NOWGONG COLLEGE

(Autonomous)

SYLLABUS

Department of Statistics

Learning Outcome-based Curriculum Framework (LOCF) of

Four Year Undergraduate Programme

Choice-based Credit System with flexibility

Effective from Academic Year 2023-24

Syllabus is approved in Academic Council, Nowgong College (Autonomous)

Dated: 30th June, 2023

Course & Credit Structure

Semester	Major	Minor	IDC	AEC	SEC	VAC (Any Two in each Semseter)		Research project/ Dissertation/ Internship	Total Credit
1st	STAT-MAJ-1014 (Descriptive Statistics)	STAT-MIN-1014 (Descriptive Statistics)	STAT-IDC-1014 (Descriptive Statistics)	ASSA/HIND/BENG-AEC-1012 Jugajogmulok Axomiya/ Vyakaran Evam Vyavaharik Hindi/Byowoharic Bangla – I Business English: Networking	STAT-SEC-1014 (Data Analysis using-Excel)	UNIN-VAC-1012 (Understanding India) ENSC-VAC-1012 (Environmental Science) NASS-VAC-1012 (National Service Scheme) Online Courses: 1. OUFU-VAC-1012 Our Energy Future 2. PHSR-VAC-1012 Philosophy, Science and Religion 3. MOTH-VAC-1012 Model Thinking **(Any Two)**		Students exiting the program after securing 44 credits will be awarded UG certificate in the relevant discipline/ subject provided they secure additional 4 credits in work based Vocation Courses offering during	22

2nd	STAT- MAJ -2014 (Probability and Mathematical Expectation)	STAT-MIN-2014 (Probability and Mathematical Expectation)	STAT-IDC-2014 (Probability and Sample Survey)	**Offline Courses:** ENGL-AEC-2012 (English and Mass Communication) **Online Courses:** Business English: Management and Leadership	STAT-SEC-2014 (Statistical Computing Using R Programming) **Online Courses:** Fundamental Skills on Python Programming & IoT (Infosys Springboard)	**Offline Courses:** DITS-VAC-2012 (Digital Technological Solutions) YOMH-VAC-2012 (Yoga and Mental Health) NACC-VAC-2012 (National Cadet Corps) **Online Courses:** Fundamental of Artificial Intelligence (Infosys Springboard) **(Any Two)**		summer term for internship/ apprenticeship in addition to 6 credits from Skill based Courses earned during 1st & 2nd Semester	22

(Online)

			(Infosys Springboard)				

Certificate after 1 year (Total Credit = 44)

| 3rd | STAT- MAJ -3014 (Probability and Probability Distribution-2) STAT-MAJ-3024 (Calculus) | STAT-MIN-3014 (Applied Statistics) | STAT-IDC-3014 (Applied Statistics) | ASSA/HIND/BENG -AEC-3012 Byowoharic Axomiya/ Karyalayi Hindi /Byowoharic Bangla – II | STAT-SEC-3014 (Data Analysis using-SPSS) | ----------- | Students exiting the program after securing 88 credits will be awarded UG Diploma in the relevant discipline/ subject provided they secure additional 4 credits in Skill based Vocation Courses offered 2nd year summer | 22 |
| 4th | STAT-MAJ-4014 (Statistical Inference) STAT-MAJ- | STAT-MIN-4014 (Probability and Probability Distribution | ------------ | ENGL-AEC-4012 (Academic Writing) | --------------- | ----------- | | 22 |

Semester									Credit
	4024 (Mathematical Methods in Statistics) STAT-MAJ-4034 (Numerical Analysis) STAT-MAJ-4044 (Sampling Distributions)	-2)						term.	
	Certificate after 1 year (Total Credit = 44)								
5th	STAT-MAJ-5014 (Statistical Computing Using R Programming) STAT-MAJ-	STAT-MIN-5014 (Basics of Statistical Inference)	----------	----------	----------	----------		STAT-INTE-5012 (Internship)	22

	5024 (Mathematical Analysis) STAT-MAJ-5034 (Survey Sampling and Indian Official Statistics) STAT-MAJ-5044 (Linear Models)								
6th	STAT-MAJ-6014 (Design of Experiments) STAT-MAJ-6024 (Statistical Computing Using	STAT-MIN-6014 (Survey Sampling)	-----------	-----------	-----------	-----------		-----------	22

	Python) STAT-MAJ-6034 (Demography and Vital Statistics) STAT-MAJ-6044 (Statistical Quality Control) STAT-MAJ-6052 (Project/ Dissertation)							
Degree after 3 years (with Major/Minor) (Total Credit = 132)								
7th	STAT-MAJ-7014 (Operations Research) STAT-MAJ-7024	STAT-MIN-7014 (Statistical Computing Using R Programming)	----------- --	-------------- -	----------------	REET-VAC-7012 (Research Ethics)		REME -MAJ-7044 (Research Methodology)	22

	(Multivariate Analysis and Nonparametric Methods) STAT-MAJ-7034 (Time Series Analysis)								
8th	STAT-MAJ-8014 (Stochastic Processes and Queuing)	STAT-MIN-8014 (Design of Experiments)	------------ -	--------------	---------------	INPR-VAC-8012		STAT-DISS-80112 (Dissertation) (Those who are undertaking Research Project or Dissertation) OR STAT-MAJ-8024 (Statistical Computing Using C/C++ Programming) STAT-MAJ-8034	22

							(Financial Statistics) STAT-MAJ-8044 (Application of Statistics in Actuarial Science) (Those who are not undertaking Research Project or Dissertation)	
						Degree after 4 years (with Honours/ by Research) (Total Credit = 176)		

N.B.: 1. 4 credit papers = 100 marks (60T+20IA+20P)

    2. 2 credit papers (except AEC) = 50 marks (30T+10IA+10P)

    3. 2 credit papers (Only AEC) = 50 marks (40T+10IA)

Question Pattern:

- For 100 marks papers [1 marks x 7 (no option) , 2 marks x 4(no option) , 5 marks x 3 (5 options), 10 marks x 3 (5 options)]
- For 50 marks papers [1marks x 4 (no option), 2 marks x 3 (no option), 5 marks x 2 (4 options), 10 marks x 1 (2 options)]
- For AEC 50 marks papers [1 marks x 4 (no options) , 2 marks x 3 (no options), 5 marks x 2 (4 options), 10 marks x 2 (4 options)]

Course		Credits (Theory With Practical)		
		Theory	Practical	Total
Major Course	**With Honours**	**23x3=69**	**23x1=23**	**92**
	With Research	**(20x3=60)+12**	**20x1=20**	
Minor Course		**8x3=24**	**8x1=8**	**32**
Interdisciplinary Course		**3x3=9**	**3x1=3**	**12**
Ability Enhancement Course	**English**	**2x2=4**	**0**	**4**
	MIL	**2x2=4**	**0**	**4**
Skill Enhancement Course		**3x3=9**	**3x1=3**	**12**
Common Value-Added Course	**UI, DTS**	**2x2=4**	**0**	**4**
	NEST, YOG	**2x2=4**	**0**	**4**
Field Based Learning Project		**1x2=2**	**0**	**2**
Internship		**1x2=2**	**0**	**2**
Intellectual Property Right		**1x2=2**	**0**	**2**
Research Methodology		**1x4=4**	**0**	**4**
Research Ethics		**1x2=2**	**0**	**2**
Total:		**----**	**----**	**176**

Details of Semester-Wise Courses:-

Major Papers (23 papers) (4 Credits):
STAT-MAJ-1014 Descriptive Statistics (Theory+ Practical)
STAT-MAJ-2014 Probability and Probability Distributions-1(Theory +Practical)
STAT-MAJ-3014 Probability and Probability Distribution-2 (Theory+ Practical)
STAT-MAJ-3024 Calculus (Theory+ Practical)
STAT-MAJ-4014 Statistical Inference (Theory+ Practical)

STAT-MAJ-4024 Mathematical Methods in Statistics (Theory+ Practical)
STAT-MAJ-4034 Sampling Distributions (Theory+ Practical)
STAT-MAJ-4044 Statistical Computing Using R Programming (Theory+ Practical)
STAT-MAJ-4052 Project based on topic from major course
STAT-MAJ-5014 Econometrics and Demand Analysis (Theory+ Practical)
STAT-MAJ-5024 Design of Experiments (Theory+ Practical)
STAT-MAJ-5034 Mathematical and Numerical Analysis (Theory+ Practical)
STAT-MAJ-5044 Survey Sampling and Indian Official Statistics (Theory+ Practical)
STAT-MAJ-6014 Operations Research (Theory+ Practical)
STAT-MAJ-6024 Statistical Quality Control (Theory+ Practical)
STAT-MAJ-6034 Multivariate Analysis and Nonparametric Methods (Theory+ Practical)
STAT-MAJ-6044 Demography and Vital Statistics (Theory+ Practical)
STAT-MAJ-7014 Stochastic Processes and Queuing (Theory+ Practical)
STAT-MAJ-7024 Statistical Computing Using Python (Theory+ Practical)
STAT-MAJ-7034 Time Series Analysis (Theory +Practical)
STAT-MAJ-8014 Financial Statistics (Theory +Practical)
STAT-MAJ-80212 Dissertation
Or
(Those who not undertaking Research Project or Dissertation)
STAT-MAJ-8024 Statistical Computing Using C/C++ Programming (Theory+ Practical)
STAT-MAJ-8034 Quantitative Epidemiology & Biostatistics
STAT-MAJ-8044 Application of Statistics in Actuarial Science (Theory+ Practical)

Minor Papers (8 papers) (4Credits):
STAT-MIN-1014 Descriptive Statistics (Theory+ Practical
STAT-MIN-2014 Probability and Probability Distribution-1 (Theory+ Practical)
STAT-MIN-3014 Applied Statistics-I (Theory+ Practical)
STAT-MIN-4014 Applied Statistics-II (Theory+ Practical)
STAT-MIN-5014 Probability and Probability Distribution-2 (Theory+ Practical)
STAT-MIN-6014 Survey Sampling (Theory + Practical)
STAT-MIN-7014 Design of Experiments (Theory+ Practical)
STAT-MIN-8014 Statistical Computing Using R Programming (Theory+ Practical)

Interdisciplinary Papers (3 papers) (4credits):
STAT-IDC-1014 Descriptive Statistics (Theory + Practical)
STAT-IDC-2014 Probability and Probability Distribution (Theory+ Practical)
STAT-IDC-3014 Sample Survey and Statistical Inference (Theory+ Practical)

SEMESTER-I
Course Code: STAT-MAJ-1014
Course Paper: Descriptive Statistics
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To summarize the data and to obtain its salient features from the vast mass of original data.

Learning Outcomes:

After completing this course, the students should have developed a clear understanding of: Concepts of statistical population and sample, Methods of collection of data, variables and attributes. Tabular and graphical representation of data based on variables. 'Conditions for the consistency' and criteria for the independence of data based on attributes. Measures of central tendency, Dispersion, Skewness and Kurtosis. Moments and their use in studying various characteristics of data

CONTENTS:

Theory

UNIT I

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample, Methods of collection of data. Data: quantitative and qualitative, attributes, variables, scales of measurement: Nominal, ordinal, interval and ratio. Presentation: Tabular, graphical, Histogram and ogives.

UNIT II

Measures of Central Tendency: Mathematical and positional averages. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.

UNIT III

Bivariate data: Definition, scatter diagram, Karl Pearson's correlation coefficient, Calculation of the correlation coefficient for a bivariate frequency distribution, probable error of correlation coefficient, rank correlation coefficient. Linear regression: Regression Coefficient, properties, angle between two lines of regression, principle of least squares and fitting of polynomials and exponential curves.

UNIT IV

Multiple and Partial correlation (3 variables only), properties. Theory of attributes: consistency of data, independence of attributes and association of attributes.

Practical/Presentation::

List of Practical using Excel:

1. Graphical representation of data.

2. Problems based on measures of central tendency.

3. Problems based on measures of dispersion.

4. Problems based on combined mean and variance and coefficient of variation.

5. Problems based on moments, skewness and kurtosis.

6. Fitting of polynomials, exponential curves.

7. Karl Pearson correlation co-efficient.

8. Correlation coefficient for a bi-variate frequency distribution.

9. Lines of regression, angle between lines and estimated values of variables.

10. Spearman rank correlation with and without ties.

11. Problems based on Partial and multiple correlations.

12. Problem based on consistency, independence and association of attributes.

Suggested Readings:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

4. Gupta, S.C., and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, S. Chand Pub. Co. Ltd.

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SEMESTER-I
Course Code: STAT-MIN-1014
Course Paper: Descriptive Statistics
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To summarize the data and to obtain its salient features from the vast mass of original data.

Learning Outcomes:

After completing this course, the students should have developed a clear understanding of: Concepts of statistical population and sample, Methods of collection of data, variables and attributes. Tabular and graphical representation of data based on variables. 'Conditions for the consistency' and criteria for the independence of data based on attributes. Measures of central tendency, Dispersion, Skewness and Kurtosis. Moments and their use in studying various characteristics of data

CONTENTS:

Theory

UNIT I

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample, Methods of collection of data. Data: quantitative and qualitative, attributes, variables, scales of measurement: Nominal, ordinal, interval and ratio. Presentation: Tabular, graphical, Histogram and ogives.

UNIT II

Measures of Central Tendency: Mathematical and positional averages. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.

UNIT III

Bivariate data: Definition, scatter diagram, Karl Pearson's correlation coefficient, Calculation of the correlation coefficient for a bivariate frequency distribution, probable error of correlation coefficient, rank correlation coefficient. Linear regression: Regression Coefficient, properties, angle between two lines of regression, principle of least squares and fitting of polynomials and exponential curves.

UNIT IV

Multiple and Partial correlation (3 variables only), properties. Theory of attributes: consistency of data, independence of attributes and association of attributes.

Practical/ Presentation:

List of Practical using Excel:

1. Graphical representation of data.

2. Problems based on measures of central tendency.

3. Problems based on measures of dispersion.

4. Problems based on combined mean and variance and coefficient of variation.

5. Problems based on moments, skewness and kurtosis.

6. Fitting of polynomials, exponential curves.

7. Karl Pearson correlation co-efficient.

8. Correlation coefficient for a bi-variate frequency distribution.

9. Lines of regression, angle between lines and estimated values of variables.

10. Spearman rank correlation with and without ties.

11. Problems based on Partial and multiple correlations.

12. Problem based on consistency, independence and association of attributes.

Suggested Readings:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

4. Gupta, S.C., and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, S. Chand Pub. Co. Ltd.

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SEMESTER-I
Course Code: STAT-IDC-1014
Course Paper: Descriptive Statistics
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To summarize the data and to obtain its salient features from the vast mass of original data.

Learning Outcomes:

After completing this course, the students should have developed a clear understanding of: Concepts of statistical population and sample, Methods of collection of data, variables and attributes. Tabular and graphical representation of data based on variables. 'Conditions for the consistency' and criteria for the independence of data based on attributes. Measures of central tendency.

CONTENTS:

Theory

UNIT I

Origin and development of Statistical, Definition, Importance and scope of Statistics, Limitations of Statistics. Collection of data: Objectives and Scope of the Enquiry, Sources of information (Data), Method of Data collection, Primary and Secondary data, Choice between Primary and Secondary data, Methods of collecting Primary Data: Direct personal investigation, Indirect oral investigation, Information received through Local Agencies. Mailed Questionnaire method, Schedules sent through Enumerators. Drafting or Framing the Questionnaire. Sources of secondary data. Published Sources, Unpublished sources.

UNIT II

Classification and tabulation: Rules for classification. Frequency distribution: Discrete, grouped and continuous frequency distributions. Basic principles for forming a Grouped frequency distribution: Types of Classes, Number of classes, Size of class intervals, Types of class intervals. Cumulative Frequency Distribution: Less than and more than Cumulative frequency. Tabulation: Meaning and Importance, Requisites of a good Table.

UNIT III

Diagrammatic and Graphic Representation: Introduction, Difference between Diagram and Graphs. General rules for constructing diagrams. Types of Diagrams: One-dimensional Diagrams, Two-dimensional Diagrams, Pictograms and Cartograms. Techniques of Construction of Graphs, General rules for graphing, Graph of frequency distributions, Histogram.

UNIT IV

Average or Measures of Central Tendency: Arithmetic mean, properties, merits and demerits. Median, Merits and demerits of median. Mode, Merits and Demerits of mode. Empirical relationship between Mean, median and mode. Geometric mean and Harmonic mean. Relation between Arithmetic mean, geometric mean and Harmonic mean.

Practical/Presentation:

List of Practical:

1. Diagrammatic representation using line diagram.
2. Diagrammatic representation using simple bar diagram.
3. Diagrammatic representation using sub-divided bar diagram.
4. Diagrammatic representation using multiple bar diagram.
5. Graphical representation using histogram.
6. Graphical representation using frequency polygon.
7. Graphical representation using frequency curve.
8. Graphical representation using ogive.
9. Problems based on Arithmetic mean.
10. Problems based on Median.
11. Problems based on Mode.
12. Problems based on Geometric mean.
13. Problems based on Harmonic mean.

Suggested Readings:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

4. Gupta, S.C., and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, S. Chand Pub. Co. Ltd.

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Course Code: STAT-SEC-1014
Course Paper: Data analysis using Excel
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   Total Marks=100 (T60 + IA20 + P20)

Objectives: To make the students acquainted with computer, which will help the students to use computers in solving different statistical problems. Excel is widely use in statistical analysis. In this course different steps of data processing such as data entry, data editing, data analysis etc. will be discuss using Excel. Demonstration of these topics will be done by using Excel.

Learning Outcomes: After completion of this course the students will be able expected to learn how to use Excel in analysis data. It is expected that students will be more confident while handling the data after completion of the course.

CONTENTS:

Theory

UNIT I:
Introduction to Excel: About Excel & Microsoft, Uses of Excel, Excel software, Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar, the Ribbon, File Tab and Backstage View, Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheets

UNIT II:
Creating Formulas: Using Formulas, Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum. PivotTables: Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data Field, Properties, Displaying a PivotChart, Graphical and Diagrammatical representation using Excel.

UNIT III:
Measurement of different measures of Central Tendency using Excel, Measurement of different measures of Dispersion: range, quartile deviation, mean deviation, standard deviation using Excel.

UNIT IV: Measurement of skewness and kurtosis using Excel. Measurement of Karl Pearson's correlation coefficient correlation coefficient, rank correlation coefficient, Linear regression using Excel.

Practical/ Presentation:

List of Practical using Excel:

1. Graphical representation of data.

2. Problems based on measures of central tendency.

3. Problems based on measures of dispersion.

4. Problems based on combined mean and variance and coefficient of variation.

5. Problems based on moments, skewness and kurtosis.

6. Karl Pearson correlation co-efficient.

7. Correlation coefficient for a bi-variate frequency distribution.

8. Spearman rank correlation with and without ties.

Suggested Readings:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

4. Gupta, S.C., and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, S. Chand Pub. Co. Ltd.

SEMESTER-II
Course Code: STAT-MAJ-2014
Course Paper: Probability and Mathematical Expectation
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To understand the concepts of probability and its applications.

To understand the concept of random variables, probability distributions and expectation.

Different approaches to the theory of probability.

Important theorems on probability and their use in solving problems. Concept of random variables and its probability distributions.

Concept of joint, marginal and conditional probability distribution for two dimensional random variables and their independence.

Univariate transformation and expectation of random variables.

Learning Outcomes:

After completing this course, there should be a clear understanding of:

The fundamental concept of expectation for univariate and bivariate random variables with their distributions and properties.Moment generating function, cumulant generating function and characteristic function. Discrete probability distributions with their properties.Continuous probability distributions with their properties.

Contents:

Theory

UNIT I

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, pair-wise independent events, theorem of total probability, Bayes' theorem and its applications.

UNIT II

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f., p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.

UNIT III

Mathematical Expectation: Expectation of single and bivariate random variables and its properties. Variance and its properties. Covariance. Conditional expectations and conditional variance..

UNIT IV

Generating Functions: Moments and Cumulants, probability generating function, moment generating function, cumulant generating function with their properties.and characteristic function. Uniqueness and inversion theorems (without proof) along with applications.

Practical/ Presentation:

List of Practical

1. **Problems based on unit I.**
2. Problems based on unit II
3. Problems based on unit III
4. Problems based on unit IV

Suggested Readings:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi

SEMESTER-II
Course Code: STAT-MIN-2014
Course Paper: Probability and Mathematical Expectation
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To understand the concepts of probability and its applications.

To understand the concept of random variables, probability distributions and expectation.

Different approaches to the theory of probability.

Important theorems on probability and their use in solving problems. Concept of random variables and its probability distributions.

Concept of joint, marginal and conditional probability distribution for two dimensional random variables and their independence.

Univariate transformation and expectation of random variables.

Learning Outcomes:

After completing this course, there should be a clear understanding of:

The fundamental concept of expectation for univariate and bivariate random variables with their distributions and properties. Moment generating function, cumulant generating function and characteristic function. Discrete probability distributions with their properties. Continuous probability distributions with their properties.

Contents:

Theory

UNIT I

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, pair-wise independent events, theorem of total probability, Bayes' theorem and its applications.

UNIT II

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f., p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.

UNIT III

Mathematical Expectation: Expectation of single and bivariate random variables and its properties. Variance and its properties. Covariance. Conditional expectations and conditional variance..

UNIT IV

Generating Functions: Moments and Cumulants, probability generating function, moment generating function, cumulant generating function with their properties.and characteristic function. Uniqueness and inversion theorems (without proof) along with applications.

Practical/ Presentation:

List of Practical

1. Problems based on unit I.
2. Problems based on unit II
3. Problems based on unit III
4. Problems based on unit IV

Suggested Readings:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi

Course Paper: Probability and Sample Survey
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   Total Marks=100 (T60 + IA20 + P20)

Objectives:

The learning objectives include:

To understand the concepts of probability and its applications.

To understand the concept of random variables, probability distributions and expectation.

Different approaches to the theory of probability.

Important theorems on probability and their use in solving problems. Concept of random variables and its probability distributions.

Univariate transformation and expectation of random variables.

Learning Outcomes:

After completing this course, there should be a clear understanding of:

The fundamental concept of expectation for univariate random variables with their distributions and properties. Discrete probability distributions with their properties. Continuous probability distributions with their properties.

Contents:

Theory

UNIT I

Measures of Dispersion: Introduction and meaning, Absolute and Relative measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and their merits and demerits, Coefficient of variation. Moments, Skewness and Kurtosis.

UNIT II

Correlation: Introduction, Types of correlation, Methods of studying correlation, Properties of correlation, Rank correlation. Regression: Introduction, Linear and non-linear regression, lines of regression, angle between the regression lines, coefficient of regression, properties of regression coefficients.

UNIT III

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability, addition rule of probability and Conditional Probability, multiplicative law of probability (only statements) and applications

UNIT IV

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables. Mathematical Expectation: Expectation of single random variables and its properties.

Practical/ Presentation:

List of Practical

1. Problems based on unit I.
2. Problems based on unit II
3. Problems based on unit III
4. Problems based on unit IV

Suggested Readings:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi

SEMESTER-II
Course Code: STAT-SEC-2014
Course Paper: Statistical Computing Using R Programming
PAPER CREDIT: 04 (3T+1P)

Total No. of Lectures: 45L + 15P   **Total Marks=100 (T60 + IA20 + P20)**

Objectives:

The learning objectives include:

To make the students acquainted with computer, which will help the students to use computers in solving different statistical problems. R is widely use in statistical analysis and knowledge of these languages is must for the students to cope up with the world of data analysis. In this course different steps of data processing such as data entry, data editing, data analysis etc. will be discuss using R. Demonstration of these topics will be done by using R.

Learning Outcomes:

After completion of this course the students will be able expected to learn how to use R in analysis data. It is expected that students will be more confident while handling the data after completion of the course.

Contents:

Theory

UNIT I:

Introduction to R, history of R, pros and cons of R, R-studio, R as a calculator, R as a statistical software and language, downloading and installing R, commands, objects and functions, using scripts, the R workspace, installing packages, getting help. Methods of data input, data accessing and indexing, built-in functions, importing data into R, matrix operations in R.

UNIT II:

Descriptive statistics using R, measures of central tendency, measures of dispersions, measures of skewness and kurtosis, correlation and tabulation of data. Handling categorical data with R.

UNIT III:

Visualization of data : standard plot function, arguments, construction of scatter plot, barplot, pie graph, histogram, boxplot, multiple bar diagram etc., visualization of data by using R packages such as ggplot.

UNIT IV:

Statistical Inference :exploring assumptions using R, different parametric and non parametric statistical tests. Linear Models using R – Simple Regression, ANOVA, ANCOVA.

Practical/ Presentation:

List of Practicals:

1. Matrix addition, subtraction, multiplication Transpose and Trace using R.
2. visualization of data by using R packages such as ggplot.
3. Roots of a quadratic equation using R
4. Mean Median and Mode of a Grouped Frequency Data.
5. Variance and coefficient of variation of a Grouped Frequency Data.
6. Multiple and Partial correlation using R.

7. Fitting of lines of regression using R.

8. Chi-square contingency table using R.
9. t-test for difference of means using R.
10. Paired t-test using R.
11. F-ratio test using R.

Suggested Readings:

. 1. Purosit S.G., Gore S.D., Deshmukh S. R. (2008), Statistics using R, Narosa Publishing House

2. Field, A., Miles J., Field Z.(2012), Discovering Statistics Using R, SAGE

3. Dalgaard P.(2002), Introductory Statistics with R, Springer

4. Cohen Y. and Cohen J. Y. (2007), Statistics and Data with R, An Applied Approach Through Examples, Wiley

5. Braun W. J. and Murdoch D. J. (2009) A First Course in Statistical Programming with R, Cambridge