ST. JOSEPH'S COLLEGE (AUTONOMOUS), DEVAGIRI, CALICUT

CURRICULUM AND SYLLABI

FOR

B.Sc. ECONOMICS & MATHEMATICS (DOUBLE MAIN)

(UNDER CHOICE BASED CREDIT & SEMESTER SYSTEM UG - 2019)

Course Outcome

(2020 Admission Onwards)

Course Outcome

Core course
FIRST SEMESTER
GDEC1B01T: INTRODUCTORY ECONOMICS

Lecture Hours: 96 (6 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	To understand the basic concepts of Microeconomics.
CO2	To familiarize with the demand and supply aspects so that students will be able to determine equilibrium
CO3	To understand consumer and producer behaviour.
CO4	To understand the basic concepts of cost and revenue and Market.
CO5	To understand basic concepts of macroeconomics like national income, inflation and unemployment

FIRST SEMESTER
GDMT1B01T: BASIC CALCULUS

Lecture Hours: 96 (6 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	At the end of the course students get able to be familiar to the world of calculus and they develop their own way of writing and explaining mathematics
CO2	Students also experience the classical way of doing and enjoying mathematics in a much more logical way

SECOND SEMESTER
GDEC2B02T: MICROECONOMICS- I

Lecture Hours: 96 (6 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	To understand and analyse Consumer and producer behavior with quantitative tools.
CO2	Also it enables students to apply theory in real practical life though optimization principles.

SECOND SEMESTER
GDMT2B02T: ADVANCED CALCULUS

COs	COURSE OUTCOMES
CO1	The students get the idea of parametrization of curves; they learn how to calculate the arc length, curvature etc. using parametrization and also the area of surface of revolution of a parametrized plane curve
CO2	Students are introduced into other coordinate systems which often simplify the equation of curves and surfaces and the relationship between various coordinate systems
CO3	Students will be able to handle vectors in dealing with the problems involving geometry of lines, curves, planes and surfaces in space and have acquired the ability to sketch curves in plane and space given in vector valued form

General Course
THIRD SEMESTER
GDEC3A01T: MACROECONOMICS - I

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Students are expected to learn and explain the theory of income and employment determination
CO2	Students are expected to learn the aggregate demand/aggregate supply model and explain its uses, and limitations

THIRD SEMESTER
GDMT3A01T: BASIC LOGIC, BOOLEAN ALGEBRA AND GRAPH THEORY

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Identify correct and incorrect arguments
CO2	Understand the criteria for the evaluation of arguments
CO3	Understand the scientific way of decision making using the laws of logic
CO4	Understand the concept of algebraic structures in Mathematics
CO5	Identify a given algebraic structure as belonging to a particular family of structures and

CO6	to state the characteristic properties of the members of the family
CO7	Understand the concept of groups and derive basic theorems on groups
CO8	Define the concept of Boolean algebra as an algebraic structure and list its properties
CO9	Understand the applications of Boolean algebra in switching circuits
CO10	Define a Graph and identify different classes of graphs
CO11	Understand various applications of Graph theory

THIRD SEMESTER
GDEC3B03T: LINEAR PROGRAMMING AND PROBABILITY

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	To formulate a given simplified description of a suitable real world problem as a linear programming model in general form
CO2	To solve a linear programming problem using various methods
CO3	To understand various approaches to probability and compute probabilities

THIRD SEMESTER
GDEC3B04T: FINANCIAL ECONOMICS

Lecture Hours: 96 (6 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	After completing this course, the student will be able to develop comprehensive knowledge on the role of finance in the operation of an economy
CO2	Enables them to know the operation of the Indian Financial System and activities in the financial markets

THIRD SEMESTER
GDMT3B03T: MULTIVARIABLE CALCULUS

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES

CO1	Understand the use of partial derivatives in getting information of tangent plane and normal line
CO2	Calculate the maximum and minimum values of a multivariable function using second derivative test and Lagrange multiplier method
CO3	Find a few real life applications of Lagrange multiplier method in optimization problems.
CO4	Extend the notion of integral of a function of single variable to integral of functions of two and three variables.
CO5	Address the practical problem of evaluation of double and triple integral using Fubini's theorem and change of variable formula.
CO6	Realize the advantage of choosing other coordinate systems such as polar, spherical, cylindrical etc. in the evaluation of double and triple integrals.
CO7	See a few applications of double and triple integral in the problem of finding out surface area, mass of lamina, volume, centre of mass and so on.
CO8	Understand the notion of a vector field, the idea of curl and divergence of a vector field, their evaluation and interpretation.
CO9	Understand the idea of line integral and surface integral and their evaluations

General Course
FOURTH SEMESTER
GDEC4A02T: INDIAN ECONOMY

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Provides a critical understanding on change in sectorial composition of GDP, change in agricultural and industrial sectors
CO2	Students will get an understanding on the issues and policy developments in India
CO3	This course enables students to get a deep understanding of the economic policy decisions of government of India, reasons and logics behind such decisions, it's probable impacts

FOURTH SEMESTER
GDEC4B05T: MICROECONOMICS - II
Lecture Hours: 96 (6 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Evaluate General equilibrium and different theories of welfare economics and their relevance in government policies.
CO2	To enable students to analyze different market structures and their applicability in the contemporary world
CO3	To understand the basic theories of factor pricing and distribution.
CO4	To explore the situation of market failures

FOURTH SEMESTER
GDMT4A02T: THEORY OF EQUATIONS AND COMPLEX NUMBERS

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**

Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	At the end of the course students get used to different ways of solving equations and they begin to prove many properties in their own way regarding numbers
CO2	At the end of the course students get the idea of Complex numbers and their properties, Complex Functions and Special Power functions.

FOURTH SEMESTER
GDMT4B04T: ABSTRACT ALGEBRA

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Students understand the abstract notion of a group, learn several examples, are taught to check whether an algebraic system forms a group or not and are introduced to some fundamental results of group theory
CO2	Students understand the idea of structural similarity, the notion of cyclic group, permutation group, various examples and very fundamental results in the areas

FOURTH SEMESTER
GDMT4B05T: DISTRIBUTION THEORY

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	To derive various descriptive statistics; verify the existence of reproductive property of distributions using generating functions-their limitations and advantages
CO2	To understand various theoretical probability distributions and their applications

FIFTH SEMESTER
GDEC5B06T: MACROECONOMICS II

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	After completing this course a student should be able to explain the concept of consumption and investment and factors affecting it in a country
CO2	Also, a student should be able to explain the components of money supply and demand in an economy.

CO3	A clear understanding of the monetary and fiscal poly enables students to review economic activities and its impact on the economy

FIFTH SEMESTER
GDEC5B07T: ECONOMETRICS I

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 3**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	The students will get a foundation for econometric analysis and develop skills for empirical research.
CO2	The students will get basic research aptitude by solving various real life economic problems.
CO3	The topic equips students to get careers in the fields of social science research.

FIFTH SEMESTER
GDMT5B06T: LINEAR ALGEBRA

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 3**
Marks: 75 (Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	Linear maps are introduced. The key result here is that for a linear map *T*, the dimension of the null space of *T* plus the dimension of the range of *T* equals the dimension of the domain of *T*.
CO2	The part of the theory of polynomials that will be needed to understand linear operators is presented.
CO3	The idea of studying a linear operator by restricting it to small subspaces to eigenvectors. The highlight is a simple proof that on complex vector spaces, eigenvalues always exist. This result is then used to show that each linear operator on a complex vector space has an upper-triangular matrix with respect to some basis. Similar techniques are used to show that every linear operator on a real vector space has an invariant subspace of dimension 1 or 2. This result is used to prove that every linear operator on an odd-dimensional real vector space has an eigenvalue. All this is done without defining determinants or characteristic polynomials

FIFTH SEMESTER
GDMT5B07T: REAL ANALYSIS

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 3**
Marks: 75 (Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	To learn and deduce rigorously many properties of real number system by assuming a few fundamental facts about it as axioms. In particular they will learn to prove Archimedean property, density theorem, existence of a positive square root for positive numbers and so on and the learning will help them to appreciate the beauty of logical arguments and embolden them to apply it in similar and unknown problems

FIFTH SEMESTER
GDMT5B08T: STATISTICAL INFERENCE

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Understand the theory essential for estimation of unknown parameters
CO2	Understand various sampling distributions and the related concepts , criteria of good estimators and interval estimation

SIXTH SEMESTER
GDEC6B09T: INTERNATIONAL ECONOMICS

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 3**
Marks: 75 (Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	The students are expected to acquire skill that will help them to take rational decisions in issues related international economics

SIXTH SEMESTER
GDEC6B10P: COMPUTER ORIENTED STATISTICAL METHODS

Lecture Hours: 64 (4 Hrs/Week)   **Credits: 4**
Marks: 100[Internal: 20, External: 80(Record:20 & Practical Exam:60)]

COs	COURSE OUTCOMES
CO1	To develop scientific and experimental skills to correlate theoretical principles of statisticswith application based studies
CO2	To familiarise the students with basics of statistics softwares R and SPSS

SIXTH SEMESTER
GDMT6B09T. NUMERICAL ANALYSIS

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 5**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Understand several methods such as bisection method, fixed point iteration method, regulafalsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy.
CO2	Understand the concept of interpolation and also learn some well known interpolation techniques.
CO3	Understand a few techniques for numerical differentiation and integration and also realize their merits and demerits.
CO4	Find out numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods

SIXTH SEMESTER
(ELECTIVE I)
GDMT6E01T: DIFFERENTIAL EQUATIONS

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Students could identify a number of areas where the modeling process results in a differential equation.
CO2	They will learn what an ODE is, what it means by its solution, how to classify DEs, what it means by an IVP and so on.
CO3	They will learn to solve DEs that are in linear, separable and in exact forms and also to analyze the solution.
CO4	They will realize the basic differences between linear and non linear DEs and also basic results that guarantee a solution in each case.
CO5	They will learn a method to approximate the solution successively of a first order IVP.

SIXTH SEMESTER
(Elective II)
GDMT6E02P: MATHEMATICAL PROGRAMMING WITH PYTHON AND LATEX

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80 (Practical Exam))   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Understand basis of Python programming, apply Python programming in plotting mathematical functions, apply Python programming in numerical analysis, understands typesetting using Latex and apply Latex in writing equations

SIXTH SEMESTER
(Elective III)
GDMT6E03T: TOPOLOGY OF METRIC SPACES

Lecture Hours: 80 (5 Hrs/Week)   **Credits: 4**
Marks: 100(Internal: 20, External: 80)   **Examination: 2½ Hours**

COs	COURSE OUTCOMES
CO1	Perform simple theoretical analysis involving sets in metric and topological spaces and maps between these spaces
CO2	Apply these concepts to other areas of mathematics

OPEN COURSE
FIFTH SEMESTER
(OPEN COURSE)
(For students not having Mathematics as Core Course)

GMAT5D01T: APPLIED CALCULUS

Lecture Hours: 48 (3 Hrs/Week)   **Credits: 3**
Marks: 75(Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	Identify the independent and dependent variables of a function and compute its domain and range.
CO2	Evaluate functions given by formulas at given points
CO3	Plot the graphs of straight lines and conics
CO4	Compute limits
CO5	Check continuity
CO6	Compute derivatives and write down the equation of the tangent line
CO7	Determine whether the function is increasing or decreasing using derivatives
CO8	Compute velocity and acceleration
CO9	Compute marginal cost/revenue/profit of production
C10	Compute differential and use it to approximate the error occurred
CO11	Perform implicit differentiation
CO12	Compute convexity, concavity and points of inflection
CO13	Sketch curves
CO14	Determine extreme values
CO15	Determine the level of elasticity and use it for predicting the behaviour of revenue/cost/profit
CO16	Combine the techniques of model building with optimization techniques
CO17	Use exponential/logarithmic function to compute compound interest, radioactive decay etc
CO18	To compute the area under a curve, average value of a function using integration
CO19	Integrate using substitution
CO20	To estimate the future and present value of an income flow
CO21	To compute the survival and renewal functions
CO22	To compute anti derivative
CO23	To determine population density
CO24	To find the area and volume of surface of revolution

FIFTH SEMESTER
(OPEN COURSE)
(For students not having Mathematics as Core Course)

GMAT5D02T: DISCRETE MATHEMATICS FOR BASIC
AND APPLIED SCIENCES

Lecture Hours: 48 (3 Hrs/Week)   **Credits: 3**
Marks: 75(Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	Identify correct and incorrect arguments
CO2	Understand the criteria for the evaluation of arguments
CO3	Understand the scientific way of decision making using the laws of logic
CO4	Understand the concept of algebraic structures in Mathematics
CO5	Identify a given algebraic structure as belonging to a particular family of structures and to state the characteristic properties of the members of the family
CO6	Understand the concept of groups and derive basic theorems on groups
CO7	Define the concept of Boolean algebra as an algebraic structure and list its properties
CO8	Understand the applications of Boolean algebra in switching circuits
CO9	Define a Graph and identify different classes of graphs
C10	Understand various applications of Graph theory

FIFTH SEMESTER
(OPEN COURSE)
(For students not having Mathematics as Core Course)

GMAT5D03T: LINEAR MATHEMATICAL MODELS

Lecture Hours: 48 (3 Hrs/Week)   **Credits: 3**
Marks: 75(Internal: 15, External: 60)   **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	the students will be able to Understand the idea of slope of the lines, understand to find solution of Linear Systems by the Echelon Method and Gauss Jordan method
CO2	Gets an idea of matrices, understand how to add, subtract and multiplication of matrices and understand how find the inverse of a matrix
CO3	Understand the methods of solving linear programming problems geometrically and understands the drawbacks of geometric methods and to solve LP problems more effectively using Simplex method
CO4	Understand duality theory, a theory that establishes relationships between linear programming problems of maximization and minimization

FIFTH SEMESTER
(OPEN COURSE)
(For students not having Mathematics as Core Course)

GMAT5D04T: MATHEMATICS FOR DECISION MAKING

Lecture Hours: 48 (3 Hrs/Week) **Credits: 3**
Marks: 75(Internal: 15, External: 60) **Examination: 2 Hours**

COs	COURSE OUTCOMES
CO1	The student could understand the classifications of data. Student is also introduced to various data collection techniques
CO2	Student will learn to visualize various types of data with the use of frequency charts and appropriate graphs
CO3	Student understands concepts like measures of central tendency, measures of variation and measures of position
CO4	Student gets a clear understanding of basic probability concepts. Student learns conditional probability, addition rule and other basic theories in probability
CO5	Student will learn various probability distributions of discrete and continuous variables
CO6	Student learns about the normal distribution, which is an important continuous probability distribution in inferential statistics
CO7	Student understands the standard normal distribution and learns the conversion of normal variable to standard normal variable