DAV UNIVERSITY JALANDHAR

Course Scheme & Syllabus

For

B.Sc. (Hons.) Economics
(Program ID-183)

Ist TO 6th SEMESTER Examinations

2018–2019 Session Onwards

Syllabi Applicable For Admissions in 2018

Scheme of Courses (Program ID-183)
B Sc (Hons) In Economics

Category of Course	**No of Courses**	**Credit Per course**	**Total Credits**
Core Discipline	16	4	64
Skill Enhancement Course (SEC)	5 1 1 2	4 3 1 5	34
Ability Enhancement Course (AEC)	1 2 1 1	4 3 1 2	13
Discipline Specific Elective (DSE)	7	4	28
Interdisciplinary General Elective (IGE)	1	4	4
Dissertation/Project	-	-	-
		TOTAL	**143**

Scheme of B.Sc (Hons.) Economics

Semester 1

S. No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO105	Microeconomics-1	4	0	0	4	Core Discipline
2	ECO106	Macroeconomics-1	4	0	0	4	Core Discipline
3	ECO107	Mathematics for Economists-1	4	0	0	4	Core Discipline
4	ECO108	Statistics-I	4	0	0	4	Core Discipline
5	ENG151A	Basic Communication Skills	3	0	0	3	Ability Enhancement Course (AEC)
6	ENG152	Basic Communication Skills Lab	0	0	2	1	Ability Enhancement Course (AEC)
7	CSA151	Computer Applications in Business	3	0	0	3	Skill Enhancement Course (SEC)
8	CSA153	Computer Applications in Business	0	0	2	1	Skill Enhancement Course (SEC)
						24	

Semester 2

S.No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO109	Microeconomics-II	4	0	0	4	Core Discipline
2	ECO110	Macroeconomics-II	4	0	0	4	Core Discipline
3	ECO111	Mathematics for Economists-II	4	0	0	4	Core Discipline
4	ECO112	Statistics-II	4	0	0	4	Core Discipline
5	CSA105	Principles of Programming and Algorithms using C	4	0	0	4	Skill Enhancement Course (SEC)
6	CSA108	C Programming Laboratory	0	0	4	2	Skill Enhancement Course (SEC)
7	ENG351	Technical Communication	3	0	0	3	Ability Enhancement Course (AEC)
						25	

Semester 3

S.No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO205	Microeconomics-III	4	0	0	4	Core Discipline
2	ECO206	Macroeconomics-III	4	0	0	4	Core Discipline
3	ECO207	Mathematics For Economists-III	4	0	0	4	Core Discipline
4	ECO208	Statistics-III	4	0	0	4	Core Discipline
5	EVS100	Environmental Studies	4	0	0	4	Ability Enhancement Course (AEC)
6	CSA203	Database concepts	4	0	0	4	Skill Enhancement Course (SEC)
7	CSA207	Database concepts Laboratory	0	0	4	2	Skill Enhancement Course (SEC)
						26	

Semester 4

S. No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO211	Development Economics	4	0	0	4	Core Discipline
2	ECO212	Econometrics	4	0	0	4	Core Discipline
3	ECO214	Money and Banking	4	0	0	4	Discipline Specific Elective (DSE)
4	ECO215	Public Finance	4	0	0	4	Discipline Specific Elective (DSE)
5	CSA218	Computer Network	4	0	0	4	Skill Enhancement Course (SEC)
						20	

Semester 5

S. No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO302	Agricultural Economics	4	0	0	4	Discipline Specific Elective (DSE)
2	ECO304	Environmental Economics	4	0	0	4	Discipline Specific Elective (DSE)
3	ECO306	International Economics	4	0	0	4	Core Discipline
4	ECO307	Indian Economy	4	0	0	4	Core Discipline
5	ECO311	Seminar on Contemporary issues	0	0	2	2	Ability Enhancement Course (AEC)
6	CSA303	Operating Systems	4	0	0	4	Skill Enhancement Course (SEC)
						22	

Semester 6

S. No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO308	Industrial Economics	4	0	0	4	Discipline Specific Elective (DSE)
2	ECO309	Economics of Health & Education	4	0	0	4	Discipline Specific Elective (DSE)
3	ECO310	Operational Research	4	0	0	4	Interdisciplinary General Elective (IGE)
4	ECO312	Labour Economics	4	0	0	4	Discipline Specific Elective (DSE)
5	ECO313	Comprehensive Viva Voce	0	0	0	2	Skill Enhancement Course (SEC)
6	CSA309	Computer Graphics and Multimedia	4	0	0	4	Skill Enhancement Course (SEC)
7	CSA311	Computer Graphics Laboratory	0	0	4	2	Skill Enhancement Course (SEC)
						24	

Discipline Specific Elective (DSE)

S. No	Paper Code	Course Title	L	T	P	Cr.	Course Type
1	ECO214	Money and Banking	4	0	0	4	Discipline Specific Elective (DSE)
2	ECO215	Public Finance	4	0	0	4	Discipline Specific Elective (DSE)
3	ECO302	Agricultural Economics	4	0	0	4	Discipline Specific Elective (DSE)
4	ECO304	Environmental Economics	4	0	0	4	Discipline Specific Elective (DSE)
5	ECO308	Industrial Economics	4	0	0	4	Discipline Specific Elective (DSE)
6	ECO309	Economics of Health & Education	4	0	0	4	Discipline Specific Elective (DSE)
7	ECO312	Labour Economics	4	0	0	4	Discipline Specific Elective (DSE)

Course Title: Microeconomics – I

L	T	P	Credits
4	0	0	4

Course Code: ECO105

Course Objectives:
This course develops the understanding of the students regarding the basic concepts of microeconomics which involves decision making at the individual economic agent level – consumer and producer.

Unit I **(15 Hours)**

Introduction to Economics: Meaning, Definition, Scope, Importance and Basic problems of an economy. Demand and Supply functions, Market Equilibrium, Shift in market equilibrium due to change in demand and supply.
Elasticity of demand: Methods of calculating price, income and cross elasticities; Degrees and their interpretation, relationship among various types of elasticities.

Unit II **(15 Hours)**

Consumer Choice: Cardinal theory, derivation of demand in case of one or more goods; Ordinal theory: Budget sets, Indifference curves: the rate and elasticity of substitution. Consumer equilibrium; effects of change in prices and income; Income and substitution effects: Hicksian approach.

Unit III **(16 Hours)**

Theory of production: Production function, isoquants, properties of isoquants, iso-cost lines, optimum input combination, Expansion Path, returns to a factor and returns to scale and their compatibility. Marginal rate of technical substitution, Principle of marginal rate of technical substitution, Law of variable proportion. Elasticity of technical substitution.

Unit IV **(14 Hours)**

Theory of Cost: concept of economic cost; Short run and long run cost curves; increasing and decreasing cost industries; envelope curve; L-shaped cost curves;
Revenue analysis: concept of total revenue, marginal revenue and average revenue & their relationships,

Suggested Readings:

1. Bernheim, B. D., M. Whinston and A. Sen. *Microeconomics*. Tata McGraw-Hill Education.
2. Koutsoyiannis, A. *Modern Microeconomics.* Palgrave Macmilian, Second Edition, 2003
3. Lipsey, *G.* and K.A. Chrysal. *Economics.* Oxford University Press. 2004.
4. Mankiw, N.Gregory. *Principles of Economics.* Worth Publishers. 2007. Seventh Edition.
5. Salvatore, D. *Microeconomics: Theory and Applications.* Oxford University Press. 2008
6. Samuelson, P.A. and W. D. Nordhaus. *Economics.* Tata McGraw Hill. 2005.

Course Title: Macroeconomics – I

L	T	P	Credits
4	0	0	4

Paper Code: ECO106

Course Objectives:

- To understand the conceptual and practical framework of the economy as a whole.
- To understand the various methods used in national income accounting.

Unit I **(14 Hours)**

Introduction to Macroeconomics; Meaning, Nature and scope, importance, Micro vs. Macroeconomics and its limitations. Variables: Real and nominal; Induced and autonomous; Lagged and un-lagged; ex-ante and ex- post; Model and Equations; Equality & identity; stock and flow; Static, Equilibrium and Disequilibrium.

Unit II **(14 Hours)**

National Income: Definition: Economic and Non- Economic Production: Productive Vs Non-productive, intermediate and final output; Concepts of national income. Measurement of National Income: National income: Concepts, components and methods of measurement; Income, Output and Expenditure methods, Difficulties in national income measurement. Nominal and Real GNP. Circular flow of income in two, three and four sectors economies;

Unit III **(16 Hours)**

National Accounts: Meaning, objectives and importance. Different methods of preparing national income accounts; Social Income Accounts, Fund Flow Accounting, Balance of Payment method and Input Output method.
GNP and Welfare; Inter temporal and international comparisons of National income.

Unit IV **(16 Hours)**

Determination of Income and Employment: Classical View: Labour Market; Product Market and Money Market.
Say's Law of Markets (Barter and a monetized economy). Classical theory of income, output and income determination.

Suggested Readings:

1. Beckerman, W. *An introduction to National Income Analysis,* London, E.L.B.S. 1976.
2. Studenski, Paul,A. *The Income of Nations part 2, Theory and Methodology,* New York University Press, 1958.
3. Ackley, G. *Macro Economics: Theory and Policy*. Macmillan publishers. 1978.
4. Branson, William H. *Macro-Economic Theory and Policy.* Indian edition.
5. Dornbush, R., S. Fisher and R. Startz. Macro Economics. Tata Mc. Graw Hill. 2004.
6. Rana, K.C. and K.N. Verma. *Macro-Economic Analysis*. Vishal Publishing Co. 2014.
7. Shapiro, Edward. *Macroeconomic Analysis*. Galgotia Publications. 1999. Indian edition.

Course Title: Mathematics for Economists-I

L	T	P	Credits
4	0	0	4

Course Code: ECO107

Course Objectives:

- To understand the basic and advanced concepts of quantitative techniques.
- To make the students conversant with various quantitative techniques used in Economics for decisions making.
- To understand the concepts and theories underlying some applications of quantitative techniques in research issues.

Unit-I **(15 Hours)**

The straight line, Mathematical modelling, Applications: Demand, Supply, Cost, and Revenue. Translations of linear Functions, elasticity of demand, Supply and Income, Budget and cost constraints, Excel for linear Functions.

Unit-II **(15 Hours)**

Simultaneous equations: Solving simultaneous equations, Equilibrium and break even, Consumer and producer surplus, Non-linear functions and applications; Quadratic, Cubic and other polynomial functions. Exponential functions.

Unit-III **(15 Hours)**

Arithmetic Progression; Definition nth term of an A.P, sum of n terms, Arithmetic mean, A.M. between two numbers, application of A.P. series, Geometric Progression; Definition, nth terms of G.P. series, sum of n terms, Geometric mean between two numbers, Application of G.P. series

Unit –IV **(15 Hours)**

Financial Mathematics: Simple interest, compound interest and annual percentage rates, depreciation, net present value and internal rate of return, Annuities, debt repayments, Sinking funds, the relationship between interest rate and the prices of bonds.

Suggested Readings:

1. Bradley T. Paul Patton. *Essential Mathematics for Economics and Business*. Wiley Publication. 2014.
2. Chiang, A.C. *Fundamental Methods of Mathematics Economics*. McGraw Hill. 2005.
3. Kandoi, B. *Mathematics for Business and Economics with Applications.*Volume-1. Himalaya Publishing House. New Delhi. 2011.
4. Kandoi, B. *Mathematics for Business and Economics with Applications.*Volume-1I. Himalaya Publishing House. New Delhi. 2011.
5. Yamane, T. *Mathematics for Economist.* Prentice Hall of India. New Delhi. 2001.

Course Title: Statistics -1

L	T	P	Credits
4	0	0	4

Course Code: ECO108

Course Objectives:
The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

UNIT-I **(15 Hours)**

Definition: Scope, Importance and limitation of statistics. Classification and Tabulation of data: discrete and continuous one – way and two – way frequency distribution. Diagrammatic and graphic presentation of Data.

UNIT-II **(17 Hours)**

Measures of Central Tendency; Mean, Median, Mode, GM and HM, properties, merits and demerits.
Measure of Dispersion: Absolute and Relative measures of dispersion-Range, Quartile Deviation, Mean Deviation, Standard Deviation and Variance.

UNIT-III **(12 Hours)**

Index Numbers: Meaning scope and limitation of index numbers, problems in construction of index numbers. Tests of Index numbers (time reversal and factor reversal tests), Weighted price and quantity index numbers using aggregate method: Laspeyre's, Paasche's, Fisher's Formulae, cost of living index numbers. Tests for the consistency of index numbers. Use the index numbers to various fields.

UNIT-IV **(16 Hours)**

Correlation: meaning, Types, importance, Methods to measure – Scatter Diagram, Karl Pearson's product moment and spearman's rank correlation.
Regression: Meaning, simple regression, least squares principle, properties of correlation and regression coefficients.

Suggested Readings:

1. Nagar A.L. and R.K. Das. *Basic Statistics*. Oxford University Press. 1976
2. Gupta, S.C. *Fundamentals of Statistics*. Himalaya Publishing House. New Delhi. 2013.
3. Gupta, S.P. *Statistical Methods.* Sultan Chand and Sons. New Delhi. 2012.
4. Gupta C.B. *An Introduction to Statistical Methods*. Vikas Publishing House. New Delhi. 2009.
5. Spiegel, M.R. *Theory &Problems of Statistics*. McGraw Hill. 2009.

Course Title: Basic Communication Skills

L	T	P	Credits
3	0	0	3

Course Code: ENG151A

Course Objective:
To enhance students' vocabulary and comprehensive skills through prescribed texts.
To enhane students' writing skills.
Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)

- Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection **4 hours**
- Tenses (Rules and Usages in Socio-cultural contexts) **5 hours**
- Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to **4 hours**
- Passives **3 hours**
- Reported/Reporting Speech **3 hours**

Unit – B Reading (Communicative Approach to be Followed)

- J M Synge: Riders to the Sea (One Act Play) **5 hours**
- Anton Chekhov : Joy (Short Story) **4 hours**
- Swami Vivekanand : The Secret of Work (Prose) **5 hours**

Unit – C Writing

- Paragraph and Essay Writing **4 hours**
- Letter Writing: Formal and Informal **4 hours**
- Notice and Email **4 hours**

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

Course Title: Basic Communication Skills Lab

Course Code: ENG152

L	T	P	Credits
0	0	2	1

Course Objective:

- To improve fluency in speaking English.

- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Unit – A Speaking/Listening	
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

Instructions:

1. Each student will prepare a scrap file on any of the topics given by class teacher. Student should be able to justify the contents of his/her Scrap file, which carries the weightage of 10 marks. Marks will be given for originality, creativity and presentation of thoughts.
2. In the end of semester, viva exam will be conducted. Viva will be for 10 marks. Spoken English will be the focus of exam. Examiner will ask questions related to scrap file and other general (non-technical) topics.
3. In the End-term exam, lab activity will carry the weightage of 10 marks.
4. Acknowledge all the sources of information in your scrap file.

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English.* India: PHI Private Limited, 2012.
2. Kumar, Sanjay and Pushp Lata. *Communication Skills*. India: OUP, 2012.

Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

Course Title: Computer Applications in Business

L	T	P	Credits
3	0	0	3

Course Code: CSA151

Course Objective: To familiarize the students with computers and their use, and make them proficient in the use of computer applications relevant to business contexts.

UNIT – A **12 Hours**

Introduction

- Block Diagram of Computer: Basic Functions of Each Component
- Classification of Digital Computers Based on Size
- Uses of Computers
- Operating System Basics - Role of Operating System
- Features of Well Known PC Operating Systems
- Networks & Data Communication
- The Uses of a Network
- How Networks Are Structured: Network Topologies
- Media & Hardware
- Internet & Online Resources: How Internet Works
- Features of the Internet
- Accessing the Internet, Working on the Internet

UNIT – B **10 Hours**

Word Processing

- Editing and Formatting a Document, Text Formatting, Paragraph Formatting, Headers and Footers
- FIND command & REPLACE command, Checking Spelling and Grammar; On-line Spelling and Grammar correction using Autocorrect
- Auto Text, Using Thesaurus, Using Clip Gallery. Inserting Graphics From files
- Working with Tables -Creating Table , Entering Text in the Table
- Changing Format of Text of cells, Changing Column width and Row height, Formatting Table Border
- Using Mail Merge - Mail Merge Procedure, Printing a document

UNIT – C **12 Hours**

Spreadsheets

- Basic Operations - Arithmetic operators, Comparison operators, Text operator & (ampersand) Reference operator
- Modifying the worksheet layout - Changing Width of Column, Changing Height of Row, Deleting Rows/Columns/Cells, Moving and copying contents of cell, Alignment of text in the cell.
- Printing the workbook - Setting up Print Area, Setting up Margins, Defining Header and Footer, Controlling Gridlines
- Working with functions - Date and time function, Statistical function, Financial function, Mathematical and Trigonometric functions.
- Introduction to CHARTS - Formatting Charts

UNIT – D **11 Hours**

Presentations

- Creating a presentation slide, Design Templates and Blank presentations
- Power Point standard toolbar buttons
- Working with the text in a slide, Arranging Text in Different Levels
- Changing Font, Font Size and Bold; Moving the frame and inserting clip art; Different slide layouts; Formatting the Slide Design; Work with the Slide Master; Saving the presentation
- The Auto Content Wizard; Using Existing Slides; Using the different views of a slide
- Adding Transitions and Animation, Running Slide Show

Reference Books:

1. A. Simpson, C. Robinson, Mastering Access 2000, New Delhi, BPB
2. Anita Goel, Computer Fundamentals, Pearson
3. K. Kumar, and R. Rajkumar, Computer Applications in Business, Tata McGraw Hill
4. Kogent Learning Solutions Inc, Office 2010 in Simple Steps, Dream Tech Press
5. R. K. Taxali, P C Software Made Simple, New Delhi, Tata McGraw-Hill
6. Silberschatz & A. Korth, Database System Concepts, New York, McGraw-Hill

Course Title: Computer Applications in Business Laboratory

Course Code: CSA153

L	T	P	Credits
0	0	2	1

- The laboratory will comprise of using commands and tools available in MS Word,PowerPoint, and Excel.
- Assignments based on the applications of above mentioned software packages.

Course Title: Microeconomics-II

L	T	P	Credits
4	0	0	4

Course Code: ECO109

Course Objectives:
This course aims to acquaint students with the different market forms and introduces them to the concepts of game theory which would enable them to grasp the strategic behaviour of the firms.

Unit-I (15 Hours)
Perfect competition: its features, price determination, equilibrium of firm and industry in market period, short run and long run; Shut down point, short period and long period supply curves.
Monopoly: Meaning, Assumptions, equilibrium of the monopolist in short and long run, monopoly power, supply curve, Price discrimination: meaning, degrees, conditions and equilibrium in discriminating monopoly, monopoly control and regulation.

Unit-II (14 Hours)
Monopolistic competition: meaning, assumptions, product differentiation and demand curve, firm and group equilibrium; Selling costs, excess capacity, Dumping. Price determination under monopsony and bilateral monopoly.

Unit-III (15 Hours)
Oligopoly: meaning, features, causes for the existence of oligopoly, approaches to the determination of price and output under oligopoly; Non-Collusive Oligopoly: Cournot, Bertrand, and Kinked demand curve model. Collusive Oligopoly: Cartels and price leadership models.

Unit IV (16 Hours)
Firm's Managerial Theories - Baumol's sales maximization model, Williamson's model, Marris model. Game Theory: basic concepts; Prisoner's Dilemma; competitive strategy: dominant strategies and Nash Equilibrium.

Suggested Readings:

1. Bernheim, B. D., M. Whinston and A. Sen. *Microeconomics*. Tata McGraw-Hill Education.
2. Koutsoyiannis, A. *Modern Microeconomics.* Palgrave Macmilian, Second Edition, 2003.
3. Lipsey, *G.* and K.A. Chrysal. *Economics.* Oxford University Press. 2004.
4. Mankiw, N.Gregory. *Principles of Economics.* Worth Publishers. 2007. Seventh Edition.
5. Salvatore, D. *Microeconomics: Theory and Applications.* Oxford University Press. 2008
6. Henderson & Quant *Microeconomic Theory, A Mathematical Approach.*
7. Samuelson, P.A. and W.D. Nordhaus. *Economics.* Tata McGraw Hill. 2005.

Course Title: Macroeconomics – II

L	T	P	Credits
4	0	0	4

Course Code: ECO110

Course Objectives: The course aims to make the students understand, the main problems found in economy in different periods of time and to analyze how government expenditures and taxation can be used to stimulate or slow the market economy and the possible consequences of such acts.

Unit-I **(12 Hours)**

Basic Concepts: Full employment and various types of unemployment. Aggregate demand and aggregate supply functions. Effective demand: Determinants of effective demand, determination of effective demand, importance of effective demand.

Unit-II **(16 Hours)**

Keynesian Economics: Keynes consumption function; saving and investment functions. Psychological law of consumption. Determination of income, employment and output in Keynesian frame work in a two sector, three sector and four sector economy. Paradox of thrift.

Unit-III **(16 Hours)**

Multiplier: Static and Dynamic analysis. Balanced – budget multiplier. Foreign trade multiplier. Theories of Consumption: Absolute Income Hypothesis; Relative Income Hypothesis; Permanent Income Hypothesis.

Unit-IV **(16 Hours)**

The Marginal Efficiency of Investment, Relationship between the MEC and MEI, Factor affecting inducement to investment; Classical theory of investment; Keynesian theory of investment; Accelerator theory of investment.

Suggested Readings:

1. Ackley, G. *Macro Economics Theory and Policy*. Macmillan publishers. 1978.
2. Branson, William H. *Macro-Economic Theory and Policy*. Indian edition.
3. Dornbush, R., S. Fisher and R. Startz. *Macro Economics*. Tata McGraw Hill. 2004.
4. Rana, K.C. and K.N. Verma. *Macro-Economic Analysis*. Vishal Publishing Co. 2014.
5. Shapiro, Edward. *Macroeconomic Analysis*. Galgotia Publications. 1999. Indian edition.

Course Title: Mathematics for Economists –II

L	T	P	Credits
4	0	0	4

Course Code: ECO111

Course Objectives: The students are to develop skills in mathematical techniques that are required for a meaningful study of both theoretical and applied economics.

UNIT-I (14 Hours)

Sets and Relations: Functions-types of function and its application in economics, System of equations and Inequalities in Market Equilibrium . Limits and Continuity of functions.

Unit II (15 Hours)

Differentiation: Rules of differentiation, Economic Applications; Marginal revenue, average revenue, total revenue, marginal cost, average cost and total cost. Partial differentiation.

Unit III (16 Hours)

Maxima and Minima, profit maximisation. Basic Trigonometric Functions: Angle – Positive and negative, Trigonometric ratio of angle, t value of ratio.

Unit IV (15 Hours)

Linear Algebra: Matrices, types, products of matrices, inverse of matrix, rank of a matrix, determinants, simultaneous linear equations (Cramer's rule). Rank method

Suggested Readings:

1. Bradley T. Paul Patton. *Essential Mathematics for Economics and Business.* Wiley Publication. 2014
2. Chiang, A.C. *Fundamental Methods of Mathematics Economics*. McGraw Hill. 2005
3. Kandoi, B. *Mathematics for Business and Economics with Applications.* Volume-I, Himalaya Publishing House. New Delhi. 2011.
4. Kandoi, B. *Mathematics for Business and Economics with Applications.* Volume-II, Himalaya Publishing House. New Delhi. 2011.
5. Monga, G.S. *Mathematics and Statistics for Economics*. Vikas Publication. New Delhi. 2005.
6. Yamane, T. *Mathematics for Economist.* Prentice Hall of India. New Delhi. 2001.

Course Title: Statistics –II

L	T	P	Credits
4	0	0	4

Course Code: ECO112

Course Objectives:

- To enable students to acquire the basic knowledge of statistical tools as required for their understanding of economic issues.
- To enable the students to apply statistical analysis to a range of economic policy problems

Unit-I (13 Hours)

Correlation and Regression Analysis: Partial and multiple correlation coefficients: Derivations, application and properties. Fitting of multiple regression by least squares technique stress on numerical examples.

Unit-II (15 Hours)

Skewness, Moments and Kurtosis: Introduction, Difference between dispersion and Skewness Tests of Skewness, Absolute measure of Skewness, Karl Pearson's coefficient of Skewness, Bowley's coefficient of Skewness Kelly's coefficient of Skewness. Moments about arbitrary origin, Central Moments, Moments about zero. Measures of Kurtosis.

Unit-III (14 Hours)

Time Series Analysis: Meaning, Components: Models, economic significance of time series, methods of estimating trend and seasonal variations. Growth Curves**:** Properties, methods of estimation and applications of parabolic, geometric, exponential, modified exponential, Gompertz and logistic growth curves.

Unit IV (16 Hours)

Probability:Definition (classical and empirical only), laws of probability, conditional probability and independence of events (applications only) concept of random variables, probability density and mass function, expectation, moments, moment generating function, properties (without proof).

Suggested Readings:

1. Nagar A.L. and R.K. Das. *Basic Statistics*. Oxford University Press. 1976.
2. Gupta, S.C. *Fundamentals of Statistics*, Himalaya Publishing House. New Delhi. 2013.
3. Gupta, S.P. *Statistical Methods.* Sultan Chand and Sons. New Delhi. 2012.
4. Gupta C.B. *An Introduction to Statistical Methods*. Vikas Publishing House. New Delhi. 2009.
5. Spiegel, M.R. *Theory &Problems of Statistics*. McGraw Hill. 2009.

Course Title: Principles of Programming and Algorithms using C

Course Code: CSA105

L	T	P	Credits
4	0	0	4

Course Objective: The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming). Students will learn to write algorithm for solutions to various real-life problems. Converting the algorithms into computer programs using C language.

UNIT-A **15 Hours**

Logic Development and Program Development Tools

- Data Representation, Flowcharts, Problem Analysis
- Decision Trees/Tables, Pseudo Code and Algorithms,
- Program Debugging, Compilation and Execution.

Fundamentals

- Character Set, Identifiers and Key Words, Data Types
- Constants, Variables, Expressions, Statements, Symbolic Constants.

Operations and Expressions

- Arithmetic Operators, Unary Operators, Relational Operators,
- Logical Operators, Assignment and Conditional Operators, Library functions.

UNIT-B **12 Hours**

Data Input and Output

- Single Character Input, Single Character Output, Entering Input Data
- More About Scan Functions, Writing Output Data, More About Print Functions
- Gets and Puts Functions, Interactive Programming.

Control Structures

- Introduction, Decision Making with If – Statement, If Else and Nested If,
- While And Do-While, For Loop.
- Jump Statements: Break, Continue, Goto, Switch Statement.

Functions

- Introduction To Functions, Function Declaration, Function Categories
- Standard Functions, Parameters And Parameter Passing, Pass – By Value/Reference
- Recursion, Global and Local Variables, Storage Classes.

UNIT-C **10 Hours**

Arrays

- Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings, String Handling Functions.

Structure and Union

- Declaration of Structure, Accessing Structure Members, Structure Initialization, Arrays of Structure, Nested Structures, Unions.

UNIT-D **8 Hours**

Pointers

- Introduction To Pointers, Address Operator And Pointers, Declaring and Initializing Pointers,
- Assignment through Pointers, Pointers and Arrays.

Files

- Introduction, Creating a Data File, Opening and Closing a Data File, Processing a Data File.

Preprocessor Directives

- Introduction and Use, Macros, Conditional Preprocessors, Header Files

Reference Books

1. Yashvant P Kanetkar, Let us C, BPB Publications, New Delhi, Seventh Edition.
2. Balaguruswamy, Programming in ANSI C.
3. Byron S. Gottfried, Programming in C, McGraw Hills, Second Edition.
4. E. Balagurusami, Programming in ANSI C, Tata McGraw Hill, Fourth Edition.
5. Kernighan & Richie, The C Programming Language, PHI Publication, Second Edition.
6. Schaum Outline Series, Programming in C.

Course Title: C Programming Laboratory

L	T	P	Credits
0	0	4	2

Course Code: CSA108

Implementation of C programming concepts:

- Control Structures, Loops, Arrays, Strings
- Functions, Structures, Union, Files, etc.

Course Title: Technical Communication

L	T	P	Credits
3	0	0	3

Course Code: ENG351

Total Lectures: 45

Course Objective: This paper, with a practice-oriented approach, aims to hone students' skills in all the dimensions of technical communication.

Learning Outcomes: Students will show adequate understanding of technical communication skills.

Unit-1

- Nature of Technical Communication
- Verbal and Non-Verbal Communication
- Barriers to Communication

Unit-2

- Conversation: Formal and Informal
- Panel Discussion and Group Discussion
- Oral Presentation

Unit-3

- Report Writing
- Business and Technical Proposals
- Memos

Unit-4

- C.V. and Resume
- Business Letters and Application Letters
- Interview

Suggested Readings

1.Koneru, Aruna. *Professional Communication*. Delhi: McGraw, 2008. Print.

2. Rizvi, M. Ashraf. *Effective Technical Communication*. Delhi: McGraw, 2005. Print.

3. Sharma, R.C. and Krishna Mohan. *Business Correspondence and Report Writing*. Delhi: McGraw, 2013. Print.

4.Tyagi, Kavita and Padma Misra. *Basic Technical Communication*. Delhi: PHI Learning, 2013. Print.

Course Title: Microeconomics-III

L	T	P	Credits
4	0	0	4

Course Code: ECO205

Course Objectives:
The course acquaints the students about the price determination of various factors of production so as to decide the price of the product. It also helps the students to use microeconomic techniques to study how allocation of resources affects welfare at the economy-wide level.

Unit-1 **(16 Hours)**
Factor Pricing: Marginal productivity theory of distribution and determination of factor prices under different market forms; Euler's Theorem.
Economic Rent: concepts (such as quasi rent etc.) and theories of rent determination - Ricardian and Modern theory.

Unit-II **(16 Hours)**
Wages and its determination; Interest: Classical and Loanable fund theory; Determination of profit and theories of profit.

Unit-III **(16 Hours)**
Edgeworth box: 2 good, 2 factor, 2 consumer analysis and Pareto optimality conditions; Walras Law; Equilibrium and efficiency; Grand Utility possibility frontier.

Unit-IV **(13 Hours)**
Welfare Economics: Concepts, Compensation Principle (Kaldor-Hicks), Social Welfare Function, Theory of Second best, Arrow' s Impossibility.

Suggested Readings:

1. Bernheim, B. D., M. Whinston and A. Sen. *Microeconomics*. Tata McGraw-Hill Education.
2. Koutsoyiannis, A. *Modern Microeconomics.* Palgrave Macmilian, Second Edition, 2003
3. Lipsey, *G.* and K.A. Chrysal. *Economics.* Oxford University Press. 2004.
4. Mankiw, N.Gregory. *Principles of Economics.* Worth Publishers. 2007. Seventh Edition.
5. Salvatore, D. *Microeconomics: Theory and Applications.* Oxford University Press. 2008
6. Samuelson, P.A. and W.D. Nordhaus. *Economics.* Tata McGraw Hill. 2005.

Course Title: Macroeconomics-III

L	T	P	Credits
4	0	0	4

Course Code: ECO206

Course Objectives:
The aim of the course is to analyse the process of economic growth, reviewing alternative approaches with a view to attaining a greater understanding of the diverse experiences of different economies, and suggesting policy implications. In addition to it, the IS-LM analysis of monetary and fiscal policy will be extended to confront problems of policy design.

Unit 1 **(16 Hours)**
Equilibrium in product and money markets: IS and LM functions, changes in IS and LM functions, General equilibrium- changes in general equilibrium, elasticity of IS and LM functions and monetary and fiscal policies.

Unit-II **(16 Hours)**
Trade Cycles: Features, Keynes' view on trade cycle, Schumpeter, Kaldor Samuelson, Hicks models, control of trade cycle.
Inflation: Causes, consequences and cures, theories of inflation: Classical, Keynesian,
Modern theory of Inflation (demand Pull and Cost push inflation) Inflation – unemployment trade off. Natural rate of unemployment.

Unit-III **(14 Hours)**
Open Economy models: Short run open economy model, nominal exchange rate and real exchange rate, Mundell-fleming model and exchange rate determination, purchasing power parity.

Unit-IV **(14 Hours)**
Monetary Policy: Instruments, objectives and effectiveness in recession and boom.
Fiscal Policy: Instruments and full employment; budget surplus; problems of stabilization policy.
Recent Developments in Macro Economics

Suggested Readings:
1. Ackley, G. *Macro Economics Theory and Policy*. Macmillan publishers. 1978.
2. Branson, William H. *Macro-Economic Theory and Policy.* Indian edition.
3. Dornbush, R., S. Fisher and R. Startz. *Macro Economics*. Tata McGraw Hill. 2004.
4. Rana, K.C. and K.N. Verma. *Macro-Economic Analysis*. Vishal Publishing Co. 2014.
5. Shapiro, Edward. *Macroeconomic Analysis*. Galgotia Publications. 1999. Indian edition.

Course Title: Mathematics for Economists –III

L	T	P	Credits
4	0	0	4

Course Code: ECO207

Course Objectives: This course enhance the skills of students by introducing mathematical tools which develop their potential for undertaking economic decisions.

Unit I **(13 Hours)**

Difference equations and their applications; Linear Homogenous Difference Equation of First order. Non-Linear differential equation of First Order.

Unit II **(16 Hours)**

Simple Integration and Applications; Rules of Integration, Methods of Integration, Integration by Parts, Economic Applications: Cost, Revenue, Demand Function, Consumer surplus.

Unit III **(15 Hours)**

Input – Output Analysis: Assumptions; Transaction matrix: Technical coefficients, Hawkin–Simon Conditions, Metzler condition, open and close input-output systems; Dynamic input output analysis (an introduction).

Unit IV **(16 Hours)**

Linear Programming: Formulation of linear programming p r o b l e m. Graphical method, Simplex method, Two-phase simplex method, unbounded solution, infeasible solution, degeneracy and cycling problem. Duality theorem, Solution of primal and dual by simplex method. Dual simplex method.

Suggested Readings:

1. Bradley T. Paul Patton. *Essential Mathematics for Economics and Business*. Wiley Publication. 2014.
2. Chiang, A.C. *Fundamental Methods of Mathematics Economics*. McGraw Hill. 2005.
3. Kandoi, B. *Mathematics for Business and Economics with Applications*. Volume-1, Himalaya Publishing House. New Delhi. 2011.
4. Kandoi, B. *Mathematics for Business and Economics with Applications*. Volume-II, Himalaya Publishing House. New Delhi. 2011.
5. Monga, G.S. *Mathematics and Statistics for Economics*. Vikas Publication. New Delhi. 2005.
6. Yamane, T. *Mathematics for Economist*. Prentice Hall of India. New Delhi. 2001.

Course Title: Statistics –III

L	T	P	Credits
4	0	0	4

Course Code: ECO208

Course Objectives:

- To enable students to acquire the basic knowledge of statistical tools as required for their use in economics based issues
- To enable the students to apply statistical analysis to a range of economic policy problems

UNIT-I **(15 Hours)**

Theoretical Distribution; binomial, poisson and normal distributions, Derivation with numerical examples based upon these distributions and their fitting.

UNIT-II **(15 Hours)**

Sampling: Concepts used in sampling: methods of sampling simple random, systematic and stratified. Point estimation: Concept of random sampling, meaning of an estimator; properties of a good estimator; methods of estimation.

UNIT III **(15 Hours)**

Theories of estimation; Point Estimation, Interval Estimation. Concepts of null and alternative hypothesis; types of errors; some elementary tests based on above sampling distributions.

UNIT IV **(15 Hours)**

Testing of Hypothesis; Large sample test; Sampling of attributes, Test of significance for difference of proportion, Single mean, Differences of means. t- test, chi square and F-test.

Suggested Readings:

1. Gupta, S.C. and V.K. Kapoor. *Fundamental of Applied Statistics*. Sultan Chand and Sons. New Delhi. 2010
2. Kapur, J.N. and H.C. Saxena. *Mathematical Statistics*. S. Chand and Company. New Delhi. 1995.
3. Mood, A.M. and F.A. Gray Bill. *Introduction to the Theory of Statistics*. McGraw Hill Company, New York. 1963.

Course Title: Environmental Studies

L	T	P	Credits
4	0	0	4

Course Code: EVS100

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies **(2 Hours)**

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: **(8 Hours)**

Natural resources and associated problems.

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: **(4 Hours)**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation **(4 Hours)**

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India

- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.

Environmental Pollution **(8 Hours)**

- Definition, causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear pollution

- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit III

Social Issues and the Environment **(7 Hours)**

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Human Population and Environment **(5 Hours)**

Unit IV

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health

- Case Studies

Field Work **(5 Hours)**

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Readings:

1. Odum, EP. *Basic Ecology*. Japan: Halt Saundurs. 1983.
2. Botkin, DB and Kodler EA. *Environmental Studies: The Earth as a living planet.* New York: John Wiley and Sons Inc., 2000.
3. De, A. K. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd. 1990.
4. Sharma, P. D. *Ecology and Environment*. Meerut. Rastogi Publications. 2004
5. Singh, J. S. Singh, S. P. and Gupta S. R. Ecology, *Environment and Resource Conservation.* New Delhi: Anamaya Publishers. 2006.

Course Title: Database Concepts

L	T	P	Credits
4	0	0	4

Course Code: CSA203

Objectives: This course covers fundamentals of database architecture, database management systems, and database systems, Principles and methodologies of database design, and techniques for database application development.

UNIT – A (**10 Hours)**

An Overview of DBMS

- Concept of File Processing Systems and Database Systems
- Database Administrator and his Responsibilities
- Physical and Logical Data Independence Three level Architecture of Database System
- The External Level, Conceptual Level, The Internal Level

UNIT-B **(12 Hours)**

Introduction to Data Models

- Entity Relationship Model, Hierarchical
- Network and Relational Model
- Comparison of Network, Hierarchical and Relational Model
- E–R Diagram
- Different Keys Used In a Relational System, Sql

UNIT – C (**10 Hours)**

Database Protection

- Recovery, Concurrency Management
- Database Security, Integrity and Control
- Disaster Management

Normal Forms: INF, 2NF, 3NF, BCNF, 4th NF, 5th NF, and DBTG

UNIT – D (**13 Hours)**

SQL *PLUS

- Introduction to SQL–DDL, DML, DCL, Join Methods & Sub Query
- Union Intersection, Minus, Tree Walking, Built in Functions
- Views, Security Amongst Users, Sequences, Indexing

Reference Books:

1. Desai Bipin C, An Introduction to Database System, New Delhi: Galgotia Publications, 2010
2. Date C.J, An Introduction to Data Base Systems, New Delhi: Narosa Publications, Eighth Edition,2012
3. Korth Henry F, Database System Concepts, New Delhi: McGraw Hill, 2010
4. Ullman, Principles of Database Systems, New Delhi: Galgotia Publications ,2010.
5. Coronel, Moris, Rob, Database Systems: Design, Implementation, and Management, New Delhi South-Western, Ninth Edition (2009)

Course Title: Database Concepts Laboratory

Course Code: CSA207

L	T	P	Credits
0	0	4	2

Implementation of SQL

- Implementation of various DDL, DML, DCL, TCL statements.
- Practice of PL/SQL.

Course Title: Development Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO211

Course Objectives:
This course acquaints the students with the various theories and models explaining the process of economic growth and development. In addition, the course highlights the contemporary development challenges faced by the developing countries.

Unit I **(15 Hours)**

Economic Development: Meaning and its evolution, Sustainable development goals. Growth vs. Development- significance, objectives and core values. Characteristics of Development.

Indicators of Development: GDP as measure of welfare, Social and Economic indicators, Physical Quality Life Index, Human Development Index.

Unit II **(14 Hours)**

Strategies of Development: Theory of Balanced and Unbalanced Growth, Theory of Big Push, Critical Minimum Effort Thesis.

Models of Structural Change: Lewis model of unlimited supply of labour, Nurkse' Model, Fei and Ranis Model.

Unit III **(15 Hours)**

Dualistic Development: Social and Technological Dualism.

Models of Growth: Classical Model, Marxian Model, Schumpeter's Model, Harrod- Domar Model, Kaldor's Model, Rostow's stages of growth.

Unit IV **(16 Hours)**
Capital formation: Meaning and Sources; capital –output ratio; Human Capital: Concept and utilization.

Foreign Aid: Forms and sources; Trade vs. Aid; Transfer of technology.

Suggested Readings:

1. Chew, S.C. and R. A. Denmark. *The Underdevelopment of Development*. Sage Publications. New Delhi. 1999.
2. Debraj, Ray. *Development Economics.* Oxford University Press. 1998.
3. Meier, G. M. and J. E. Rauch. *Leading Issues in Economic Development.* Oxford University Press. 2000.
4. Taneja, M. L. and R. M. Myer. *Economics of Development and Planning.* Vishal Publications. 2014.
5. Thirlwall, A.P. *Growth and Development.* Palgrave Macmillan Publishers. 7th edition.
6. Todaro, M. P. and Stephen C. Smith. *Economic Development.* Pearson Publications. 2011.

Course Title: Econometrics

L	T	P	Credits
4	0	0	4

Course Code: ECO212

Course Objective:

The main objective of the course is to introduce students to basic econometrics techniques and develop their potential for application to economic decision making.

Unit-I **(14 Hours)**

Nature, Meaning and Scope of econometric; Difference between mathematical economics, statistics and econometrics; Methodology of Econometrics.

Simple linear regression model (Two variables): Sources of disturbance terms, assumptions, least squares estimators and their properties; Gauss Markov's theorem.

Unit-II **(13 Hours)**

Multiple regression Model: Definition, assumptions, least–squares estimation. Testing significance of regression coefficients, concepts of $R^2$and R^{-2}. OLS SML Estimator of regression coefficient.

Unit-III **(16 Hours)**

Econometric Modeling: Specification of regression model. Multicollinearity: Problem consequences, test to detect Multicollinearity, remedies. Autocorrelation and Hetroscedasticity: Nature, Consequences tests and remedies (elementary treatment).

Unit-IV **(17 Hours)**

Dummy Variables; Regression on qualitative and quantitative variables, dummy variable trap, structural stability of regression models.

Distributed Lag Models; Formation of expectations, naïve expectation versus adaptive expectations models, partial adjustment models, distributed lag models; Koyck's model, Almon lag, polynomial distributed lag models.

Suggested Readings:

1. Christopher Dougherty. *Introductory Econometrics*. Oxford University Press. 2012.
2. Gujarti, D. N. *Basic Econometrics*. Tata McGraw Hill. 2004.
3. Koutsoyiannis, A. *Theory of Econometrics*. Palgrave Macmillan.2005.
4. Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach*. Peking: Cengage Learning. 2009. Print.
5. Brooks, C. *Introductory Econometrics for Finance*.Cambridge University Press. 2003. First edition.

Course Title: Money and Banking

L	T	P	Credits
4	0	0	4

Course Code: ECO214

Course Objectives: This course acquaints the students with the functioning of money market by providing theoretical foundations of money demand and money supply. It also introduces the students to the functioning of banking and financial institutions.

Unit-I **(15 Hours)**

Money: Introduction, Nature and functions; money and near money; Demand for money: Fisher, Cambridge, Keynesian theories. Supply of money: mechanics of money supply creation; measures of money supply in India.

Unit-II **(14 Hours)**

Rate of Interest: Meaning and Classification of Interest, Determination; Factors affecting the level and structure of interest rates.

Theories of interest: Classical theory of interest and Keynesian theory of interest.

Unit-III **(15 Hours)**

Commercial Banking: Meaning, Types, Functions, Theories; credit creation process.

Central Banking: Meaning and functions, techniques of credit control with special reference to India.

Unit IV **(16 Hours)**

Monetary Policy: Targets and indicators; macroeconomic objectives. Monetary policy in less developed countries. Inflation in India.

Indian Monetary and Credit System: System of note-issue; computation of money supply by the RBI. Problems and working of money and capital markets.

Suggested Readings:

1. F. S. Mishkin and S. G. Eakins. *Financial Markets and Institutions.* Pearson Education. 2009.
2. Gupta, S.B. *Monetary Economics-Institutions, Theory and Policy*. S. Chand & Co. Ltd. New Delhi. 1995.
3. L. M. Bhole and J. Mahukud. *Financial Institutions and Markets*. Tata McGraw Hill. 2011.
4. Misra, S. Puri. *Indian Economy*. Himalaya Publishing House. 2015.
5. Pathak, Bharati V. *The Indian Financial System, Market, Institutions & Services*. Pearson. 2008.
6. Paul, R.R. *Monetary Economics*. Kalyani Publishers. 2005.
7. Sundram, K.P.M. *Money, Banking, Trade and Finance*. Sultan Chand & Sons. New Delhi. 2014.
8. Vaish, M.C. *Money, Banking and International Trade*. Vikas Publishing House. 2005.

Course Title: Public Finance

L	T	P	Credits
4	0	0	4

Course Code: ECO215

Course Objectives:
The course aims to equip students with the understanding of public sector with emphasis on the role of government in terms of its key fiscal functions. It provides a comprehensive overview of issues involved in the domain of public finance with the application of basic principles of economics.

Unit 1 **(14 Hours)**
Introduction: Nature and scope of public finance, categories of revenue, fiscal functions (allocation, distribution and stability), meaning of public sector and public expenditure.
Market Performance: Meaning of efficiency, externalities, private versus public good – their efficient provision, merit goods.

Unit-II **(14 Hours)**
Taxation: Requirements for a good tax structure; benefit principle, ability to pay principle, equity (horizontal and vertical); tax base (income, consumption and wealth); direct vs. indirect taxes, proportional vs. progressive taxes; tax incidence (Concept and measurement).

Unit-III **(16 Hours)**
Optimal Taxation: Normative versus positive, commodity tax, income tax, analysis of normative and positive optimal tax.

Public Debt: Concept, objectives and significances of public debt, sources of public borrowings; distinction between internal and external debt.

Unit-IV **(16 Hours)**
Issues in Indian Public Finance: Recent tax reforms, fiscal federalism in India, state and local finances

International Issues: Global public goods, taxation of international trade, government revenue and smuggling

Suggested Readings:

1. Musgrave, R. A and P. B Musgrave. *Public Finance in Theory and Practices,* McGraw-Hill International Editions, 1989.
2. Cullis, John and Philip Jones, *Public Finance and Public Choice*, Oxford University Press, Third Edition (Indian), 2010.
3. Rao, M Govind and Mihir, Rakshit. *Public Economics: Theory and Policy Essays in Honor of Amaresh Bagchi*, Sage Publications, 2011.
4. Srivastava, D K and U, Shankar (ed.). *Development and Public Finance: Essays in Honour of Raja J. Chelliah*, Sage Publications, 2012.

Course Title: Computer Networks

L	T	P	Credits
4	0	0	4

Course Code: CSA218

Course Objective: Fundamental principles as well as the critical role of performance in driving protocol and network design; it explores in detail all the critical technical areas in data communications, and protocol design.

UNIT – A **15 Hours**

Introduction to Data Communication

- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing Review of Network Hardware
- LAN, MAN, WAN
- Wireless networks, Internetworks Review of Network Software
- Layer, Protocols, Interfaces and Services Review of Reference Models
- OSI, TCP/IP and their comparison Physical Layer
- Transmission Media: Twisted pair, Coaxial cable, Fibre optics
- Wireless transmission (Radio, Microwave, Infrared)

UNIT – B **15 Hours**

Data Link Layer

- Error Correction and Detection
- Framing, Noiseless Channels and Noisy Channels
- Multiple Access Protocol (ALOHA, CSMA, CSMA/CD, CSMA/CA)
- Wired LANs

UNIT – C **15 Hours**

Network Layer

- Logical Addressing, Internet Protocol IPv4 and IPv6
- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast)
- Internetworking, IP Protocol, ARP, RARP.

UNIT - D **15 Hours**

Transport Layer

- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP)
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding) Application Layer
- Domain name system, Email, File transfer protocol
- HTTP, HTTPS, World Wide Web.

Reference Books

1. Tanenbaum. Andrew S. , Computer Networks, 4th Edition, New Delhi: PHI, 2013.
2. Forouzan B. A., Data Communications and Networking, Fourth Edition, New Delhi: Tata McGraw Hill, 2003.
3. Stalling W, Data & Computer Communications, New Delhi: PHI, Ninth Edition 2010.

Course Title: Agricultural Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO302

Course Objectives:
The objective of this course is to provide students with an understanding of the motivations for agricultural policies and the instruments that governments use to pursue policy goals.

UNIT-I (12 Hours)
Nature, scope of agriculture and its importance Agriculture Economics in the economy. Role of agriculture in economic development. Reasons for backwardness of Indian agriculture. Transforming traditional agriculture.
Farming Systems: Family farming, co-operative farming, collective farming and state farming. Farm size and productivity.

UNIT-II (16 Hours)
Agricultural credit: Need, role of co-operative and commercial banks. Land reforms- consolidation of holdings, abolition of intermediaries, ceiling on land holdings and tenurial reforms - need, nature and evaluation with special reference to India.

UNIT-III (16 Hours)
New agricultural technology – Its impact on production, income distribution and labour absorption. Negative consequences of new agricultural technology in the context of Punjab. Crop diversification – Need, progress and problems.

UNIT-IV (16 Hours)
Agricultural Marketing in India: Structure, types, defects, marketing functions, marketing margins, marketed surplus and marketable surplus. Factors affecting marketed surplus.
Agricultural Price Policy: Need and objectives. Mobilization of agricultural surpluses, Terms of trade between agriculture and industry, Agricultural taxation in India.

Suggested Readings:
1.Sourth Worth, H.M. and John Sten, B.F. *Agricultural Development and Economic Growth* (1967)
2. *Economic Survey*, Government of India. Various Issues.
3.Schultz T.W. *Transforming Traditional Agriculture*(1964)
4.*Handbook of Agriculture Economics*.
5. H Drummond, John Goodwin. *Agriculture Economics*. Pearson Publication. 2013.
6. Sadhu, A.N. and Amarjit Singh. *Fundamentals of Agricultural Economics*, Himalaya Publishers. New Delhi. 2012.

Course Title: Environmental Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO304

Course Objectives:

This is an applied economics course which aims to acquaint the students with the range of environmental issues and develop their skills for addressing such environmental problems with the help of suitable tools and techniques for decision making.

Unit I **(15 Hours)**

Introduction to Environmental Economics: Meaning, Scope and Importance; Positive and Normative Economics.

Type of Environmental Goods – Use value and Nonuse value (existence, altruistic and bequest value), Public goods, Private goods, Club goods, Open access resources.

Unit II **(16 Hours)**

Market Failure and Externalities; Theory of Environmental Regulation and Policy: Assignment of Property Rights and Coase Theorem, Government Interventions - Command & Control Measures and Marketable Instruments.

Unit III **(16 Hours)**

Valuation of Environmental Goods and Services: Indirect method (revealed preference); household production function–travel cost, hedonic pricing, direct/stated preference method – contingent valuation.

Unit IV **(14 Hours)**

Economic Growth and the Natural Environment: Rise and fall of Environmental Kuznets Curve.

Sustainable Development: Meaning of sustainability – weak or strong, goals and indicators.

National Accounting and the Natural Environment: Green National Income Accounting with special reference to India

Suggested Readings:

1. GOI, *Green National Accounts for India – A Framework*. Government of India, 2013.
2. Kolstad, Charles D. *Intermediate Environmental Economics.* Oxford University Press. 2011.
3. Koutsoyiannis, A., *Modern Microeconomics.* Palgrave Macmilian. Second Edition. 2003.
4. Maureen L. Cropper and Wallace E. Oates. *Environmental Economics: A Survey*. Journal of Economic Literature Volume 30, pp. 675-740.1992
5. Partha Dasgupta. *Measuring Sustainable Development: Theory and Application*. Asian Development Review Volume 24(1**)**, pp: 1-10. 2007.
6. Roger Perman, Yue Ma, James McGilvray and Michael Common. *Natural Resource and Environmental Economics*. Pearson Education/Addison Wesley. 3rd edition. 2003.

Course Title: International Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO306

Course Objectives: The objective of the paper is to make the students aware about the important linkages between domestic economy and its external sector and to provide comprehensive, up-to-date, and clear exposition of the theory and principles of international economics and trade.

Unit-I **(16 Hours)**

Trade Theories and Commercial Policy: Theories of absolute advantage, comparative advantage and opportunity cost; Heckscher-Ohlin theory of trade- its main features, assumptions and limitations: Terms of trade (concepts and secular deterioration in terms of trade).

Unit-II **(14 Hours)**

Instruments of Trade Policy: Rationale of protection; Tariff and non-tariff barriers to trade (quota, voluntary export restraints, export subsidies, dumping and international cartel); Tariff and quota (partial equilibrium analysis).

Unit-III **(15 Hours)**

Balance of Payments: Concepts and components of balance of payments; Equilibrium and disequilibrium in balance of payments; various measures to correct deficit in the balance of payment.

Unit-IV **(15 Hours)**

Exchange Rate: Meaning, concept of equilibrium exchange rate and determination; Fixed versus flexible exchange rates: Managed floating exchange rate; Purchasing Power Parity (absolute, relative); Brettonwood systems and its breakdown.

Contemporary Issues: Financial Globalisation, Global Financial Crises (2007-2009), IMF its working and operation.

Suggested Readings:

1. Krugman, Paul, M. Obstfeld and Marc J. Melitz. *International Economics: Theory and Policy*. Addison Wesley Longman. Ninth Edition, 2012.
2. Salvatore, D.K. *International Economics*. John Wiley and Sons. 2013.
3. Soderston, Bo and G. Reed. *International Economics*. Macmillan Publishing House. 1994.

Course Title: Indian Economy

L	T	P	Credits
4	0	0	4

Course Code: ECO307

Course Objectives:
The course acquaints the students with the features and problems of Indian Economy. Students will understand the national planning system, foreign trade, problems of Indian agriculture and industry in addition to the emerging issues faced by the Indian economy.

Unit 1:
Structure of Indian Economy: National Income and Trends, Sectorial contribution, Inter-state variation of National income in India. Capital Formation and Economic Development in India.
Human resources and economic development in India: Size and growth rate of population in India, Demographic features of India's Population, Population Policy in India, Family Planning and welfare programme in India.
Poverty Line and various measures to control Poverty.

Unit II
Economic Planning in India: Review of first ten Five Year Plans in India, Resources mobilization during different plans. Eleventh five year plan: objectives, target and achievement and its critical analysis. Twelfth five year plan: objectives, target and achievement, issues for approach to the twelfth plan, Financing for various sector under 12_{th} plan.

Unit III
Basic Issues in Agriculture: Role, nature and Emerging trends; Trends in agricultural production and productivity; Factors determining productivity; Remedies measures to raise agriculture productivity in India, Agriculture sustainability and development during plan period.
Issues in Industrial Development: Industrial development during planning period; Review of Industrial policy of 1948, 1956, 1977 and new industrial policy 1991; Industrial policy reforms 1992-93 onwards. Small scale and Cottage industries in India and MSME ; Public sector in India-its role, growth, performance, problems; Issue of privatization.

Unit IV
External Sector: India's foreign trade- features, composition and direction; India's balance of payments position in India, Foreign Trade policy in India. Current Global slowdown and financial turmoil and its impact on Indian economy.

Suggested Readings:
1. Kapila, Uma, Indian Economy: Programme and Policies, Academic Foundation, New Delhi, 2015.
2. Dutt, Ruddra and, K.P.M. Sundharam. *Indian Economy*. New Delhi: S. Chand and Company Ltd. 2015.
3. Misra, S.K. & V.K. Puri. Indian Economy. Himalayan Publishing House. 2015.
4. Wadhawa, C.D. *Some Problems of India's Economic Policy*, New Delhi: Tata McGraw Hill Publishing P. Ltd.

Course Title: Operating Systems

L	T	P	Credits
4	0	0	4

Course Code: CSA303

Course Objective: Understand the overall architecture of the operating system and its main components, Functions of Kernel, file system architecture and implementation, concurrent programming and concurrency.

UNIT– A **15 Hours**

Introduction to Operating System

- OS, History of OS, Types of OS
- Functions/operations of OS, User services/jobs, system calls
- Traps, architectures for operating systems Process Management
- Process overview, Process states
- Interrupt mechanism

UNIT – B **18 Hours**

CPU Scheduling and Process Synchronization

- Scheduling algorithms
- Pre-emptive scheduling & Non-Pre-emptive scheduling
- Levels of schedulers
- Process Synchronization, Critical section and mutual exclusion problem
- Classical synchronization problems, Multithreading. System Deadlock
- Deadlock characterization, Deadlock prevention and avoidance
- Deadlock detection and recovery, practical considerations

UNIT– C **15 Hours**

Storage Management

- Storage allocation methods: Single contiguous allocation
- Multiple contiguous allocation Memory Management
- Paging, Segmentation combination of Paging and Segmentation
- Virtual memory concepts, Demand Paging, Page replacement Algorithms
- Thrashing. Address Protection,
- Cache memory, hierarchy of memory types, associative memory.

UNIT-D 12 **Hours**

File Management

- Overview of File Management System
- Disk Space Management, Directory Structures
- Protection Domains, Access Control Lists, Protection Models
- Queue management, File and directory systems Device Management
- Goals of I/O software, Design of device drivers, Device scheduling policies
- FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK

Reference Books

1. Galvin and Silberschatz A., Operating System Concepts, Eigth Addition, New York: J. Wiley & Sons, 2009.
2. Crowley, Operating Systems: A Design Oriented Approach, New Delhi: Tata McGraw Hill, 2008.
3. Donovan J.J, Systems Programming, New York: McGraw Hill, 1972.

4. Dhamdhere. D.M, System Programming and Operating Systems, New Delhi: Tata McGraw Hill, 1999.
5. Madnick and Donovan, Operating System, New York: McGraw Hill, 1978.
6. Beck Leland L., System Software, Delhi: Pearson Education, 2000.
7. Henson P.B., Operating System Principles, Delhi: Prentice Hall 8. Tenenbaum A.S., Operating System: Design and Implementation, New Delhi: PHI, 2013.

Course Title: Industrial Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO308

Course Objectives:

- This course provides an introduction to current theory and empirical work in Industrial economics.
- It aims to develop the understanding of students regarding the internal structure of firms, their strategic interaction and decision making.

Unit-I **(14 Hours)**

Definition: Nature and scope of Industrial Economics. History and development of industrial Economics. Basic Concepts: Firm, industry, Market, Market structure, Market power, passive and active behaviour of the firm.

Unit-II **(15 Hours)**

Conceptual framework for the study of Industrial Economics. Organizational form and alternative motives of the firm. Industrial efficiency and technical efficiency. Optimum size of the firm.

Unit-III **(15 Hours)**

Growth of the firm: Acquisition, diversification, merger constraints on Growth: demand, managerial and financial.

Market Structure: Seller's concentration; product differentiation; entry conditions and economics of scale.

Unit-IV **(16 Hours)**

Theories of Industrial Location: Factors affecting location; contributions of weber and Sargent Florance. Location policy in India since Independence. Industrial concentration and dispersal in India. Industrial growth under planning in India. Industrial policy and licensing policy, MRTP Act and FERAAct in India.

Suggested Readings:

1. Barthwal, R. R. 2007. *Industrial Economics: An Introductory Text Book*. New Age International. New Delhi.
2. Ferguson, P. R.1998. *Industrial Economics: Issues and Prospectus*. New York University Press.
3. Seth, R. 2010, *Industrial Economics.* Ane Book. New Delhi.

Course Title: Economics of Health and Education

L	T	P	Credits
4	0	0	4

Paper Code: ECO309

Course Objectives:
This course deals with the economic issues regarding the provision of, and demand for, health and education services. Moreover, this paper is about the economic analysis of the health and education sectors, with particular emphasis on government policy concerning them.

Unit I
Introduction to Health Economics: Meaning, Importance and Essential Features of Health Economics. Concepts: Health, Health Care, Birth rate, Fertility rate, Death rate, IMR, CMR, MMR, Morbidity rate (Acute and Chronic), Disability Adjusted Life Year (DALY), Quality Adjusted Life Year (QUALY), Sex Ratio.

Unit II
Demand and Supply of Heath Care: Demand for Health Care – Case of Health Care Accessibility – Socio Economic and Cultural Features,
Determining Health Status – Supply of Health, Health Care Delivery System – Pricing of Health Care.

Unit III
Health Financing Policy: Health Expenditure – Public & Private – Direct and Indirect – Health Insurance – Concept of User Cost – Health Policy of WHO, National Health Policy – NRHM, Health as a State Subject.

Unit IV
Education: Investment in Human Capital: Rate of Return to Education: Private and Social; Quality of Education; Signaling or Human Capital; Theories of Discrimination; Gender and Caste Discrimination in India. Literacy Rates, School articipation, School Quality Measures with special reference to India.

Suggested Readings:
1. Henderson J.W. *Health Economics and Policy* .Thomson learning. Latest Edition.
2. Ramankutty. *A Premier of Health System Economics*. Allied publications. New Delhi. 2007
3. Ronald G., Ehrenberg and S. Robert and Smith. *Modern Labor Economics: Theory and Public Policy*. Addison Wesley. 2005.
4. William, Jack. *Principles of Health Economics for Developing Countries*. World Bank Institute Development Studies. 1999.
5. World Development Report. *Investing in Health*. The World Bank, 2014.

Course Title: Operations Research

L	T	P	Credits
4	0	0	4

Course Code: ECO310

Course Objective: The course is designed to introduce the students with various quantitative techniques which are of great importance for quantitative decision-making.

Unit – I **(15 hours)**

Introduction to OR: Operations research in India, nature, scope, limitation and techniques of OR.
Duality-Concept of duality in LPP, Formulation of the dual problem, Rules for constructing the dual problem, Primal-Dual relationship, Interpreting the Primal-Dual relationship, -Dual of the Dual is Primal, Dual Simplex, Steps in Dual Simplex
Senstivity Analysis: Sensitivity analysis, Limitations of Sensitivity analysis

Unit –II **(15 hours)**

Transportation Model: Introduction, Optimal solution of Transportation problem, Methods for initial basic feasible solutions- NWCM, LCM, VAM, Optimality Tests- Stepping stone method,, Modified distribution method, Degeneracy in Transportation problem, Profit maximization in Transportation problem, Unbalanced Transportation problems, Trans shipment problem.

Unit –III **(15 hours)**

Assignment Model: Introduction, Mathematical Formulation, Hungarian method [Minimization method, Maximization case in Assignment Problems, Travelling Salesman Problem, Un-balanced Assignment Problem, Air Crew assignment, Prohibited assignment/ Constrained assignment problem, LPP formulation of Assignment Problem.

Inventory Control: Meaning, Inventory decisions, Types of Inventory, Factors affecting IC policy, Objectives of IC, Scope of IC, IC systems- P& Q, Inventory Models-Deterministic models (EOQ), Price break approach, Safety stocks- factors & methods, Approaches to IC- ABC, VED.

Unit – IV **(15 hours)**

Game Theory: Introduction, Types of strategy, The Maximin-Minimax principle, Saddle point, Types of problems-Games with pure strategies, Games with mixed strategies (8 methods), Limitations of Game theory

Network Analysis- PERT and CPM- Introduction, Objectives of Network Analysis, Applications of Network Model, twork, Fulkerson's Rule to numbering of events, Stages of project management, Activity Times & Critical Path Computation of Critical Path Slack & Float, PERT- Steps & computing variance, Merits & demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT &CPM, Project Cost analysis- Direct & indirect costs, The lowest cost schedule, Crashing of jobs, Allocation & leveling of resources (through CPM)

Suggested Readings

1. Kalavathy, S. *Operations Research*. Vikas Publishing House. New Delhi.

2. Kapoor, V.K. *Operations Research*. Sultan Chand & Sons. New Delhi.
3. Paneerselvam, R. *Operations Research*. Prentice Hall of India. New Delhi.
4. Sharma, J.K. *Operations Research: Theory and Applications*. Macmillan India Ltd., New Delhi.
5. Taha, H.A. *Operations Research: An Introduction*. Prentice Hall of India. New Delhi.
6. Vohra, N.D. *Quantitative Techniques in Management*. Tata McGraw Hill Publishing Company Ltd.
7. Chawla, Gupta and Sharma. *Operations Research*. Kalyani Publishers. New Delhi. 14th edition
8. Gupta P.K, Hira D.S. *Operations Research*. S. Chand & Company. New Delhi.

Course Title: Labour Economics

L	T	P	Credits
4	0	0	4

Course Code: ECO312

Course Objectives:
This is an applied economics course which aims to develop the understanding of the students regarding the functioning of the labour market and related issues, with special focus on developing economies like India.

Unit I **(15 Hours)**
Introduction to Labour Economics: Meaning, Scope and Importance, Labour Demand: Nature, Marginal Productivity Theory and demand for labour under different market forms, Short run and Long run labour demand curve for firm and industry; elasticity of substitution; Marshall's rules of derived demand.

Unit II **(16 Hours)**
Labour Supply: Neoclassical Model of labour-leisure choice; Effects of changes in non-labour income and wage rate on individual equilibrium; role of income and substitution effect, backward bending supply curve; Individual and market labour supply curve.

Unit III **(16 Hours)**
Equilibrium in Labour Market: Analysis of equilibrium under the competitive and non-competitive market forms.
Unemployment: History of Economic Thought – classical theory, Keynesian, New Classical, Phillips curve, Monetarism; various concepts of unemployment; work participation, labour absorption.

Unit IV **(14 Hours)**
Rural and Urban Labour Market: Labour Market Reforms in India; Labour Laws in India; Subsistence wage and Minimum Wage Act in India; Contemporary issues (post liberalization era); Welfare programmes, government wage employment and self-employment programmes. Human Capital; Labour Mobility; Child Labour issues; Issues in developing and transition economies.

Suggested Readings:

1. Borjas, George J. *Labour Economics*. McGraw-Hill Irwin. 2013.
2. Gould, J. P. and P. Edward Lazear. *Microeconomic Theory*. AITBS Publishers and Distributors Delhi. 2001.
3. Government of India. *Indian Labour Yearbooks (various issues)*, GOI
4. Kar, Saibal and Debabratta, Datta. *Industrial and Labor Economics: Issues in Developing and Transition Countries*. Springer India. 2015.
5. Smith, Stephen. *Labour Economics*. Routledge. 2003

Course Title: Computer Graphics and Multimedia

L	T	P	Credits
4	0	0	4

Course Code: CSA309

Objective: The objective of the study is to let students understand basics of computer graphics, Input/output primitive and basic transformations, which can be applied on objects of graphics.

UNIT – A **10 Hours**

Overview of Graphics Systems

- Video Display Devices
- Raster Scan Systems, Random Scan Systems.
- Graphics Monitors and Workstations,
- CRT Monitors (Random – Scan and Raster Scan, DVST, Plasma – PanelDisplay
- LED and LCD Monitors.

UNIT-B **10 Hours**

Scan Conversion

- Scan Conversion Algorithms For Line, Circle and Ellipse
- Effect of Scan Conversion
- Bresenham's Algorithms for Line and Circle Along with Their Derivations
- Midpoint Circle Algorithm, Area Filling Techniques, Flood Fill Techniques Character Generation

UNIT – C **15 Hours**

Two Dimensional Transformations

- Basic Transformations, Ceiling, Translation, Rotation, Deflection,
- Skew Matrix representation of Basic transformations
- Homogenous Coordinates

Composite Transformations.

- Windowing and Clipping, Windowing Concedes, Clipping and its Algorithms.
- Window–to–View Port Transformations
- Three Dimensional Concepts
- 3 D Coordinate Systems
- 3 D transformations: Translation, Scaling, Rotation
- Projections: Parallel Projections, Perspective Projection

UNIT – D **10 Hours**

Technology System Components

- Multimedia Platforms
- Development Tools, Image, Audio
- Video, Storage for Multimedia, Communications

Applications

- Multimedia in the Real World, Training and Education, Image Processing

Reference Books:

1. D. Hearn and M.P. Baker, *Computer Graphics*(2nd ed.), New Delhi: Prentice–Hall of India, 2004.
2. Foley. J.D., Dam A van, FeinerS.K. andHughes J.F., *Computer Graphics: Principals and Practices*(2nd ed.), Addison-Wesley, MA, 1990.
3. Rogers D.F., *Procedural Elements in Computer Graphics (2nd ed.),* New Delhi: McGraw Hill Book Company, 2001.
4. Plastock Roy A., Kalley Gordon,*Computer Graphics*, New Delhi: McGraw Hill Book Company, 1996.

Course Title: Computer Graphics Laboratory

L	T	P	Credits
0	**0**	**4**	**2**

Course Code: CSA311

Implementation of Graphics Functions

- Algorithms Implementation (line, circle, ellipse)
- 2D transformation Implementation