

Scheme of Studies

Associate Degree in Science
Combination-IV
(General Math, Computer & Statistics)

Semester-I

Sr.No	Course Code	Course Title	Crd. Hrs		
			Theory	Lab.	Total
1	ENG-1107	Functional English (C1)	3	0	3
2	ISL-1112/ ETH-1112	Islamic Studies/Ethics (C2)	2	0	2
3	MAT-1115	Calculus-I (Ma1, F1)	3	0	3
4	STA-1101	Statistics-I (S1, M1)	3	1	4
5	ARA-1101	Arabic (C3)	3	0	3
Total			14	1	15

ENG-1107

ENGLISH-I (Functional English)

Credit Hrs: 03

Basics of Grammar, Parts of speech and use of articles, Sentence structure, active and passive voice, Practice in unified sentence, Analysis of phrase, clause and sentence structure, Transitive and intransitive verbs, Punctuation and spelling, Comprehension: Answers to questions on a given text, Discussion: General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students), Listening: To be improved by showing documentaries/films carefully selected by subject teachers, Translation skills: Urdu to English, Paragraph writing: Topics to be chosen at the discretion of the teacher, Presentation skills: Introduction. **Note:** Extensive reading is required for vocabulary building

RECOMMENDED BOOKS

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506
3. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-4
4. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

ISL-1112

ISLAMIC STUDIES

Credit Hrs: 03

Fundamental of Islam, Tauheed: Arguments for oneness of God, impact of Tauheed on human life, place of man in the universe, purpose of creation, textual study of Surah al- Rehman and Surah al- Furqan, Prophethood, need for prophet, characteristics of a prophet, finality of prophethood, seerat; life of prophet as embodiment of Islamic ideology, faith in hereafter aakhirat, effects of belief on worldly life. Ibadah: Concepts of Ibadah, Salat, Saom, Zakat, Hajj and jehad. The Holy Quran: Its revelation and compilation, The authenticity of the text, Hadith: Its need, authenticity and importance. Consensus (Ijma), analogy (Qiyas). Sources of Knowledge: Islamic approach to institution, Reason and experience. Revelation Wahi as a souce knowledge. Moral and social Philosophy of Islam: The concept of good and evil, Akhlaq -e- Hasna with special reference to surah Al- Hujrat, Professional Ethics Kasb-e- Halal. Islamic Political Principles: Salient feature of the Islamic state, Madina character, Responsibilities of the Head of the state, Rights and Duties of Citizens. Economics Oder of Islam: Right to property, System of Taxation, Distribution of Wealth Zakat and Ushar, Interest Free Economy Shirakat and Muzarabat. Islam as Living Force: Application of Islam Teaching to Socio- Economic Development in the 20th Century.

RECOMMENDED BOOKS

1. Muhanmmad, H. "Emergence of Islam", IRI, Islamabad.
2. Muhanmmad, H. "Muslim Conduct of State"
3. Muhanmmad, H. "Introduction to Islam"
5. Hussan, H. H. "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.

6. Hasan, A. "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)

7. Mir, W. 1982. "Muslim Jurisprudence and the Quranic Law of Crimes"

Islamic Book Service.

8. Bhatia, H.S. 1989. "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi.

9. Muhammad, Zia-ul-Haq. 2001. "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad.

MAT-1115

CALCULUS-I

Credit Hrs: 03

Introduction, real numbers, intervals, absolute values and its properties, coordinates planes and graphs, lines, functions, operation on functions, graph of functions, shifting of graph limits, continuity, graphical and analytical approach. The derivatives, geometrical meanings of derivatives, tangent lines and rate of changes. Derivatives of Trigonometric functions, inverse trigonometric functions, the chain rules, implicit differentiation, differential derivative of hyperbolic, inverse hyperbolic, logarithmic, exponent function, first order differential equation and application, increase and decrease, concavity relative extrema, first and second derivatives test, Maximum and minimum of a function, applied maximum and minimum problem, L' hospital rules integration, basic rules of integration, formula of integration, integration by parts, by substitutions, partial fraction definite integrals, Riemann sur theorems of definite integral, first and second fundamental theorems of calculus definite integral with property areas between curves, Disk and washer, volumes by cylindrical shell and slicim length of plane curves, Area of surface of revolution, First order differential equation and applications, Roll's theorem, mean values theorem and its application, improper integral, convergent and divergence of integrals, straight line in R3, Planes, Cylindrical and Spherical coordinate surfaces, cylinders and cones, sphere, spherical trigonometry.

RECOMMENDED BOOKS

1. Calculus and analytical Geometry, by Thomas & Finny. 10th Edition.
2. Calculus & Analytical Geometry, by Howard anton, 7th Edition
3. Calculus & Analytical Geometry, by S.M. Yosuf.
4. Calculus & Analytical Geometry, by SkowSky. 6th Edition.

STA- 1101: INTRODUCTORY STATISTICS

Learning Objectives:

1. To have introduction of statistics as a field of knowledge and its scope and relevance to other disciplines of natural and social sciences.
2. To equipped and prepare students for advance courses in the field of statistics.
3. To achieve the capability of critical thinking about data and its sources; have idea about variables and their types and scale measures.
4. Be able to calculate and interpret descriptive statistics (able to classify, tabulate, describe and display data using software).

Learning Outcomes:

1. Acquire the basic knowledge of the discipline of Statistics.
2. Understand and differentiate between the types of data and variables.
3. Evaluate and Interpret basic descriptive statistics. Display and Interpret data graphs.

Course Contents:

The nature and scope of the Statistics, Variables and their types, Data and its sources, Scales of measurements, Tabulation and classification of data, Graphs and Charts: Stem-and leaf diagram, Box and Whisker plots and their interpretation. Measures of Central Tendency, Quantiles, Measures of Dispersion: Their properties, usage, limitations and comparison. Moments, Measures of Skewness and Kurtosis and Distribution shapes. Rates and ratios, Standardized scores.

Index numbers: construction and uses of index numbers, un-weighted index numbers (simple aggregative index, average of relative price index numbers), weighted index numbers (Laspayer's, Paasche's and Fisher's ideal index numbers), Consumer price index (CPI) and Sensitive Price Indicators

Recommended Books:

1. Clark, G.M. and Cooke, D. (2011). "A Basic Course in Statistics", 5th edition, Arnold, London.
2. Ross, S. M. (2010). "Introductory Statistics", 3rd edition, Academic Press USA.
3. Mann, P. S. (2010) Introductory Statistics. Wiley.
4. Spiegel, M.R., Schiller, J.L. and Sirinivasan, R.L. (2012). "Probability and Statistics", 4th edition, Schaums Outlines Series. McGraw Hill. NY.
5. Walpole, P.E. Myers, R.H., Myers S.L. (2012). "Probability and Statistics for Engineers and Scientists", 9th edition, Prentice Hall.
6. Zaman, A. (2016), "Introduction to Statistics" Online access for book and related data sets.

a. <https://sites.google.com/site/introstats4muslims/textbook>
<https://sites.google.com/site/introstats4muslims/excel>.

ARA-1101

ARABIC

Credit Hrs: 03

الاول الدرس

تعريف فاعل، كى حرف، فعل اسم، مثال بين اسد تعامل، ك ان اشارات اسماء معانى ال فاعل، عربى *
مثال بين

امثلة واسد تعامل ك ا ب ل، ن عم، اسد تفهيم، ك ل مات *

الثانى الدرس

مشق اسد تعامل، م بين جملا عربى متصله ضمائر اق سام كى ضمائر معانى، ال فاعل *

ال ثلاث ال درس

ام ثلہ تہ عریف۔ ، اضافی مرکب ام ثلہ و تہ عریف فات کی نہ فی حروف لہ یست، لالہ یس، معانی ال فاض، *
مشق تہ رجمہ، جملے، عربی

ال سادس ال درس

مشق، م ثلہ میں اور مکسر جمع قواعد م ثلہ میں اور اقسام کی جمع جمع واحد، *

ال سابع ال درس

مشق ام ثلہ، ماضی، وفعل قواعد م ثلہ میں کی ماضی فعل کی لمات تہ عریف ماضی، فعل *

ال ثامن ال درس

مشق مکالمہ۔ مضارع، فعل قواعد ام ثلہ و مضارع، فعل کی لمات مضارع، فعل *

ال تاسع ال درس

مشق م ثلہ ہیں۔ و مصدنف فعل قواعد ام ثلہ و مصدنف فعل کی لمات و مصدنف فعل *

ال عاشر ال درس

مشق قواعد، م ثلہ ہیں۔ معتل، فعل صدیح، فعل کی لمات معتل، فعل صدیح، فعل *

ال حادی ال درس

مشق الخمس تہ، اسماء م ثلہ ہیں۔ موزن، موزن کی لمات موزن، موزن *

ال ثانی ال درس

ام ثلہ و عقود اعداد و قواعد ام ثلہ و اعداد اعداد *

ال ثلاث ال درس

ام ثلہ ای کی م لاسد تعما کا ان اور کی م ای *

ال رابع ال درس

جملے م ثلہ میں، کی لمات فاعل، اسم *

ال خامس ال درس

م ثلہ میں جملے، الاجسام اعضاء *

ال سادس ال درس

ام ثلہ و کی لمات *

ال سابع ال درس

فعلیہ جملہ و اسمیہ جملہ *

ال ثامن ال درس

الحروف مخارج قمریہ، شمسیہ، حروف حلقی، حروف مدہ حروف الہجاء، حروف *

ال تاسع ال درس

ضد تہ الامر ال ضیاء، اجمل ما، دُعا الامذ تارہ ناشد ید الا *

پاکستان آباد اسلام یونورسٹی اوپن ایف بال علامہ العربی۔ ال لسان بک ٹریکسٹ

Semester-II

Sr. No	Course Code	Course Title	Crd. Hrs		
			Theory	Lab.	Total
1	ENG-1207	Composition & Comprehension (C4)	3	0	3
2	COM-1205	Introduction to Computer (C5)	2	1	3
3	MAT-1215	Calculus-II (Ma2, F2)	3	0	3
4	STA-1202	Statistics-II (S2, M2)	3	1	4
5	COM-1201/ STA-1220	Programming Fundamental /Statistics (E1)	3	1	4
Total			14	3	17

COM-1205**INTRODUCTION TO COMPUTING****Credit Hrs: 03**

Brief history of computers and their applications, Major, components of a computer (CPU and Memory, Data storage devices, Input/Output devices), Software (Standards, Application software, System software, Standard options, Windows, Linux and Macintosh) Computers Networks, Telecommunication basics, The Internet and the World Wide Web, Web Pages, Intro to Information Systems in Business, Office automation tools, Word processing, Graphic packages, Databases and Spreadsheets, Current trends in research and future prospects, Legal and moral aspects of Computer Science, Presentation Software etc.

RECOMMENDED BOOKS

1. Meta, Toledo, Roman, Schaum's Outline of Introduction to Computer Science, McGraw Hill, Book Company, 2000
2. Kelly, Julia, Nelson, Stephan L., Office XP The Complete Reference, McGraw Hill Book Company, 2001.
3. Joseph, Rubin, Excel 2007, CPA Company, 2007
4. Michael, Halvorson, Microsoft XP 2000, Microsoft Press Washington, 2007.

MAT-1215**CALCULUS-II****Credit Hrs: 03**

Sequences, Monotone sequences, convergence of sequence, infinite series, partial sum, convergence test Alternating sequence, conditional convergence, Power series Taylor's and Maclaurin's series, differential and integration of series. Arc length in polar, Cartesian, parametric curves, surface area, area in polar and Cartesian form of curves. Area of revolution in polar and Cartesian forms. Conversion of systems, Unit tangent and normal Vectors, Curvature and radius of Curvature, Motion along a curve. Function of several variables, homogeneous function Euler theorem, Partial derivatives, Laplace equation. Differentiability and chain rules, Tangent planes, total differential, Directional Derivatives Gradient of two functions Function of n- Variables maxima and minima of two functions Lagrange Multipliers Double integral, triple integrals Centroid, center of Gravity, Total mass. Triple integrals, Jacobians, triple integrals in cylindrical and Spherical coordinates. Introduction to conic section, rotation of axes, Parabola, Ellipse, Hyperbola, Sketching of conics Volumes of Surfaces, complex numbers: DeMoivre's theorem and its applications, Complex functions, analytical functions, harmonic and conjugate, harmonic functions, Cauchy- Rehmunn equations (in Cartesian and polar coordinates). Line integrals, Green's theorem, Cauchy' theorem, Chauchy's integral formula, singularities, poles, residues and contour integration and applications.

RECOMENDED BOOKS

1. Calculus & Analytical Geometry, by Thomas & Finny, 10th Edition
2. Calculus & Analytical Geometry, by Howard Anton, 7th Ed
3. Calculus & Analytical Geometry, by S.M. Yousaf
4. Calculus & Analytical Geometry, by Skowsky, 6th Edition.

STA- 1202: Introduction to Probability Theory

Learning Objectives:

1. Understand basic concepts of probability, conditional probability, independence etc.
2. Be familiar with some of the more commonly encountered random variables, particularly the Binomial and Normal random variable.
3. Be able to calculate first two moments of common random variables i.e. means and variances.
4. Be able to apply the concepts of random variables to scientific applications. Computation of uncertainty using probability techniques.

Learning Outcomes:

1. Acquire the basic knowledge of probability and probability distribution.
2. Understand the concepts of basic techniques of measuring the uncertainty problem.
3. Analyze the problem of genetics finance and telecommunications by using probability techniques.

Course Contents:

Set theory and its operations, Probability Concepts, Addition and Multiplication Rules, Bivariate Frequency Tables, Joint and Marginal Probabilities, Conditional Probability and Independence, Bayes' Rule. Random Variables, Discrete Probability Distribution, Mean and Variance of a Discrete Random Variable, Bernoulli Trials, Properties, Applications and Fitting of Binomial, Poisson, Hypergeometric, Negative Binomial and Geometric Distributions. Continuous Random Variable, Probability Density Function and its Properties, Normal Distribution and its Properties, Standard Normal Curve.

Recommended Books:

1. Cacoullos, T. (2012). *Exercises in probability*. Springer Science & Business Media.
2. Mclave, J.T., Benson, P.G. and Snitch, T. (2005) "*Statistics for Business & Economics*" 9th Edition. Prentice Hall, New Jersey.
3. Santos, David (David A.) (2011). *Probability: an introduction*. Jones and Bartlett Publishers, Sudbury, Mass 20.
4. Walpole, P.E. Myers, R.H., Myers S.L. (2012). "Probability and Statistics for Engineers and Scientists", 9th edition, Prentice Hall.

COM-1201

Programming Fundamental

Credit Hrs: 04

Course Outline: This course covers overview of Computer Programming, Principles of Structured and Modular Programming, Overview of Structured Programming Languages, Algorithms and Problem Solving, Program Development: Analyzing Problem, Designing Algorithm/Solution, Testing Designed Solution, Translating Algorithms into Programs, Fundamental Programming Constructs, Data Types; Basics of Input and Output, Selection and Decision (If, If-Else, Nested If-

Else, Switch Statement and Condition Operator), Repetition (While and For Loop, Do-While Loops), Break Statement, Continue Statement, Control Structures, Functions, Arrays, Pointers, Records, Files (Input-Output), Testing & Debugging.

Recommended Textbooks

1. C How to Program, Paul Deitel and Harvey Deitel, Prentice Hall; 7th edition (March 4, 2012)
2. Programming in C, Stephen G. Kochan, Addison-Wesley Professional 4th edition (September 25, 2013). ISBN-10: 0321776410
3. Java How to Program, Paul Deitel and Harvey Deitel, Prentice Hall; 9th edition (March, 2011)
4. C++ How to Programme, Paul Deitel and Harvey Deitel, Prentice Hall; 9th edition (February, 2013)..

Semester-III

Sr.No	Course Code	Course Title	Crd. Hrs		
			Theory	Lab.	Total
1	PS-2317	Pakistan Studies (C6)	2	0	2
2	COM-2302	Object Oriented Programming (Com1, M3)	2	1	3
3	STA-2303	Statistics-III (S3, M4)	3	1	4
4	MAT-2315	Linear Algebra (Ma3,M5)	3	0	3
5	ENG-2307	Communication Skills (C7)	3	0	3
6	COM-2303/ STA-2320	Computer Architecture and Organization /Statistics (E2)	3	0	3
Total			17	2	18

An overview of the British Rule in the sub-continent, two nation theory & role of Sir Sayyed for the revival of Muslims, major political organization (congress muslim league), Constitutional reforms, Constitutional & political struggle (separate electrolate, Lucknow Pact), Tehrik –e-Khilafat, Nehru Report, Jinnah’s 14 point, e-Allah Abad Address 1930, Round table conferences, Election of 1937 and Congress Minstries, Pakistan Moment (194047), Crips proposal 1942, Wavell plane and shimla conference 1945, Election of 1945-46, Cabinet mission plan 1946, 3rd June plane and Red cliff award, Pakistan's Immediate Problems: Administrative problems, problems of Refuges, Problems of Accession of states(Kashmir, Hyderabad, June Garh), Distribution of Assets, Canal Water dispute, political and constitutional Development, Hurdles of Constitution Making, 1956 constitution, Islamic clauses) 1962 constitution (Islamic clauses) and Ayub Era, Yahya Regime and first General election 1970, Bhutto in power 1973 constitution (Islamic clauses), Zia government steps for Islamization, Era of Democracy (1988-1999), Pakistan’s foreign policy: Relations with USA, Soviet union, Relations with neighboring countries (India, china, Iran, Afghanistan), Relations with Saudi Arabia and Turkey, Pakistan and International Organizations (UNO, OIC, ECO,SAARC), M.D. Zafar, Pakistan studies, Aziz Book Depot Urdu Bazaar Lahore.

RECOMMENDED BOOKS

1. Sheikh Muhammad Rafique, Pakistan studies, urdu Bazar Lahore
2. Sheikh Muhammad Rafique, History of Pakistan, urdu Bazar Lahore.

Course Code: COM-2302

Object-Oriented Programming

Credit Hrs: 03

Course Outline:

Evolution of Object Oriented Programming (OOP), Object Oriented concepts and principles, problem solving in Object Oriented paradigm, OOP design process, classes, functions/methods, objects and encapsulation; constructors and destructors, operator and function/method overloading, association, aggregation, composition, generalization, inheritance and its types, derived classes, function/method overriding, abstract and concrete classes, virtual functions, polymorphism, exception handling.

Text and Reference Books:

1. Object Oriented Programming in C++ by Robert Lafore
2. An Introduction to Object-Oriented Programming with Java, C. Thomas Wu (2010). 5th Edition. McGraw-Hill. ISBN: 9780073523309
3. Java: How to Programme, 5/e, Deitel and Deitel, Prentice Hall, 0131016210/ 0131202367 International Edition.
4. Ivor Horton’s Beginning Java, 7/e, Ivor Horton
5. C++: How to Programme, Deitel and Deitel, 5/e, Pearson.

STA- 2303: Basic Statistical Inference

Learning Objectives:

1. To understanding of basic techniques of sampling and estimation, their properties and application
2. To select a sample from a given population and use it to make inferences about the population and its parameter
3. To test, deduce and infer the validity of different types of hypotheses and models built on the basis of the raw data collected in diverse problem-situations.

Learning Outcomes:

1. Acquire the knowledge of the sampling distributions and their properties.
2. Derive the appropriate estimators for parameters using best estimation procedure.
3. Use appropriate sampling distributions for interval estimation and hypotheses testing.
4. Apply appropriate inferential procedures to handle the practical situations.

Course Contents:

Sampling and sampling distribution of sample mean, proportion, difference between means and difference between proportions; Point and interval estimate properties of good point estimator; Testing of hypothesis for population mean, difference between population means and population proportion and difference between two population proportions, difference between means for paired data; Single population variance, ratio of two variances; Non-parametric methods: The sign test, Wilcoxon's signed rank test, Mann-Whitney U test, Median test, Run test, Kolmogorov-Smirnov test, Kruskal-Wallis test, Median test for k-samples, Friedman test.

Recommended Books:

1. Ross, S. (2019). *A first course in Probability*. 10th edition. Pearson Education Limited.
2. DeGroot, M. Schervish, M. (2017). *Probability and Statistics*. 4th edition. Pearson Education Limited.
3. Srivastava, M.K., Khan, A.H. and Srivastava, N. (2014). *Statistical Inference: Theory of Estimation*. Prentice-Hall of India Pvt. Ltd
4. Clark, G.M. and Cooke, D. (2011). "A Basic Course in Statistics", 5th edition, Arnold, London.
5. Mclave, J.T., Benson P.G. and Sincich, T. (2014). "Statistics for Business and Economics". 12th edition, Pearson Education Ltd, U.K.
6. Spiegel, M.R., Schiller, J.L. and Sirinivasan, R.L. (2015). "Probability and Statistics". 3rd edition, Schaums Outlines Series. McGraw-Hill. NY.

MAT-2315

LINEAR ALGEBRA

Credit Hrs: 03

System of Linear Equations: Basic concepts. Standard matrix form, Inverse of matrix, Matrix operations, Elementary row and column operation Echelon & Reduce Echelon form System of homogeneous & non-homogeneous linear equations (Gauss Elimination and Gauss-Jordan). Application of linear equations, Linear Dependence & Independence sets of vectors, Linear Transformations. Vector spaces: Definitions, Properties of vector spaces, vector spaces and subspaces, Basic, Dimensions of vector space, Eigen vector & Eigen value, Characteristic Equations, Eigen vectors and Linear Transformations, Inner Product, Length and Orthogonality sets, Gram Schmidt process, Inner Product Spaces.

RECOMMENDED BOOKS

1. Linear algebra and its application (3rd edition) by David C. Lay.
2. Advance Engineering Mathematics by Ervin KAREYZIG, 9th Edition.
3. Elementary Linear Algebra (8th edition) by ANTON.

ENG-2307

ENGLISH-III (Communication Skills)

Credit Hrs: 03

Paragraph writing, Practice in writing a good, unified and coherent paragraph, Essay writing, Introduction, CV and job application, Translation skills, Urdu to English, Study skills, Skimming and scanning, intensive and extensive, and speed reading, summary, and précis writing and comprehension, Academic skills, Letter/memo writing, minutes of meetings, use of library and internet, Presentation skills, Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review.

RECOMMENDED BOOKS

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.
2. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
3. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
4. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills.

Third Impression 1991. ISBN 0 19 453403 0. 5. Reading and Study Skills by John Langan

6. Study Skills by Richard Yorky.

COM-2303

Computer Architecture and Organization

Credit Hrs: 03

Course Outline: The design of computer systems and components. Processor design, instruction set design, and addressing; control structures and microprogramming; memory management,

caches, and memory hierarchies; and interrupts and I/O structures. Pipelining of processor Issues and Hurdles, exception handling, Parallelism, Multiprocessor Systems.

Text Book & Reference Material:

1. Computer Architecture: A Quantitative Approach by Hennessy & Patterson, Morgan & Kauffman Series (2006) 4th Edition.
2. Computer Organization & Design: The Hardware/Software Interface By Patterson & Hennessy, Morgan & Kauffman Series (2008) 4th Edition.

STA-2320

PROBABILITY AND STATISTICS

Credit Hrs: 03

Objective:

This course is to introduce the notions of probability and statistics to enable students to apply in the deferent fields of actions in physics. The concepts of data preparation and analysis is the key feature of this course.

What is Statistics? Definition of Statistics, Population, sample Descriptive and inferential Statistics, Role of statistics in physics, Observations, Data, Discrete and continuous variables, Errors of measurement, Significant digits, Rounding of a Number, Collection of primary and secondary data, Sources, Editing of Data. Exercises. Presentation of Data Introduction, basic principles of classification and Tabulation, Constructing of a frequency distribution, Relative and Cumulative frequency distribution, Diagrams, Graphs and their Construction, Bar charts, Pie chart, Histogram, Frequency polygon and Frequency curve, Cumulative Frequency Polygon or Ogive, Histogram, Ogive for Discrete Variable. Types of frequency curves.

Exercises. Measures of Central Tendency: Introduction, Deferent types of Averages, Quintiles, The Mode, Empirical Relation between Mean, Median and mode, Relative Merits and Demerits of various Averages. Properties of Good Average, Box and Whisker Plot, Stem and Leaf Display, definition of outliers and their detection. Exercises. Measures of Dispersion Introduction, Absolute and relative measures, Range, The semi-Inter-quartile Range, The Mean Deviation, The Variance and standard deviation, Change of origin and scale, Interpretation of the standard Deviation, Coefficient of variation, Properties of variance and standard Deviation, Standardized variables, Moments and Moments ratios. Exercises. Regression and Correlation: Introduction, cause and effect relationships, examples, simple linear regression, estimation of parameters and their interpretation. r and R^2 . Correlation. Coefficient of linear correlation, its estimation and interpretation. Multiple regression and interpretation of its parameters. Examples. Probability and Random Variable.: Introduction to probability, sample Space, Events, Laws of probability with their applications, Conditional probability, dependent and independent events, Bays theorem and its applications. Random variable discrete and continuous random variable with their application. Mathematical Expectation, Mean, Variance etc. Statistical Packages and data analysis. SPSS software, Data analysis on excel and E Views etc.

Recommended Books:

1. R.E. Walpole, Introduction to Statistics. Macmillan Publishing Co., Inc. New York, 3rd Ed, 1982.
2. F. Muhammad, Statistical Methods and Data Analysis, Kitab Markaz, Bhawana Bazar Faisalabad, 2005.

3. B L Agarwal, Basic Statistics? New Age International, 2006. 4. Carver, Nash, Doing Data Analysis with SPSS version 14.

Semester-IV

Sr.No	Course Code	Course Title	Crd. Hrs		
			Theory	Lab.	Total
1	COM-2404	Database Systems (Com2, M6)	3	1	4
2	MAT-2415	Differential Equations (Ma4, M7)	3	0	3
3	STA-2404	Statistics-IV (S4, M8)	3	1	4
4	COM-2405	Operating Systems (Com3, M9)	3	0	3
5	*SUB-2499	Project	4 or	4	4
	MAS-2415	Or Mathematics Statistics	3	1	
	COM-2406	Or Data Structure and Algorithms	3	1	
Total			16	2	18

***SUB (MAT or STA or COM)**

Course Code: COM-2404

Database System

Credit Hrs: 04

Course Outline:

Basic database concepts, Database Architecture, DB Design Life Cycle, Schema Architecture, Conceptual, Logical and physical database Modeling and design, Entity Relationship diagram (ERD), Enhanced ERD, Relational data model, mapping ERD to relational model, Functional dependencies and Normalization, Relational Algebra, Structured Query language (SQL), Transaction processing, concurrency control and recovery techniques, Query optimization concepts.

Text Book & Reference Material:

1. Database Systems A Practical Approach to Design, Implementation, and Management, 4th Edition, Thomas Connolly, Carolyn Begg, Addison Wesley, 2005.
2. Modern Database Management by Fred McFadden, Jeffrey Hooper, Maryth Prescott, Prentice Hall; 11 Edition (July 26, 2012). ISBN-10: 0132662256
3. Fundamentals of Database Systems by R. Elmasri and S. Navathe. 6th Edition, Addison-Wesley (2010). ISBN-10: 0136086209.
4. Database Design and Relational Theory: Normal Forms and All That Jazz by C. J. Date, O'Reilly Media; 1st Edition (April 24, 2012). ISBN-10: 1449328016.

MAT-2403

DIFFERENTIAL EQUATIONS

Credit Hrs: 03

Introduction to ODEs (physical motivation), First order ODEs (separate variables, homogeneous equations, exact equations, linear equations, Bernoulli equation and other examples), applications of first order ODEs linear and non-linear, linear differential equations of higher order (initial value and boundary value problems, linear dependence and independence, solutions of linear equations, constructing a second solution from a known solution, homogeneous linear equations with constant coefficients, undetermined coefficients, variation of parameters), applications of second order ODEs (simple harmonic equation, damped and forced oscillators, electrical circuits and springs), differential equations with variable coefficients (Cauchy-Euler equation, power series solution of differential equation- solutions about ordinary and singular points-Legendre's and Bessel's equations as examples), Laplace transform (Laplace transform and its inverse properties, use in solving differential equations, Dirac function).

RECOMENDED BOOKS

1. D. G. Zill and M. R. Cullen, Differential equations with boundary value problems, 3rd Ed., National Book Foundation.
2. E. Kreyszig, Advanced engineering mathematics, Jhon Wiley, 8th

3. K. F. Riley, M. P. Hobson and S. J. Bence, *Mathematical Methods for Physicists*, Cambridge University Press 2006.

STA-2404: Introduction to Regression and Analysis of Variance

Learning Objectives:

1. To provide foundations of regression analysis.
2. To provide basic knowledge and art of statistical data analysis
3. To predict and draw inference about the parameters of the parameters of population.

Learning Outcomes:

1. Explore more adequately the connection between theories of regression.
2. Analysis of real world problems.
3. Prediction of dependent variable.

Course Contents:

Relationship between variables, Simple linear regression model, Estimation of parameters by method of least squares and corresponding variance estimates, Testing and confidence intervals for least squares estimators, mean prediction and individual prediction. Multiple linear regression with two regressors, coefficient of multiple determination, Partial and multiple correlation up to three variables. Inference of simple, partial and multiple correlation coefficients, Analysis of variance for one-way classification and two-way classification. Decomposition of total sum of squares, Multiple comparison tests; least significant difference and Duncan's multiple range test, Tukey test and Least significant difference test.

Recommended Books:

1. Montgomery, D. C., Peck, E. A., and Vining, G. G. (2012). *Introduction to linear regression analysis* (Vol. 821). John Wiley and Sons.
2. Dielman, T. E. (2001). *Applied regression analysis for business and economics*. Pacific Grove, CA: Duxbury/Thomson Learning.
3. Rawlings, J. O., Pantula, S. G., and Dickey, D. A. (2001). *Applied regression analysis: a research tool*. Springer Science and Business Media.

Course Code: COM-2405

Operating Systems

Credit Hrs: 4

Course Outline:

History and Goals, Evolution of multi-user systems. Introduction to the techniques used to implement operating systems and related kinds of systems software. Among the topics covered will be process management (creation, synchronization, and communication); Multi-Threading, processor scheduling; deadlock prevention, avoidance, and recovery; main-

memory management; virtual memory management (swapping, paging, segmentation and page-replacement algorithms); control of disks and other input/output devices; file-system structure and implementation; and protection and security. Lab assignments involving different single and multithreaded OS algorithms.

Text and Reference Books

1. Operating System Concepts, 9th Edition, Silberschatz A., Peterson, J. L., & Galvin P.C. 2012.
2. Modern Operating Systems, 3rd Edition, Tanenmaum A. S., 2008.

Course Code: MAS-2415

Title: Mathematical Statistics

Credit Hrs: 03

Course Outline: The postulates of probability, Some elementary theorems, Addition and multiplication rules, Baye's rule and future Baye's theorem, Random variables and probability functions, Uniform, Bernoulli and Binomial distribution, Hypergeometric and geometric distribution, Negative binomial and Poisson distribution, Uniform and exponential distribution, Gamma and beta distributions, Normal distribution, Moments and moment generating functions Moments of binomial, hypergeometric, Poisson, gamma, beta and normal distributions

Text and Reference Books

1. M. H. De-Groot and M. J. Schervish, *Probability and Statistics*, 3rd Edition, Addison Wesley, 2002.
2. A. Papoulis, *Probability, Random Variables, and Stochastic Processes*, 3rd Edition, Mc-Graw Hill, 1991.
3. T. Sincich, *Statistics by Examples*, Dellen Publishing Company, 1990.
4. A. S. Hirahi. *A Course in Mathematical Statistics*, 4th Edition, Ilmi Kitab Khana, Lahore, Pakistan, 2012.
5. S. M. Chaudhry and S. Kamal, *Introduction to Statistical Theory Part-II*, Ilmi Kitab Khana, Lahore, Pakistan, 2012.

COM-2406

Data Structures and Algorithms

Credit Hrs: 04

Introduction to Data Structures and Algorithms; Complexity Analysis; Arrays; Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Shell Sort, Heap Sort, Quick Sort, Merge Sort, Radix Sort, Bucket Sort; Linked Lists: Singly Linked Lists, Doubly Linked Lists, Circular List; Stacks, Queues, and Priority Queue; Recursion: Function call and Recursion Implementation, Tail Recursion, Non-tail Recursion, Indirect Recursion, Nested Recursion, Backtracking. Trees: Binary Trees, Binary Heap, Binary Search. Tree Traversal, Insertion, Deletion, and Balancing a Tree; Heap; B-Tree; Spanning Tree, Splay Trees; Graphs: Representation, Traversal, Shortest Path, and Cycle Detection; Isomorphic Graphs; Graph Traversal Algorithms; Hashing; Memory Management and Garbage Collection.

RECOMMENDED BOOKS

1. Data Structures and Algorithm Analysis, Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition)
2. Algorithms , Robert Sedgewick, Princeton University Publisher: Addison- Wesley Professional (latest Edition)
3. Data Structures: Abstraction and Design Using Java, Koffman and Wolfgang, Wiley; 2nd Edition (or latest Edition), 2010

ENG-2301

ENGLISH-II

Credit Hrs. 03

Objectives: To enable the students to write a research paper / technical report in a succinct manner according to a specified format.

Presentation skills, Essay writing, Descriptive, narrative, discursive, argumentative, Academic writing
How to write a proposal for research paper/ term paper. How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency), Technical Report writing, Note:
Extensive reading is required for vocabulary building

Recommended Books:

1. R. White, Writing. Advanced, Oxford Supplementary Skills. Third Impression 1992. (Particularly suitable for discursive, descriptive, argumentative and report writing).
2. J. Langan. College Writing Skills, McGraw-Hill Higher Education. 2004.
3. L. G. Kirszner and S. R. Mandell. Patterns of College Writing, 4th edition St. Martin's Press.
4. The Mercury Reader. A Custom Publication. Compiled by northern Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Russett and Maurice Scharon.