, limit of a function and limit laws, the precise definition of a limit, one sided limits. Tangents and the derivative at a point, the derivative as a function, differentiation rules, the derivative as a rate of change, derivatives of trigonometric functions, the chain rule and implicit differentiation.

Text 2: Chapter – 2, Sections 2.1 – 2.4,

Chapter – 3, Sections 3.1 – 3.7

**Module III: Application of derivatives**

**(15 L)**

Extreme values of functions, The Mean Value Theorem, Monotonic functions and the first derivative test.

Text 2: Chapter – 4, Sections 4.1 - 4.3

**Module IV: Partial Derivatives**

**(10 L)**

Functions of several variables (definition only), Partial derivatives, The Chain Rule.

Text 2: Chapter – 14, Sections 14.3 - 14.4

## Reference Books :

1. Shanty Narayan : Differential Calculus ( S. Chand)
2. George B. Thomas Jr. and Ross L. Finney: Calculus, LPE, Ninth edition, Pearson Education.
3. Robert.R.Stoll-Set theory And Logic (Eurasia Publishers, N.Delhi)
- 4.Schaum's outline series - Discrete mathematics, second edition

**INTEGRATED M.Sc. DEGREE PROGRAMME  
COMPLEMENTARY(MATHEMATICS) COURSE TO INTEGRATED M.Sc.  
STATISTICS SECOND  
SEMESTER  
IST2CM05  
INTEGRAL CALCULUS AND TRIGONOMETRY**

**Hours per week – 4  
Number of credits -3**

## Text Books

1. **George B. Thomas Jr., Maurice D.Weir, Joel R. Hass: Thomas' Calculus 12<sup>th</sup> Edition, Pearson, 2010.**
2. **S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.**

### **Module I: Integral Calculus** **(20 L)**

Sigma notation and limit of finite sums, The Definite integral, The fundamental theorem of Calculus, Indefinite integrals and substitution method, Substitution and area between curves.

Text 1: Chapter – 5, Sections 5.2 - 5.6

### **Module II: Application of Definite Integrals** **(15 L)**

Volumes using cross-sections, Volumes using cylindrical shells, Arc length, Areas of surfaces of revolution.

Text 1: Chapter – 6, Sections 6.1- 6.4

### **Module III: Techniques of Integration** **(17 L)**

Basic integration formulas, Integration by parts, Trigonometric integrals, Trigonometric substitutions , Integration of rational functions by partial fractions.

Text 1: Chapter – 8, Sections 8.1- 8.4

**Module IV: Trigonometry****(20 L)**

Complex quantities, Demoiver's theorem (without proof) Circular and hyperbolic functions, inverse circular and hyperbolic function, Separation into real and imaginary parts, Summation of infinite series based on  $C + iS$  method.(Geometric, Binomial, Exponential, Logarithmic and Trigonometric series).

Text 2: Relevant Sections in Chapter 2, 5 and 8.

**Reference Books :**

1. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education
2. Shanti Narayan , P .K . Mittal : Integral Calculus ( S. Chand & Company).
3. S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.