FACULTY OF ECONOMICS AND BUSINESS

SYLLABUS
of
Bachelor of Science (Economics)
(Semester I-Vl)
(Under Continuous Evaluation System)

Session: 2021-22

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

Program Specific Outcome – Bachelor of Science (Economics)

B.Sc. (Economics) is a three year graduation degree program. The program aims at creation and dissemination of knowledge regarding core economic principles and issues; focusing on the link between theory and real world.

Upon successful completion of this course, students will be able to:

PSO1: understand the basic concepts and principles of economics.

PSO2: have in depth knowledge of concepts and basic theories of consumer behaviour, cost and market structure, and production behaviour.

PSO3: have in depth knowledge of concepts and basic macroeconomics theories such as employment, consumption, investment and international trade, money, banking, development and public finance.

PSO4: understand basic techniques of presentation and analysis of data; and some advanced applications and theory of theoretical and sampling distribution and econometric estimation methodologies.

PSO5: understand Indian experience with planning and various problems faced by Indian economy and latest developments in Indian economy.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester I									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-1421 BECL-1031 BECL-1431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-1212		English (Compulsory)			C	50	40 / -	10	3
BECM-1333		**Mathematics**	I	(Algebra)	E	100	80 (40+40) / -	20	3+3
			II	(Calculus and Trigonometry)					
BECL-1453		**Quantitative Techniques** (Quantitative Techniques-I)			E	100	80 / -	20	3
BECM-1134		**Computer Science** (Computer Fundamentals and PC Software)			E	100	50 / 30	20	3+3
	(P)	**Computer Science**(Computer Fundamental and PC Software) (PRACTICAL)							
BECM-1124		**Computer Applications (Vocational)**(Computer Fundamentals and PC Software)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (**Computer Fundamentals and PC Software) (PRACTICAL)							
BECL-1175		**Economics**(Microeconomics)			C	100	80 / -	20	3
AECD-1161		*Drug Abuse: Problem Management and Prevention (Compulsory)			AC	50	40 / -	10	3
SECF-1492		*Foundation Course			AC	25	20 / -	5	1
Total						**400**			

C-Compulsory
E-Elective
AC- Audit Course
[1] Special paper in lieu of Punjabi (Compulsory).
[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.
***Marks of these papers will not be added in total marks and only grades will be provided.**

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester II									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-2421 BECL-2031 BECL-2431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-2212		English (Compulsory)			C	50	40 / -	10	3
BECM-2333		**Mathematics**	I	Calculus and Differential Equations	E	100	80 (40+40) / -	20	3+3
			II	Calculus					
BECL-2453		**Quantitative Techniques** (Quantitative Techniques-II)			E	100	80 / -	20	3
BECM-2134		**Computer Science** (Programming in C)			E	100	50 / 30	20	3+3
	(P)	**Computer Science** (Programming in C) (PRACTICAL)							
BECM-2124		**Computer Applications (Vocational)**(Programming in C)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (**Programming in C) (PRACTICAL)							
BECL-2175		**Economics**(Macroeconomics)			C	100	80 / -	20	3
AECD-2161		*Drug Abuse: Problem Management and Prevention (Compulsory)			AC	50	40 / -	10	3
SECM-2502		*Moral Education			AC	25	20 / -	5	1
Total						**400**			

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Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester III									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-3421 BECL-3031 BECL-3431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-3212		English (Compulsory)			C	50	40 / -	10	3
BECM-3333		**Mathematics**	I	(Analysis)	E	100	80 (40+40) / -	20	3+3
			II	(Analytical Geometry)					
BECL-3453		**Quantitative Techniques** (Quantitative Techniques-III)			E	100	80 / -	20	3
BECM-3134		**Computer Science** (Computer Oriented Numerical And Statistical Methods)			E	100	50 / 30	20	3+3
	(P)	**Computer Science** (Computer Oriented Numerical And Statistical Methods) (PRACTICAL)							
BECM-3124		**Computer Applications (Vocational)**(Operating System)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (**Operating System (PRACTICAL)							
BECL-3175		**Economics** (Indian Economy)			C	100	80 / -	20	3
AECE-3221		*Environmental Studies (compulsory)			AC	100	60 / 20	20	3
SECP-3512		* Personality Development			AC	25	20 /	5	1
Total						**400**			

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AC- Audit Course
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Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester IV									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-4421 BECL-4031 BECL-4431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-4212		English (Compulsory)			C	50	40 / -	10	3
BECM-4333		**Mathematics**	I	Statics and Vector Calculus	E	100	80 (40+40) / -	20	3+3
			II	Solid Geometry					
BECL-4453		**Quantitative Techniques** (Quantitative Techniques-IV)			E	100	80 / -	20	3
BECM-4134		**Computer Science** (Data Structures)			E	100	50 / 30	20	3+3
	(P)	**Computer Science** (Data Structures) (PRACTICAL)							
BECM-4124		**Computer Applications (Vocational)** (Relational Database Management Systems)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (**Relational Database Management Systems)							
BECL-4175		**Economics (**International Economics and Public Finance)			C	100	80 / -	20	3
SECS-4522		*Social Outreach			AC	25	20	5	
Total						**400**			

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Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester V									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-5421 BECL-5031 BECL-5431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-5212		English (Compulsory)			C	50	40 / -	10	3
BECM-5333		**Mathematics**	I	Dynamics	E	100	80 (40+40) / -	20	3+3
			II	Number Theory					
BECL-5453		**Quantitative Techniques** (Quantitative Techniques-V)			E	100	80 / -	20	3
BECM-5134		**Computer Science** (Database Management System)			E	100	50 / 30	20	3+3
	(P)	**Computer Science** (Database Management System) (PRACTICAL)							
BECM-5124		**Computer Applications (Vocational)** (Internet and Web Designing)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (**Internet and Web Designing) (PRACTICAL)							
BECL-5175		**Economics (** Economics of Development)			C	100	80 / -	20	3
SECI-5541		*Innovation,Enterpreneurship and Creative Thinking			AC	25	20 / -	5	1
Total						**400**			

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[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.
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Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Economics)

Session: 2021-22

Bachelor of Science (Economics) Semester VI									
Course Code		**Course Name**			**Course Type**	**Marks**			**Examination time (in Hours)**
						Total	**Ext.**	**CA**	
							L / **P**		
BECL-6421 BECL-6031 BECL-6431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History and Culture			C	50	40 / -	10	3
BECL-6212		English (Compulsory)			C	50	40 / -	10	3
BECM-6333		**Mathematics**	I	Linear Algebra	E	100	80 (40+40) / -	20	3+3
			II	Numerical Analysis					
BECL-6453		**Quantitative Techniques** (Quantitative Techniques-VI)			E	100	80 / -	20	3
BECM-6134		**Computer Science** (Information Technology)			E	100	50 / 30	20	3+3
	(P)	**Computer Science** (Information Technology) (PRACTICAL)							
BECM-6124		**Computer Applications (Vocational)** (Business Data Processing)			E	100	50 / 30	20	3+3
	(P)	**Computer Applications (** Business Data Processing) (PRACTICAL)							
BECL-6175		**Economics** (QUANTITATIVE METHODS FOR ECONOMISTS)			C	100	80 / -	20	3
Total						**400**			

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E-Elective
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Bachelor of Science (Economics) Semester–I

Session: 2021-22

Course Title: Mathematics (Algebra)

Course Code: BECM -1333(I)

Course Outcomes

After passing this course, the students will be able to:

CO1: Distinguish between solution of cubic equations and Bi-quadratic equations.

CO2: Classify real quadratic form in variables, definite, semi- definite and indefinite real quadratic form.

CO3: Understand the concept of matrix congruence of skew symmetric matrices and its reduction in real field.

CO4: Solve system of linear equations and obtain Eigen values, Eigen vectors, minimal and characteristic equation of a matrix and to apply it in advanced dynamics and electric current.

CO5: To find the relations between the roots and coefficients of general polynomial equation in one variable.

Bachelor of Science (Economics) Semester–I
Session: 2021-22
Course Title: Mathematics (Algebra)
Course Code: BECM -1333(I)

Examination Time: 3 hrs. Max.Marks:50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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Unit–I

Linear independence of row and column vectors. Row rank, Column rank of a matrix, Equivalence of column and row ranks, Nullity of matrix, Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit-II

Eigen values, Eigen vectors, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field.

Unit–III

Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Matrix Congruence of skew–symmetric matrices. Reduction in the real field. Classification of real quadratic forms in variables. Definite, semi–definite and indefinite real quadratic forms. Characteristic properties of definite, semi–definite and indefinite forms.

Unit-IV

Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations and symmetric function of roots, Descarte's rule of signs, Newton's Method of divisors, Solution of cubic equations by Cardon method, Solution of biquadratic equations by Descarte's and Ferrari's Methods.

Text Book:

Chandrika Parsad: Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.

Reference Books:

1.K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002).
2.Shanti Narayan and P.K. Mittal : Text Book of Matrices.
3.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.

Bachelor of Science (Economics) Semester–I
Session: 2021-22
Course Title: Mathematics (Calculus and Trigonometry)
Course Code: BECM -1333(II)

Course Outcomes

After passing this course, the students will be able to:

CO1: Understand real number system, lub& glb of set of real numbers, limit of a function, basic properties of limit & to apply it in real world problem.

CO2: Analyse continuous and discontinuous function, Apply concept of continuity in uniform continuity.

CO3: Manage to solve problems related to successive differentiation, Leibnitz theorem, Taylor's & Maclaurin's theorem with various forms of remainders and to use these expansion to compute values of Sine, Cosine, tangent or log function.

CO4: Understand the concept of De Moivre's theorem & its applications. Identify circular, hyperbolic function and their inverses and use these function to describe the shape of the curve formed by high voltage line suspended between two towers.

CO5: Demonstrate exponential and logarithmic function of complex numbers, and to solve Gregory's series and summation of series.

Bachelor of Science (Economics) Semester–I
Session: 2021-22
Course Title: Mathematics (Calculus and Trigonometry)
Course Code: BECM -1333(II)

Examination Time: 3 hrs. Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Real number system and its properties, lub, glb of sets of real numbers, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuities.

Unit-II

Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms.

Unit-III

De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses.

Unit-IV

Exponential and Logarithmic function of a complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

Text Books:

1.George B.Thomas and Ross L.Finney: Calculus and Analytic Geometry, 9thedition, Addison Wesley,1998(Relevant portions related to Unit-I &II)

2..S.L.Loney: Plane trigonometry part -II(relevant portions related to Unit-III & IV) Cambridge university press.

Reference Books:

1.Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.

2.N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.

3.Gorakh Prasad: Differential Calculus, PothishalaPvt. Ltd., Allahabad.

Bachelor of Science (Economics) (Semester–I)
Session 2021-22
Course Code: BECL-1453
Course Title: Quantitative Techniques–I

Course Outcomes

After the successful completion of this course, the students will be able to

CO1: Solve linear equations of two variables and its applications in economics, under the quadratic equations, arithmetic progression, geometric progression and their applications in economics.

CO2: Develop understanding of elements of analytical geometry, straight lines, basic concepts of trigonometry and permutations and combinations.

CO3: Differentiate between a constant and a variable, graph of linear and quadratic functions and its applications in economics.

CO4: Recognize derivative of implicit functions, parametric functions, exponential functions, logarithmic functions and how to apply these derivatives in economics theory.

Bachelor of Science (Economics) (Semester–I)
Session 2021-22
Course Code: BECL-1453
Course Title: Quantitative Techniques–I

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Solution of Linear Equations: Solution of Simultaneous Linear Equations (upto two variable case), Application of Linear Equation in Economics; Solution of Quadratic Equations Series: Arithmetic Progression Series, Geometric Progression Series and their applications in economics.

UNIT–II

Elements of Analytical Geometry: Straight line; Basic concepts of trigonometry (with formulae); Concepts of combination and permutation, Elements of set theory, union, intersection, difference, symmetric difference, complementation, Venn diagrams.

UNIT–III

Difference between a constant and a variable, concept of functions, classifications of functions, graph of linear and quadratic functions (Economic applications). Limits and continuity of a function. Concept of differentiation.

UNIT–IV

Derivatives of elementary functions excluding inverse trigonometric functions, Rules of derivatives; functions of functions rule; derivatives of implicit functions, parametric functions, logarithmic differentiation (Application in Economics).

Text Book:
R.S. Aggarwal, Mathematics for Economists.

Reference Books:
1. Monga, G.S., Mathematics and Statistics for Economics.
2. Yamane, Taro, Mathematics for Economists.
3. Allen, R.G.D., Mathematical Analysis for Economists.
4. Edward T Dowling, Introduction to Mathematical Economics.
5.Chiang, A.C., Fundamental Methods of Mathematical Economics, McGraw Hill, New York

Bachelor of Science (Economics) (Semester–I)
Session 2021-22
Course Code: BECL-1175
Course Title: Microeconomics

Course Outcomes:

CO: After passing this course, students will be able to have an in-depth understanding of the preliminary concepts about consumer behaviour, costs and revenue curves, production behaviour and market structure.

Bachelor of Science (Economics) (Semester–I)
Session 2021-22
Course Code: BECL-1175
Course Title: Microeconomics

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Introductory: Definition of Economics, Nature, Scope and Assumptions of Microeconomics. Demand Function, Supply Function, Price Determination, Elasticity of Demand – Price, Income and Cross elasticities and their Measurement.
Utility Analysis: law of diminishing marginal utility and law of equi-marginal utility, Indifference Curve Analysis and Revealed Preference Analysis (Meaning and Equilibrium).

UNIT–II

Theory of Production and Costs: Concept of Production Function. Laws of Returns to Scale and Returns to Factor
Cost: Concepts and Cost curves in the short and in the long run; Traditional and modern cost Theory, Revenue Curves and their relationship with elasticity of demand.

UNIT–III

Market forms: Perfect Competition- Assumptions, Price and output determination of firm and Industry in Short run and Long run; Monopoly-Assumptions and Equilibrium.
Monopolistic Competition- Assumptions and Equilibrium(except Group Equilibrium).

UNIT–IV

Marginal Productivity Theory; Factor Pricing (with reference to labour) under Perfect Competition and Imperfect Competition, Modern Theory of Distribution.
Rent: Concept, Ricardian Theory and Modern Theory of Rent.
Interest: Concept of interest; classical theory, lonable funds theory.
Profit: Concept of profit; Risk and uncertainty theories.

SuggestedReadings:

1. Ahuja,H.L.(2018),'*AdvancedEconomicsTheory:MicroEconomicsanalysis'*,S.ChandPublishing.
2. Dwivedi, D.N. (2018), '*Microeconomics: Theory and Applications'*, Pearson Education, New Delhi.
3. Koutsoyiannis,A.(2015),'*ModernMicroeconomics',*MacmillanPress,London.
4. Sen,A.(2007),'*Microeconomics:TheoryandApplications'*,OxfordUniversityPress,NewDelhi.

Note: The latest edition of the books is recommended..

Bachelor of Science (Economics) Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus and Differential Equations)
Course Code: BECM -2333(I)

Course Outcomes

After passing this course, the students will be able to:

CO1: Demonstrate Asymptotes, points of inflexion, multiple points on a curve & also to differentiate between concavity and convexity & hence tracing of curve.

CO2: Understand the concept of linear differential equation with constant and variable coefficients & also the exact differential equations & to apply in a wide variety of disciplines like Bio, Eco, Physics & Engineering.

CO3: Demonstrate the geometrical meaning of a differential equation & the orthogonal trajectories.

CO4: Manage to solve the problem related to series solution of differential equations like Bessel and Legendre equation by Power series method.

CO5: Apply reduction formula on different functions & to develop the concept of variation of parameter.

Bachelor of Science (Economics) Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus and Differential Equations)
Course Code: BECM -2333(I)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple Points, Curvature, Tracing of Curves (Cartesian and Parametric coordinates only).

Unit-II

Integration of hyperbolic functions. Reduction formulae. Definite integrals. Fundamental theorem of integral calculus. Quadrature, rectification.

Unit– III

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories.

Unit-IV

Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series method, Bessel and Legendre equations (only series solution).

Text Book:

Om P.Chug, Parmanand Gupta, R.S.Dahiya: Topics in Mathematics: Calculus and Differential Equations, Laxmi Publications Private Ltd.

Reference Books:

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longman (India), 1967.
2. G.F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. Gorakh Prasad: Integral Calculus, PothishalaPvt. Ltd., Allahabad.
4. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999. 52

Bachelor of Science (Economics) Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus)
Course Code: BECM -2333(II)

Course Outcomes

After passing this course, the students will be able to:

CO1: Understand the concept of Double and Triple integrals, & application to evaluation of areas, volumes, surfaces of solid of revolution and to apply to find out area and volume of plane and solid figure.

CO2: Differentiate between limit and continuity of function of two variables and apply this concept in partial derivatives & differentiability of real valued function of two variables.

CO3: Manage to solve problems related to Maxima, Minima & Saddle points of functions of two variables.

CO4: Classify Envelopes & Evolutes, Application of inverse & implicit function theorems.

Bachelor of Science (Economics) Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus)
Course Code: BECM -2333(II)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem, Statements of Inverse and implicit function theorems and applications.

Unit-II

Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and saddle points of functions of two variables.

Unit-III

Lagrange's undetermined multiplier method, Double and Triple Integrals, Change of variables, Change of order of integration in double integrals.

Unit-IV

Application to evaluation of area, volume, surface of solids of revolutions.

Text Book:

George B. Thomas and Ross L. Finney: Calculus and Analytic Geometry, 9th Edition, Addison Wesley, 1998

Reference Books:

1. Narayan, S. and P.K. Mittal: Integral Calculus. Sultan Chand & Sons.
2. Kreyszig, E.: Advanced Engineering Mathematics.
3. Narayan S. and P.K. Mittal : Differential Calculus, Sultan Chand & Sons.

Bachelor of Science (Economics) (Semester –II)
Session: 2020-2021
Course Code: BECL-2453
Course Title: Quantitative Techniques–II

Course Outcomes:

After passing this course, students will be able to:

CO1: understand the basic concepts and techniques for analyzing data.

CO2: develop statistical approach and thinking among students to problem solving on a diverse variety of disciplines.

CO3: understand the concept of time series in analyzing economics problems.

Bachelor of Science (Economics) (Semester –II)

Session 2021-22
Course Code: BECL-2453
Course Title: Quantitative Techniques–II

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setters:
Two questions, each carrying 16 marks, from each of Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

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UNIT–I

Statistics: Definition, Scope in Economics, Significance, Limitations. Classification, Tabulation, Diagrammatic and Graphical Representation of Data.
Introduction to SPSS - Defining Variables and Entering Data.

UNIT–II

Concepts and Measures of Central Tendency: Mean, Median, Mode, GM, and HM. Concepts and Measures of Relative Dispersion, Concepts and Measures of Skewness (Stress on Numerical Examples).

UNIT–III

Correlation Analysis: Introduction, Importance, Karl-Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient, Simple Regression Analysis; Difference Between Correlation and Regression, Lines of Regression, Properties of Correlation and Regression Coefficients (Stress on Numerical Examples).

UNIT–IV

Index Numbers: Concept of Index Number, Purpose Construction & Problems, Laspeyre's, Paasche's and Fisher's Formulae, Tests of Consistency.
Analysis of Time Series: Definition, Components of Time Series, Measurement of Trend by Different Methods, Measurement of Seasonal Variations (Stress on Examples).

Suggested Readings:

1. Gupta, S.P. (2014), *Statistical Methods*, Sultan Chand & Sons, New Delhi.
2. Croxton, F.E., Cowden D.J. and Klein, S. (1973), *Applied General Statistics*, 3rd. Ed., Prentice Hall of India, New Delhi.
3. Nagar, A.L. and Das, R.K. (1976), *Basic Statistics*, Oxford University Press, Bombay.
4. Aggarwal, C.S and R.C Joshi.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) (Semester –II)
Session 2021-22
Course Code: BECL-2175
Course Title: Macroeconomics

Course Outcomes:

After passing this course students will be able to:

CO1: understand the consumption and investment behaviour of an economy and factor affecting consumption and investment decisions.

CO2: demonstrate an understanding of nature and functions of money and the role of financial markets in the economy.

CO3: understand the problem of inflation, its causes, effects and solutions in an economy.

Bachelor of Science (Economics) (Semester –II)
Session 2021-22
Course Code: BECL-2175
Course Title: Macroeconomics

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:
Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Distinction between Micro and Macro Economics; Determination of Income and Employment: Classical and Keynesian models; Say's Law of Market and aggregate demand and aggregate supply. Consumption functions; average (short-run and long run) and marginal propensity to consume; Keynes' Psychological Law of Consumption, Multiplier: Meaning and its working.

UNIT–II

Investment: Meaning, Investment Demand schedules and factors affecting investment decision. Marginal Efficiency of Capital, Accelerator, multiplier-accelerator interaction.
Trade cycles-meaning, characteristics and phases, Samuelson and Hicks Models of trade cycles.

UNIT–III

Money: Its functions and role. Money and Capital Markets (Introductory); Quantity Theory of Money: Fisher's and Cambridge's equations, Liquidity preference theory.
Banking: Meaning and Functions of commercial and central banks, Credit creation and credit control.

UNIT–IV

Inflation: Concept, Causes and cures. Inflation-unemployment Trade-off (only Phillips' contribution).**Macroeconomic Policies:** Fiscal policy – meaning, objectives and instruments. Monetary policy:meaning, objectives and instruments.

Suggested Readings:

1. Shapiro E.,(2001),*Macroeconomic Analysis, Harcourt, Brach and World*, New York.
2. Dwivedi D.N., (2018),*Macroeconomics: Theory and Policy*, Tata McGraw-Hill.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) Semester–III
Session: 2021-22
Course Title: Mathematics (Analysis)
Course Code: BECM -3333(I)

Course Outcomes
After passing this course, the students will be able to:

CO1: Demonstrate an understanding of limits and how they are used in sequences and series.
CO2: To understand the concepts of Riemann sum, partitions, upper and lower sums, Riemann integrability of continuous functions and of monotone functions.
CO3: To know and describe the converging behavior of improper integrals and Beta , Gamma functions.
CO4: Distinguish between the absolute convergence and conditional convergence.
CO5: To find the relation between Beta and Gamma functions.

Bachelor of Science (Economics) Semester–III
Session: 2021-22
Course Title: Mathematics (Analysis)
Course Code: BECM -3333(I)

Examination Time: 3 hrs. Max.Marks:50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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Unit-I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.

Unit-II

Series of non-negative terms. Comparison tests. Cauchy's integral tests. Ratio tests. Cauchy's root test. Raabe's test, logarithmic test. Demorgan's and Bertrand's tests. Kummer's test, Cauchy Condensation test, Gauss test, Alternating series. Leibnitz's test, absolute and conditional convergence.

Unit-III

Partitions, Upper and lower sums. Upper and lower integrals, Riemann integrability. Conditions of existence of Riemann integrability of continuous functions and of monotone functions. Algebra of integrable functions.

Unit-IV

Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.

Text Book:
Ajit Kumar and S. Kumaresan : A Basic Course in Real Analysis, CRC Press
Reference Books:

1. Malik, S.C.: Mathematical Analysis, Wiley Eastern Ltd. (1991).
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974).

Bachelor of Science (Economics) Semester–III
Session: 2021-22
Course Code: BECM -3333(II)
Course Title: Mathematics (Analytical Geometry)

Course Outcomes
After passing this course, the students will be able to:
CO1: Understand the concept of the geometry of lines and conics in the Euclidian plane.
CO2: Develop geometry with a degree of confidence and will gain fluency in the basics of Euclidian geometry.
CO3: Sketch conic sections; identify conic sections, their focal properties and classifications.
CO4: Demonstrate the concept of parabola, ellipse, hyperbola, sphere and the general quadratic equation.
CO5: Understand the concept of coordinate geometry on a wider scale with the help of shifting of origin and rotation of axis.

Bachelor of Science (Economics) Semester–III
Session: 2021-22
Course Code: BECM -3333(II)
Course Title: Mathematics (Analytical Geometry)

Examination Time: 3 hrs.

Max.Marks:50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Transformation of axes, shifting of origin, Rotation of axes in two dimension and three dimension, the invariants, Joint equation of pair of straight lines, equations of bisectors

Unit-II

Parabola and its properties. Tangents and normal, Pole and polar, pair of tangents at a point, Chord of contact, equation of the chord in terms of mid point and diameter of conic.

Unit-III

Ellipse and hyperbola with their properties. Tangents and normal, Pole and polar. pair of tangents at a point, Chord of contact, Identifications of curves represented by second degree equation (including pair of lines).

Unit-IV

Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Sphere: Section of a sphere by a plane, spheres of a given circle. Intersection of a line and a sphere. Tangent line, tangent plane, power of a point with respect to a sphere, radical planes.

Text Book:

S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London.

Reference Books:

1. Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry.
2. Narayan, S and P.K.Mittal.: Analytical Solid Geometry, Sultan Chand & Sons (2005).
3. Kreyszig, E.: Advanced Engineering Mathematics.
4. Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.

B. Sc. Economics (Semester –III)
Session 2020-21
Course Code: BECL-3453
Course Title: Quantitative Techniques–III

Course Outcomes:

After passing this course students will be able to:

CO1: understand and apply the concept of differentiation in economic applications such as profit maximization, cost minimization or utility optimization.

CO2: understand and apply the concept of indefinite and definite integrals to the economics concepts like consumer and producer surplus.

CO3: explain and use matrix operations to solve system of equations

CO4: understand the basics of Linear programming.

Bachelor of Science (Economics) (Semester –III)
Session 2021-22
Course Code: BECL-3453
Course Title: Quantitative Techniques–III

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Differentiation: Maxima and Minima of Functions, Partial derivatives, Higher order partial derivatives.

UNIT–II

Integration (Excluding Trigonometric and Inverse Functions): Indefinite Integrals; Integration by Partial Fractions; Integration by substitution; Integration by parts; Definite Integrals; Application of Integration in Consumer Surplus and Producer Surplus.

UNIT–III

Matrices: Definition, Types, Addition, Subtraction and Multiplication of Matrices, Scaler Multiplication, Transposition, Determinants and their Properties, Minors and Co-factors, Rank of a Matrix, Inverse of a Matrix, Crammer's Rule for Solution of Simultaneous system of equations; Applications of matrices in economics.

UNIT–IV

Linear Programming: Formulation of problem, Assumptions, Graphical solution, Simplex method, Use of Artificial Variables, Dual Simplex method. Input-Output Analysis: Basic concepts, Input-Output tables for closed and open economies, Leontief Basic Input-Output Model, Simple Applications of Input-Output Analysis.

Suggested Readings:

1. Rangi, S.S. and Chowdhary, V. (2013), "*Mathematical Techniques*", S. Vikas& Co. Publishing House, India.
2. Allen, R.G.D.(1938), Mathematical Analysis for Economists, ELBS and Macmillan Press, New York.
3. Chiang, A.(1967), Fundamental Methods of Mathematical Economics, McGraw Hill.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) (Semester –III)
Session 2021-22
Course Code: BECL-3175
Course Title: Indian Economy

Course Outcomes:

After passing this course students will be able to:

CO1: understand the Indian development strategies and dynamics of problems of different sectors of Indian Economy

CO2: understand latest developments in social, agriculture, industry and external sector in India.

Bachelor of Science (Economics) (Semester –III)
Session 2021-22
Course Code: BECL-3175
Course Title: Indian Economy

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT- I

Nature of Indian Economy; Agriculture in India: Nature and Importance of Agriculture, Causes of Decline in Productivity, Sustainable Agricultural Growth, Green Revolution and New Agricultural Strategy; WTO and Indian Agriculture (Introductory).

UNIT- II

Industry: Performance and Problems of Industrial Development; Public Sector versus Private Sector, Role of Privatization, Role of Small and Cottage Industries, Latest Industrial Policy.

UNIT- III

Foreign Trade: Direction and Composition of Exports and Imports since 1991; Recent Foreign Trade Policy, Balance of Payment Problem, Foreign Capital and Multinational Corporations in India.

UNIT- IV

Features of Population Growth in India. Major Problems of the Economy – Inflation, Unemployment, Poverty and Inequality. Current Indian Tax Structure. Planning- Objectives, Strategy, Evaluation of Planning in India; A Brief Idea of Objectives, Targets, Resources of the Latest Five Year Plan (Twelfth Five Year Plan).

Suggested Readings:

1. Mishra, S.K. and Puri, V.K. (2019), "*Indian Economy",* Himalaya Publication House, Mumbai.
2. Dutt, R. and Sundharam, *K.P.M.* (2018), "*Indian Economy",* S. Chand & Co. Ltd., New Delhi.
3. Aggarwal, A. N. (1975), "*Indian Economy",* Vikas Publishing House, Delhi.
4. Wadhwa, C. D. (1980), "*Indian Economic Policy",* Tata McGraw Hill, Bombay.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) Semester–IV
Session: 2021-22
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BECM -4333(I)

Course Outcomes
After passing this course, the students will be able:
CO1: To apply parallelogram law of forces, triangle law of forces, Lami's theorem to real life problems.
CO2: To understand that how one can resolve number of coplanar forces, parallel forces and concurrent forces acting at a body.
CO3: To find the moments of number of coplanar forces acting at a particle
CO4: To find the resultant of a force and couple acting on a body.
CO5: To find the applications of CG of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.
CO6: To find the values of gradient, divergence and curl operator of given vectors.
CO7: To find the application of Gauss theorem, Green's theorem and Stokes's theorem in real life problems.

Bachelor of Science (Economics) Semester–IV
Session: 2021-22
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BECM -4333(I)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami's Theorem(ג-μ) theorem). Resultant of a number of coplanar forces, parallel forces. Moments ,Varignon's Theorem of moments, Couples , Resultant of two Coplanar Couples, Equilibrium of two coplanar couples, Resultant of a force and a couple, Equilibrium of coplanar forces.

Unit-II

Friction, Laws of friction, Equilibrium of a particle on a rough plane. Centre of Gravity: Centre of gravity of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

Unit-III

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, and Vector integration.

Unit-IV

Theorems of Gauss, Green, Stokes and problems based on these.

Text Books:

1. N.P.Bali: Statics, Laxmi Publications (P) Ltd.
2. Spiegal,M.R.: Vector Analysis, Schaum's outline Series, McGraw Hill.

Reference Books:

1. S.L. Loney: Statics, Macmillan and Company, London.
2. R.S. Verma: A Text Book on Statics, Optical Pvt. Ltd., Allahabad.

Bachelor of Science (Economics) Semester–IV
Session: 2021-22
Course Title: Mathematics (Solid Geometry)
Course Code: BECM -4333(II)

Course Outcomes
After passing this course, the students will be able to:
CO1: Demonstrate the concept of cone, classification of cone, intersection of line and cone, reciprocal cone.
CO2: Understand the concept of cylinder, enveloping cylinder and its limiting form.
CO3: Describe the concept of conicoids or quadratic surface, its classification, trace different types of conicoids.
CO4: Manage to find surface of revolution and concept of tangent and normal to the conicoid
CO5: Identify the conicoids and representing it in the form of hyperboloid, ellipsoid, paraboloid.

Bachelor of Science (Economics) Semester–IV
Session: 2021-22
Course Title: Mathematics (Solid Geometry)
Course Code: BECM -4333(II)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Cylinder as surface generated by a line moving parallel to a fixed line and through fixed curve. Different kinds of cylinders such as right circular, elliptic, hyperbolic and parabolic in standard forms

Unit-II

Cone with a vertex at the origin as the graph of homogeneous equation of second degree in *x, y, z* . Cone as a surface generated by a line passing through a fixed curve and fixed point outside the plane of the curve. Right circular and elliptic cones.

Unit-III

Equation of surface of revolution obtained by rotating the curve f(x,y)=0 about the z-axis in the form of $f(x^2+y^2, z) = 0$.Equation of ellipsoid, hyperboloid and Paraboloid in standard forms.

Unit-IV

Surfaces represented by general equation of 2nd degree S = 0. Tangent lines, tangent planes and Normal Plane.

Text Book:

P.K.Jain& Khalil Ahmed: A text book of Analytical Geometry of three dimensions, Wiley Eastern Ltd. 1999.

Reference Books:

1. Narayan, S &P.K.Mittal : Analytical Solid Geometry, Sultan Chand & Sons(2005)
2. Kreyszig, E : Advanced Engineering Mathematics

Bachelor of Science (Economics) (Semester –IV)
Session: 2021-2022
Course Code: BECL-4453
Course Title: Quantitative Techniques–IV

Course Outcomes:

After passing this course students will be able to**:**

CO1: understand the axiomatic formulation of modern probability theory and think of random variables as intrinsic need for analysis of random phenomena.

CO2: recognize the connection between theory and applications by appropriately fitting, assessing and interpreting the results/ outcomes

CO3: understand the basic principles underlying survey design and estimation.

Bachelor of Science (Economics) (Semester –IV)

Session: 2021-2022

Course Code: BECL-4453

Course Title: Quantitative Techniques–IV

Time: 3 Hours **Max. Marks: 100**

Theory: 80

Internal Assessment: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Multiple Linear Regression: Concepts, Estimation and Applications (without derivations). Partial and Multiple Correlation. Non-Linear Regression: Quadratic and Exponential; Estimation of Fitting of Various Growth Curves (Modified Exponential, Gompertz).

UNIT–II

Probability: Definition, Additive & Multiplicative Laws and their Applications, Bayes Theorem, Concept of Random Variable, Probability Mass Function & Density Function, Mathematical Expectation (meaning and properties), Moments, Moment Generating Function and Characteristic Function.

UNIT–III

Theoretical Probability Distributions: Derivations of the properties of Binomial (with numerical), Poisson (with numerical), Normal (with numerical), Beta and Gamma Distributions.

UNIT–IV

Sampling: Various concepts – Population, Sampling Units, Complete Enumeration sample Surveys, Concept of an Estimator and The Standard Error, Standard Error of Estimates. Features of a Good Sample, Random and Subjective Sampling, Simple Random Sampling (with and without replacement), Stratified Random Sampling (applications only).

Suggested Readings:

1. Gupta, S.C. (2018), "Fundamentals of Statistics", Himalaya Publishing House, 7th Edition,Delhi
2. Gupta, S.P. (2014), "Statistical Methods", Sultan Chand & Sons, 43rd Edition, Delhi
3. Rangi, S. S. and Nayyar, R.K. (2014), "Statistical Techniques (Vol. II)", S. Vikas and Company, India.
3. Siegel, Andrew F. (2002), Practical Business Statistics, International Edition, 5th Edition, McGraw Hill Irwin.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) (Semester –IV)
Session 2021-22
Course Code: BECL-4175
Course Title: International Economics and Public Finance

Course Outcomes:

After studying this course, students will be able to:

CO1: understand the basis of and gains from international trade.

CO2: understand the concept, structure, disequilibrium causes and measures through which disequilibrium can be corrected and how the exchange rate is determined.

CO3: be able to understand the basic aspects of public finance.

Bachelor of Science (Economics) (Semester –IV)
Session 2021-22
Course Code: BECL-4175
Course Title: International Economics and Public Finance

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

International Trade: Internal and External Trade; Classical and Heckscher-Ohlin Theories, Gains from Trade, Terms of Trade, (gross, net and income terms of trade).Trade and economic development.
Commercial Policy: Free trade vs. protection, rationale of a protectionist policy in less developed area. GATT & WTO (Introductory).

UNIT–II

Balance of Payments: Meaning and components of balance of payments, Methods for Correcting adverse balance of payments, devaluation and direct control.
Rate of Exchange: Meaning and determination (PPP and BOP Theory), Fixed and flexible exchange rates.

UNIT–III

Public Finance: Nature, scope importance. Public Expenditure: Meaning, principles, importance, effect of public expenditure on production and distribution.

UNIT–IV

Taxes: Meaning, classification, features of a good taxation system, canons of taxation, incidence and impact of taxation. Public Debt: Meaning, objectives, importance, its burden.

Suggested Readings:

1. Sodersten, B.O. (1970), "*International Economics",* Macmillan, London.
2. Salvatore, D. and Reed, G. (1983), "*International Economics",* Macmillan Publishing Company, New York.
3. Tyagi, B.P. (2004), "Public Finance", Jai Prakash Nath & Company, Meerut.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) Semester–V
Session: 2021-22
Course Title: Mathematics (Dynamics)
Course Code: BECM -5333(I)

Course Outcomes
After passing this course, the students will be able to:
CO1: Identify the basic relations between distance, time, velocity and acceleration.
CO2: Explain the relationship between forces and motion. Differentiate between balanced and unbalanced forces and Explain how unbalanced force affect motion.
CO3: Understand Newton's Laws of Motion and Apply the laws to solve many problems.
CO4: Discuss the motion of particles connected by a string, motion along a smooth inclined plane.
CO5: Solve different types of problems with Variable Acceleration.
CO6: Discuss Simple Harmonic Motion and Illustrate it with a variety of examples.
CO7: Solve Pendulum, Damped and forced Oscillations oscillating system problems.
CO8: Define Work, Power and Energy and Explain their relationship. Use measurement tools to apply the concepts of Work and power to solve real life problems.
CO9: Define Energy and Identify the different types that exist

Bachelor of Science (Economics) Semester–V
Session: 2021-22
Course Title: Mathematics (Dynamics)
Course Code: BECM -5333(I)

Examination Time:3 Hours | Max.Marks: 50
Theory:40
CA:10

Instructions for the paper setter:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

Rectilinear motion in a straight line with uniform acceleration, Newton's laws of motion. Motion of two particles connected by a string.

Unit-II

Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit-III

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles, velocity and direction of motion of a projectile after a given time, projectiles on an inclined plane. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum.

Unit-IV

Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

Text Book:

S.R.Gupta: A text book of Dynamics

Reference Books:

1. F. Chorlton: Dynamics.
2. S.L. Loney: An Elementary Treatise on the Dynamics of a Practice and of Rigid Bodies, Cambridge University Press, 1956.

Bachelor of Science (Economics) Semester–V
Session: 2021-22
Course Title: Mathematics (Number Theory)
Course Code: BECM -5333(II)

Course Outcomes
Successful completion of this course will enable the students to:
CO1: Prove results involving divisibility and greatest common divisors.
CO2: Solve system of linear congruences.
CO3: Find solutions of specified linear Diophantine equation.
CO4: Apply Fermat's and Euler's theorem to prove relation involving prime numbers.
CO5: Apply the Wilson's theorem to solve numerical problems.
CO6: Solve system of equations using congruences.
CO7: Understand and apply properties of phi functions in real world problems.
CO8: Understand application of important arithmetic functions.

Bachelor of Science (Economics) Semester–V
Session: 2021-22
Course Title: Mathematics (Number Theory)
Course Code: BECM -5333(II)

Examination Time: 3 hrs. Max.Marks: 50
Theory: 40
CA:10

Instructions for the Paper Setter:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

The division algorithm, The greatest common divisor, least common multiple, The Euclidean algorithm.

Unit-II

The Diophantine equation ax + by = c, Prime numbers and their distribution, the fundamental theorem of arithmetic, Basic properties of congruences.

Unit-III

Linear congruences, Special divisibility tests, Chinese remainder theorem, The Fermat's theorem, Wilson's theorem

Unit-IV

Euler's Phi function, Euler's theorem, some properties of the Phi Function, σ and τ functions, Mobius Inversion formula, Greatest integer function

Text Book:
D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope in Chapters 2-5, 7) 2005.
Reference Book:
Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.

Bachelor of Science (Economics) (Semester–V)
Session 2021-22
Course Code: BECL-5453
Course Title: Quantitative Techniques-V

Course Outcome:

After the successful completion of this course, the students will be able to

CO 1: understand the process of formulation and of testing the hypothesis.

CO2: understand the theoretical details of sampling distributions and their basic applications.

CO 3: learn ANOVA to split and analyse the variations in economic phenomenon.

Bachelor of Science (Economics) (Semester–V)
Session 2021-22
Course Code: BECL-5453
Course Title: Quantitative Techniques-V

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:
Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Statistical Inference: Point & Interval Estimation, Properties of a Good Estimator, Maximum Likelihood Method of Estimation and derivation of mean and variance of Binomial, Poisson and Normal distributions using MLE. Basic Concepts of Null and Alternative Hypotheses, Types of Errors, One Tailed and Two Tailed Tests, Power of Test, Critical Region.

UNIT–II

Sampling Distributions: Derivation of properties of Z, T, Chi Square and F distributions.

UNIT–III

Tests of significance based upon distribution of Z, t, F and Chi-square.

UNIT–IV

Analysis of Variance: Introduction, Assumptions, Techniques of Analyzing Variance-Analysis of Variance of one-way and two-way classification.

Suggested Readings:

1. Gupta and Kapoor(2014) , *Fundamentals of Mathematical Statistics* , Sultan Chand & Sons , New Delhi
2. Rangi S.S.(2016), Statistical Techniques, S. Vikas &Co. (Publishing House) India.

Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) (Semester–V)
Session 2021-22
Course Code: BECL-5175
Course Title: Economics of Development

Course Outcomes:

After passing this course students will be able to:

CO1: understand the different path ways of economic development, recognize the importance of assumptions in development models and their policy implications.

CO2: critically evaluate economic problems of developing and least developed countries and participate in the contemporary policy debate on development priorities

Bachelor of Science (Economics) (Semester–V)
Session 2021-22
Course Code: BECL-5175
Course Title: Economics of Development

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:
Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Economic Development: Meaning and Measurement, Economic and Non-Economic Factor, Characteristics of Developing and Least Developed Countries. Human Development Index, Concept of Sustainable Development.
Dualism: Social and Technological Dualism
Lewis Model of Unlimited Supply of Labour, Problems of Unemployment and Disguised Unemployment.

UNIT–II

Models of Growth: Classical, Marxian, Schumpeter's, Harrod-Domar and Solow's Growth Models.

UNIT–III

Rostow's Stages of Growth
Strategies of Economic Development-Balanced vs. Unbalanced Growth; Theory of Big Push; Leibenstein's Critical Minimum Efforts Thesis
Export Promotion and Import Substitution.

UNIT–IV

Capital Formation – Meaning and Sources.
Choice of Technique
Role of Planning in Under Developed Countries, Need, Objective, Strategy, Types and Problems of Planning.

Suggested Readings:
1. Meier, G.M.(1995),*Leading Issues in Economic Development*, Oxford University Press, New Delhi.
2. Thirlwall, A.P.(2011), *Economics of Development*, Palgrave Macmillan.
3. Todaro, M.P. and Smith, S.C. (2018), *Economic Development*, Pearson India
4. Misra and Puri (2016), *Economics of Development and Planning*, Himalaya Publishing House, New Delhi
Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) Semester–VI
Session: 2021-22
Course Title: Mathematics (Linear Algebra)
Course Code: BECM -6333(I)

Course Outcomes
After the completion of this course, students should be able to:
CO1: Express the algebraic concepts such as binary operation, groups, rings and fields.
CO2: Define a vector space and subspace of a vector space.
CO3: Check the linear dependence and linear independence of vectors.
CO4: Describe the concepts of basis and dimension of vector spaces.
CO5: Investigate properties of vector spaces and subspaces using linear transformation.
CO6: Express linear transformations between vector spaces.
CO7: Perform algebra operations between linear transformations.
CO8: Find the matrix representing a linear transformation.

Bachelor of Science (Economics) Semester–VI
Session: 2021-22
Course Title: Mathematics (Linear Algebra)
Course Code: BECM -6333(I)

Examination Time: 3 Hours Max. Marks: 50
Theory:40
CA:10

Instructions for the paper setters/examiners:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Definition of groups, rings and fields with examples. Definition of a vector space, subspaces with examples. Direct sum of subspaces. Linear span, Linear dependence, Linear independence of vectors. Linear combination of vectors.

Unit-II

Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis. Invariance of the number of elements of the basis set. Dimension of sum of two subspaces. Quotient space and its dimension.

Unit-III

Linear transformation. Algebra of linear transformation. Rank-Nullity theorem, Isomorphism and Isomorphic spaces.

Unit-IV

Matrix of a linear transformation. Changes of basis, Linear operator.

Text Book:
Charles W.Curtis : Linear Algebra
Reference Books:
1.Surjit Singh: Linear Algebra, Vikas Publishing ,1997.
2.V. Krishnamurthy, V. P. Mainra and J.L. Arora: An Introduction to Linear Algebra, East West Press, 1976.
3.Shanti Narayan & P.K. Mittal: A Text Book of Matrices, 10th Edition (2002), S. Chand & Co.

Bachelor of Science (Economics) Semester–VI
Session: 2021-22
Course Title: Mathematics (Numerical Analysis)
Course Code: BECM -6333(II)

Course Outcomes

After passing this course, the students will be able to:
CO1: Perform computation for solving a system of equations.
CO2: Understand its application in all branches of engineering.
CO3: Know how to find the roots of transcendental equations.
CO4: Learn how to interpolate the given set of values.
CO5: Understand the curve fitting for various polynomials .
CO6: Learn numerical solution of differential equations.
CO7: Compute numerical integration and differentiation, numerical solution of ordinary differential equations.

Bachelor of Science (Economics) Semester–VI
Session: 2021-22
Course Title: Mathematics (Numerical Analysis)
Course Code: BECM -6333(II)

Examination Time: 3 Hours Max. Marks: 50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
The students can use only Non Programmable & Non Storage Type Calculator.

Unit-I

Error generation, propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Iteration method, Newton's Method, Generalized Newton's Method, Method of false position, Muller's method, Rate of convergence of these methods.

Unit-II

Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi's Method, Gauss Seidel Method. Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator. Interpolation with divided difference, Newton's formula, Lagrangian Method.

Unit-III

Finite difference interpolation, Gauss formula, Stirling formula, Bessel's formula, Error Estimation Extrapolation. Numerical differentiation, Method based on interpolation. Numerical Integration, Trapezoidal rule, Simpson's rule, Weddle rule, Romberg Integration, Gaussian integration method, Gaussian legendre integration. Double numerical integration.

Unit-IV

Numerical solution of ordinary differential equations, Initial value problem, Taylor's method, Euler's methods, Picard's method, Milne's Method, Runge-Kutta Method. Predictor-Corrector's Method.

Text Book:

Iyenger, S. R. K., R. K. Jain, and Mahinder Kumar. Numerical Methods for Scientific and Engineering Computation. Delhi: New Age International Publishers, 2012.

Bachelor of Science (Economics)(Semester–VI)
Session 2021-22
Course Code: BECL-6453
Course Title: Quantitative Techniques-VI

Course Outcomes:

After passing this course students will be able to:

CO1: understand the nature and methodology of econometrics.

CO2: understand the OLS procedure of estimation of model and problems associated with it.

CO3: understand basics of estimation of models with lags

Bachelor of Science (Economics) (Semester–VI)
Session 2021-221
Course Code: BECL-6453
Course Title: Quantitative Techniques-VI

Time: 3 Hours **Max. Marks: 100**
Theory: 80
CA: 20

Note: Instructions for the Paper–Setter:
Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

Unit – I

Definition, Scope and Nature of Econometrics. Simple Linear Regression Model (OLS method) with applications

Unit – II

General Linear Regression Model: assumptions, properties (BLUE). Gauss-Markov Theorem (Two Variable and K-variable). Concepts of R^2 and Adjusted R^2, Test of Significance (Stress on Numericals); Estimation of regression using SPSS and Interpretation of Output.

Unit – III

Econometric Problems of Heteroscedasticity and Multicollineraity in the Regression Analysis: Sources, Consequences, Tests and Remedial Measures. Specification Bias.

Unit – IV

Problem of Auto-Correlation in the Regression Analysis: Sources, Consequences, Tests and Remedial Measures. Distributed Lag Models and Auto-Regressive Models (Introductory). Dummy Variable Technique and its uses.

Suggested Readings:
1. Madnani GMK, (2015), *Introduction of Econometrics,* Oxford and IBH Publishing, N. Delhi.
2. Koutsoyiannis, A, *(2001), Theory of Econometrics,* The Macmillan Press Ltd., London.
Note: The latest edition of the books is recommended.

Bachelor of Science (Economics) (Semester –VI)
Session 2021-22
Course Code: BECL-6175
Course Title: Quantitative Methods for Economists

Course Outcomes:

After passing this course students will be able to:

CO1: Learn basic tools of mathematics and statistics.

CO2: Develop analytical and interpreting skills.

CO3: Understand the appropriate methods for forecasting and estimation.

Bachelor of Science (Economics) (Semester –VI)

Session 2021-22

Course Code: BECL-6175

Course Title: Quantitative Methods for Economists

Time: 3 Hours **Max. Marks: 100**

Theory: 80

CA: 20

Note: Instructions for the Paper–Setter:

Two questions, each carrying 16 marks, from each of the Units I-IV (i.e. a total of eight questions) are to be set. Candidates are required to attempt five questions, selecting at least one from each unit. The fifth question may be attempted from any unit.

UNIT–I

Sets, Relations and functions, Derivative of simple functions only (excluding log & exponential functions).Maxima/Minima for single variable functions. Introduction to Matrices - definition, properties & inverse.

UNIT–II

Measures of Central Tendency — Mean, Mode, Median and Geometric Mean; Measures of Dispersion.

UNIT–III

Concepts and Measure of Skewness and Kurtosis: Boyle's & Karl Pearson's measures. Simple Correlation & Regression (ungrouped & grouped data).

UNIT–IV

Interpolation: Concepts and Methods — Binomial expansion, Newton and Lagrange's Method (with emphasis on missing values only). Price Index Numbers–Weighted and Unweighted Index Numbers, various formulae and consistency tests.

Suggested Readings:

1. Gupta, S.P. (2014), *Statistical Methods*, Sultan Chand & Sons, New Delhi.
2. Gupta, S.C. (2018), *Fundamentals of Statistics*, Himalaya Publishing House, New Delhi
3. Elhance, D.N. and Elhance, V. (2018), *Fundamentals of Statistics* , Kitab Mahal, Allahabad
4. Croxton, F.E., Cowden D.J. and Klein. S. (1973), *Applied General Statistics,* 3rd. Ed., Prentice Hall of India, New Delhi.
5. Nagar, A.L. and Das, R.K. (1976), *Basic Statistics*, Oxford University Press, Bombay.
6. Aggarwal, C.S and Joshi, S.C.(2017) ,*Mathematics for Students of Economics*, New Academic Publishing Co., Jalandhar

Note: The latest edition of the books is recommended.