SREEKRISHNAPURAM
V.T. BHATTATHIRIPAD COLLEGE

Aided and Affiliated to University of Calicut, NAAC Accredited with B+ Grade

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CRITERION – II
TEACHING–LEARNING AND EVALUATION

2.6 Student Performance and Learning Outcomes

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2.6.1. Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

Programme Outcomes (POs) and Course Outcomes (COs) of UG and PG Programmes

SREEKRISHNAPURAM V T BHATTATHIRIPAD COLLEGE, MANNAMPATTA

OUTCOME-BASED EDUCATION (OBE)

Outcome-Based Education (OBE) is an educational approach that focuses on defining specific, measurable outcomes or competencies that students are expected to achieve by the end of a learning process. Rather than focusing solely on what content is taught (inputs), OBE emphasizes what students should be able to do or demonstrate (outputs) after completing a course or programme. The University of Calicut did not introduce Outcome Based Education (OBE) till 2023-2024.

PROGRAMME OUTCOMES (POs)

Programme Outcomes (POs) refer to the specific results or achievements expected from students who complete an academic program or course of study. These outcomes are generally defined by educational institutions or accrediting bodies to ensure that graduates possess the necessary knowledge, skills, and competencies to succeed in their chosen field or profession.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Programme Specific Outcomes (PSOs) are a subset of the broader Programme Outcomes (POs) in educational contexts. They are specifically tailored to a particular academic program or course of study, outlining the specific knowledge, skills, and attitudes that students are expected to acquire upon completion of that program. PSOs are designed to reflect the unique characteristics and objectives of the program, providing a detailed description of what graduates should be able to demonstrate or achieve within their field of study.

COURSE OUTCOMES (COs)

Course Outcomes (COs) are the specific, measurable statements that describe what students should be able to know, do, or demonstrate by the end of a particular course within an academic program. They are derived from and contribute to achieving the broader Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) of the program.

LIST OF PROGRAMME OUTCOMES AND COURSE OUTCOMES

There are eight Programmes offered in our college. These eight programmes have well-defined POs. Each Desired Outcomes are communicated to the teachers and teachers do evaluation of the attainment of these POs.

Under each Programme, there are number of Courses and each course are having specific Course Outcomes. The following table shows the Courses coming under each Programme:

Programme Code	Programme Name	Number of Courses
BCM	Bachelor of Commerce	31 + 4 (Audit Courses) = 35
BBA	Bachelor of Business Administration	32 + 4 (Audit Courses) = 36
MCM	Master of Commerce	20 + 2 (Audit Courses) = 22
BFT	BA Economics with Foreign Trade	30 + 4 (Audit Courses) = 34
HIS	BA History	31 + 4 (Audit Courses) = 35
SKT	BA Sanskrit	35 + 4 (Audit Courses) = 39
MTS	B.Sc. Mathematics	34 + 4 (Audit Courses) = 38
CSS	M.Sc. Computer Science	21 + 2 (Audit Courses) = 23
MTD	M.Sc. Mathematics	21 + 2 (Audit Courses) = 23

Bachelor of Commerce (B.Com) - Finance

Introduction

The B.com course prepares students to be adequately equipped with good domain knowledge and skills required for careers in Business. With an innovative curriculum design and content the B.com course empowers students to conveniently adapt to an ever changing and dynamic business environment. The course enables students to have good fundamental knowledge of Accounting, Economics, Taxation, Statistics, Auditing, Cost Accounting, and Finance and in addition to the management subjects. The B.com course is challenging and yet very rewarding to students with high career aspirations. It also builds competence and confidence among students to pursue and complete, professional courses such CA, CFA, CMA, ACS etc. Our B.com students have been in high demand with employers for their excellent knowledge, skills and attitude which gives them an edge over their peers from other institutions. The B.com course of the college is rated among the top 10 in the country (India Today-AC Nielsen Survey 2014).

Objectives of the Course

1. To provide conceptual knowledge and application skills in the domain of Commerce studies,

2. To provide knowledge and skills in almost all areas of business to be able to meet expectations of business and to handle basic business tasks, thus equipping a student to pursue careers in different sectors of commerce, trade and industry,

3. To sharpen the students' analytical and decision making skills,

4. To provide a good foundation to students who plan to pursue professional courses like CA, CMA, ACS, CFA and MBA,

5. To facilitate students to acquire skills and abilities to become competent and competitive in order to be assured of good careers and job placements,

6. To develop entrepreneurship abilities and managerial skills in students so as to enable them to establish and manage their own business establishments effectively,

7. To develop ethical Business professionals with a broad understanding of Business from an interdisciplinary perspective,

8. To develop positive attitude and interest towards the concept of entrepreneurship and administration,

9. To develop the ability to appreciate and admire the practice of business administration, and

10. To make the learner a self sufficient, economically productive and socially dynamic individual.

Learning Outcomes

1. The learner demonstrates knowledge of major theories and models in key areas of commerce subject,

2. The learner analyses organizational problems and generate realistic solutions based on current academic research in organizational behaviour,

3. The learner applies basic mathematical and statistical skills necessary for analysis of a range of problems in economics, actuarial studies, accounting, marketing, management and finance,

4. The learner analyses commerce /business issues in the international contexts,

5. The learner compares international contexts and issues through the lens of the commerce disciplines,

6. The learner evaluates national and international debates and discussions on economic, commercial, and business issues,

7. The learner becomes confident in making effective decisions in an international business settings,

8. The learner shows interest and attitude towards starting and administering a business enterprise,

9. The learner makes further studies to acquire deeper knowledge in the concepts, persons, or institutions related to business administration, and

10. The learner starts to appreciate the concept of commerce.

Subject-wise Learning Outcomes

Semester I

Sl.No.	Course	Title	Learning Outcomes
1	Core	BCM1B01 Business Management	• The learner develops the understanding about the process of business management, its functions and current management practices. • The learner realizes the importance of ethics in business and also acquires the capability to develop ethical practices for effective management.
2	Complementary	BCM1C01 Managerial Economics	• Develops the understanding regarding the micro and macro economic concepts and ability to apply the economic principles in business management.

Semester II

Sl.No.	Course	Title	Learning Outcomes
1	Core	BCM2B02 Financial Accounting	• The learner develops the skill for recording the business transactions and for preparing the financial statements.
2	Complementary	BCM2C02 Marketing Management	• The learner acquires the skill of marketing in a business firm

Semester III

Sl.No.	Course	Title	Learning Outcomes
1	Common	BCM3A11 Basic Numerical Methods	• On completing the course, the students will be able to understand, numerical equations, matrix, progression, financial mathematics, descriptive statistics and their applications.
2	Common	BCM3A12 Professional Business Skills	• The learner updates and expands basic Informatics skills and develops the skill to utilize the digital knowledge resources.
3	Core	BCM3B03- Business regulation	• The learner develops the awareness regarding the basic legal concepts and the Indian legal environment in which the business is carried on. • The learner also develops understanding regarding the emerging legal issues in a digital networked environment.
4	Core	BCM3B04 Corporate Accounting	• The learner acquires the conceptual knowledge of the fundamentals of the corporate accounting and the techniques of preparing the financial statements.
5	Complementary	BCM3C03 Human Resources Management	• The learner develops understanding regarding the human resource practices in organizations.

Semester IV

Sl.No.	Course	Title	Learning Outcomes
1	Common	BCM4A13 Entrepreneurship Development	• The learner develops the entrepreneurial skills and the ability to generate innovative business ideas in the emerging industrial scenario.
2	Common	BCM4A14 Banking and Insurance	• The learner develops knowledge about basics of banking and insurance.
3	Core	BCM4B05 Cost Accounting	• The learner develops cost consciousness by acquiring deep knowledge and understanding of cost and its elements.
4	Core	BCM4B06 Corporate Regulations	• The learner develops the awareness regarding the basic legal concepts and the Indian legal environment in which the business is carried on. • The learner also develops understanding regarding the emerging legal issues in a digital networked environment.
5	Complementary	BCM4C04 Quantitative Techniques for Business	• The learner develops the ability to use the quantitative techniques in managerial decision making.

Semester V

Course	Title	Learning Outcomes
Core	BCM5B07 Accounting for Management	• The learner realizes the relevance of management accounting and the use of accounting and costing data for planning, controlling and decision making.
Core	BCM5B08 Business Research Methods	• The learner develops the skill in conducting survey researches and case studies.
Core	BCM5B09 Income Tax Law and Accounts	• The learner develops knowledge and skills regarding the application of principles and provisions Income - tax Act, 1961 amended up to date.
Core	BCM5B10 Financial Markets and Services	• The learner develops basic knowledge about the structure, organization and working of financial system in India.
Core	BCM5B11 Financial Management	• familiarize the students with the concepts, tools and practices of financial management. • Learns about the decisions and processes of financial management in a business firm.
Open	BCM5D01 Basic Accounting	• The learner acquire knowledge of Accounting Principles and Practice

Semester VI

Course	Title	Learning Outcomes

Core	BCM6B12 Income Tax and GST	Learner develops basic knowledge and equip with application of principles and provisions Income - tax Act, 1961 and GST Act 2016
Core	BCM6B13 Auditing and Corporate Governance	The learner develops knowledge in auditing principles and techniques and familiarize with the understanding of issues and practices of corporate governance in the global and Indian context.
Core	BCM6B14 Fundamentals of Investments	Learner familiarizes with the world of investments. develops a theoretical framework for the analysis and valuation of investments.
Core	BCM6B15 Financial Derivatives	Learner acquires knowledge about financial derivatives and their features. Develops an understanding about various risks associated with derivatives.

Bachelor of Business Administration (BBA) - Finance

Introduction

Gone are the days when people used to enroll for conventional undergraduate programs such as BA, B.Com and B.Sc. These days' youngsters have moved towards professional and vocational courses which gives them an extra edge over other graduates. BBA is one of such program, which has now become quite popular with the students.

After completing class XII board exam, students can apply to various private and government colleges offering BBA programs. BBA course aims at exploring management skills in the students. The course curriculum is designed in such a way so as to develop basic business and management skills in the students.

Outline of the Course

University of Calicut is conducting the BBA programme which has 3 years duration with 6 semesters. The course aims at explaining the business environment in which the public and private sectors operate. It helps students to develop decision making ability in real time business situations. It also focuses on developing operational and analytical skills in students to tackle business problems in different sectors. The students are required to choose a specialization of their interest in the last year of the program, which further facilitates them to develop their management skills in a particular sector.

Objectives of the Course

The course is designed with the following objectives in mind:

1. To develop Critical Thinking and Decision Making abilities in students,

2. To develop analytical and reflective thinking techniques to identify and analyze problems, develop viable alternatives, and make effective decisions,

3. To develop the ability to identify and analyze ethical conflicts and social responsibility issues involving different stakeholders,

4. To develop the ability to identify and analyze relevant global factors that influence decision making,

5. To develop the ability to apply appropriate quantitative and qualitative techniques in solving business problems,

6. To develop good communication Skills,

7. To develop the skill to formulate viable alternatives and make effective decisions relating to business ethics and social responsibility,

8. To develop the skill to formulate viable alternatives and make effective decisions in an international business setting,

9. To develop positive attitude and interest towards the concept of entrepreneurship and administration, and

10. To develop the ability to appreciate and admire the practice of business administration.

Learning Outcomes

After the completion of the BBA course, following learning outcomes are expected:

1. The learner starts to think critically,

2. The learner takes effective decisions through analytical and reflective thinking,

3. The learner becomes socially responsible person with great ethical values,

4. The learner is aware of the global factors that affects his/her decisions,

5. The learner solves the business problems by applying appropriate quantitative and qualitative techniques,

6. The learner presents his/her concepts in an attractive way with good communication skills,

7. The learner identifies viable alternatives and make effective decisions relating to business ethics and social responsibilities,

8. The learner becomes confident in making effective decisions in an international business settings,

9. The learner shows interest and attitude towards starting and administering a business enterprise, and

10. The learner makes further studies to acquire deeper knowledge in the concepts, persons, or institutions related to business administration.

Subject-wise Learning Outcome

Semester I

Sl.No.	Course	Title	Learning Outcomes
1	Core	BBA1B01 Management Theory and Practices	• The learner develops the understanding about the process of business management, its functions and current management practices. • The learner realizes the importance of ethics in business and also acquires the capability to develop ethical practices for effective management.
2	Complementary	BBA1C01 Managerial Economics	• Develops the understanding regarding the micro and macro economic concepts and ability to apply the economic principles in business management.

Semester II

Sl.No.	Course	Title	Learning Outcomes
1	Core	BBA2B02 Financial Accounting	• The learner develops the skill for recording the business transactions and for preparing the financial statements.
2	Core	BBA2B03 Marketing Management	On completing the course students will be able to 1. Understand and develop insights and knowledge base of various concepts that driving marketing strategies. 2. Develop skills in organizing for effective marketing and in implementing the market planning process

Semester III

Sl.No.	Course	Title	Learning Outcomes
1	Common	BBA3A11 Basic Numerical Methods	On completing the course, the students will be able to understand, numerical equations, matrix, progression, financial mathematics, descriptive statistics and their applications.
2	Common	BBA3A12 Professional Business Skills	The learner updates and expands basic Informatics skills and develops the skill to utilize the digital knowledge resources.
3	Core	BBA3B04 Corporate Accounting	On completing the course students will be able to: 1. Understand and apply fundamental IndASs on inventories, PPE, provisions, income tax, borrowing cost and intangible assets 2. Prepare annual financial statements for companies and compute accounting ratos. 3. Record accounting transactions in respect of redemption of preference shares and debentures
4	Core	BBA3B05 Financial Management	On completing the course students will be able to: 1. Understand and develop insights and knowledge base of various concepts of finance 2. Develop skills for effective Financial, Investment and Dividend decisions making,
5	Complementary	BBA3C02 Business Regulations	On completing the course students will be able to: 1. Analyse statutory provisions and the core concepts in business laws 2. Analyze legal issues arising in day-to-day business operations prevalent in India 3. Discuss possible solutions to issues in organisations in the frame work of business laws

Semester IV

Sl.No.	Course	Title	Learning Outcomes
1	Common	BBA4A13 Entrepreneurship Development	• The learner develops the entrepreneurial skills and the ability to generate innovative business ideas in the emerging industrial scenario.
2	Common	BBA4A14 Banking and Insurance	• The learner develops knowledge about basics of banking and insurance.
3	Core	BBA4B06 Cost & Management Accounting	• The learner is capable of designing and Implementing cost control, cost reduction programme and different cost systems, and • The learner gets adequate knowledge on cost accounting and management accounting practices.
4	Complementary	BBA4C03 Corporate Regulations	On completing the course students will be able to: 1. Understand the features and different types of companies 2. Aware as to the formation of companies and also as to different documents of companies 3. Understand the share capital and other relevant provisions of the same 4. Understand the management, corporate governance, corporate social responsibility and some basic aspects of SEBI, and 5.Understand the provisions of conducting meetings and also the winding up procedure of companies.

5	Complementary	BBA4C04 Quantitative Techniques for Business	On completing the course students will be able to 1. Understand and develop insights and knowledge base of various concepts of Quantitative Techniques. **2.** Develop skills for effectively analyse and apply Quantitative Techniques in decision making.

Semester V

Sl.No.	Course	Title	Learning Outcomes
1	Core	BBA5B07 Human resources Management	• The learner develops understanding regarding the human resource practices in organizations.
2	Core	BBA5B08 Business Research Methods	• The learner develops the skill in conducting survey researches and case studies.
3	Core	BBA5B09 Operations Management	• The learner develops necessary skills related to operations in management in a business firm.
4	Core	BBA5B10 Income Tax	• On completing the course the students will be able to understand the latest provisions of Income Tax Act Law and enable to compute different heads of income as well as total income and tax liability.
5	Core	BBA5B11 Financial Market and Institutions	• The course helps to understand different aspects and components of financial Institutions and financial markets. This will enable the students to take rational decisions on financial market and institutions.
6	Open	E-Commerce	• On completing the course the students will be able to Understand the practice of Ecommerce, e-payment and also the security issues.

Semester VI

Sl.No.	Course	Title	Learning Outcomes
1	Core	BBA6B12 Organisational Behaviour	On learning the course the students will be able to- 3. Understand the different concepts of Organisational Behaviour 4. Analyse individual and group behaviour 5. Understand and deal with organisational change, development and stress
2	Core	BBA6B13 Management Science	On completion of the course the students will be able to learn different OR techniques useful in managerial decisions.
3	Core	BBA6B14.Project Management	On learning the course the students will be able to- 1. Understand the different concepts of managing a project 2. Analyse the viability of a project.
4	Core	BBA6B15 Financial Services	On completion of the course students will be able to aware of various financial services available in Indian financial system
5	Core	BBA6B16 Investment Management	By completing the course students will be able to aware of various investment opportunities from an investor's perspective of maximizing return on investment.

BA Economics with Foreign Trade

Programme Outcomes

PO: 1. Students understand the theoretical and practical knowledge that makes accurate analysis of the economic situation possible.

PO: 2. Students understand and evaluate the interrelation between the economy and society.

PO: 3. Students understand and evaluate the economic problems from a global perspective and

take a local approach to solving them.

PO: 4. Students understand different economic system and analyse the implications of decisions related to economic policy.

PO: 5. Students respond to the economic problems arising from society in general and the different units that interact therein (e.g. institutions, private companies and sectors of the economy).

PO: 6. Students assimilate skill needed to carry a careers in government and private enterprise as well as those pursuing graduate degrees in professional schools or in the field of economics.

PO: 7. Students develop the attitude to conduct research in the socio economic issues arising in their environment.

PO: 8. Students assimilate the necessary skills for analysing the data set related to socio economic issues.

PO: 9. Students develop the capacity to analyze the socio-political and economic issues in the

language of an economist.

PO: 10. Students analyse economic data, interpret the economic events and visualise the economic future of the nation.

PO 11: Students understand the practical side of international trade and develop interest to choose a career in the foreign trade related sectors.

Programme Specific Outcomes

PSO: 1. Students critically evaluate and apply the theories and techniques of economics.

PSO: 2. Students demonstrate subject-specific „thinking" skills that are readily transferable to

problem solving and decision making in a wider context.

PSO: 3. Students develop interest for lifelong learning, employing a range of practical and professional skills.

PSO: 4. Student find, evaluate, synthesize and use information from a variety of sources

PSO: 5. Students articulate an awareness of the social and community contexts within their

disciplinary field

PSO: 6. Students assimilate knowledge of fundamental concepts and theoretical propositions

PSO: 7. Students understand the methodology by which economic ideas are framed, tested and modified.

PSO: 8. Students take up a career in economics and related areas.

PSO: 9. Students anayse the economic issues of national and international importance and realize the dynamics behind them.

PSO: 10. Students generalise how the economic policies of the government and governmental institutions affect the common people.

PSO: 11. Students critically evaluate and apply the theories and techniques of economics.

PSO: 12. Students demonstrate subject-specific „thinking" skills that are readily transferable to problem solving and decision making in a wider context.

PSO 13: students develop interest in the activities of foreign trade and chose a career from this sector.

Semester I

Course Category Core Course 1

Course Title and Code Microeconomics – I

ECO1 B01

- ➢ Students explain what Economics is and explain why it is important
- ➢ Students explain how economists use economic models
- ➢ Students understand the scarcity and choice in the economy and the basic problems of an economy.
- ➢ Students explain and illustrate market equilibrium and disequilibrium.

- Students analyse how consumers maximize the total utility within a given income using the utility maximizing rule.
- Students describe how consumer's utility changes when income or price change.
- Students define the term production and explain what a production function is; define and differentiate between marginal, average and total product; compute and graph marginal, average and total product.
- Students define and differentiate between different cost concepts and interpret the relation between long run and short run costs.

Semester II

Course Category Core Course 2

Course Title and Code Macroeconomics I

ECO2B02

- Students appreciate the context in which Macroeconomics emerged as a separate discipline.
- Students understand the concepts regarding macroeconomic model building.
- Students understand and evaluate different concepts and measurements of national income
- Students explain how output and employment are determined in classical and Keynesian systems of economics.
- Students explain and analyse why actual output will fall short of the productive capacity of the economy.
- Students evaluate fiscal policies of Governments at different situations.
- Students understand and generalize the concept of money and money supply in the economy and evaluate monetary policy of different Governments.

Semester III

Course Category Core Course 3

Course Title and Code Quantitative Methods for Economic Analysis - I

ECO3 B03

- Students understand and demonstrate sound quantitative skills to collect analyse and interpret empirical data related to socioeconomic issues.
- Students understand the skill in statistical and mathematical techniques that are required for a meaningful study of applied economics and for carrying out empirical analysis.

- Students generalizes skills in quantitative analysis and apply it to study the concepts in most branches of economics
- Students solve and analyse the data using Spread Sheet
- Students draw graphs with the help of economic data Drawing
- Students analyse and apply different techniques of correlation and regression

Semester III

Course Category Core Course 4

Course Title and Code Microeconomics II

ECO3 B04

- Students understand the difference between the firm and industry; explain and illustrate Demand curve, Average Revenue curve and Marginal Revenue curve of a perfectly competitive firm.
- Students understand and determine the break-even and shut down points of production for a perfectly competitive firm; understand why perfectly competitive markets are efficient.
- Students define and analyse the characteristics of monopoly and explain the sources of barriers to entry.
- Students explain why a monopoly is inefficient using dead weight loss; differentiate between a single price monopolist and a price discriminating monopolist.
- Students define the characteristics of a monopolistically competitive industry and explain the difference between short run and long run equilibrium in a monopolistically competitive industry.
- Students define characteristics of oligopolies and explain why collusion can occur in oligopolistic industries.
- Students explain pricing and employment of factor inputs and define demand for and supply of factor inputs.
- Students explain equilibrium in competitive factor market and factor market with monopoly power.

Semester IV

Course Category Core Course 5

Course Title and Code Quantitative Methods for Economic Analysis II

ECO4 B05

> ➤ Students understand the skill in the calculation of mathematical techniques that are required for a meaningful study of applied economics and other branches.

> ➤ Students understand and demonstrate sound quantitative skills to collect analyse and interpret empirical data related to socio-economic issues.

> ➤ Students understand and apply the concepts Derivatives and Marginal Concepts

> ➤ Students quantify economic variables and apply statistical techniques in Economics.

> ➤ Students understand and calculate different concepts coming under index number.

> ➤ Students analyse and apply different concepts coming under the areas of vital statistics

> ➤ Students understand and solve different problems of probabilities.

Semester IV

Course Category Core Course 6

Course Title and Code Macroeconomics II

ECO4 B06

> ➤ Students understand and derive IS-LM curves and use the framework to explain the working of an economy

> ➤ Students explain the way fiscal and monetary policy works and apply the concept of ISLM framework.

> ➤ Students explain the concept and measurement of inflation and unemployment.

> ➤ Students explain the trade-off between inflation and unemployment as predicted by the Phillips curve and its collapse after the stagflation of 1970s.

> ➤ Students analyze different phases of trade cycle, and demonstrate various trade cycle theories

> ➤ Students understand and analyse the reasons for economic recessions and suggest the appropriate instruments of monetary and fiscal policy.

> ➤ Students measure the inflation in the economy and apply the concepts like WPI-CPI-PPI-GDP deflator.

Semester V

Course Category Core Course 7

Course Title and Code Fiscal Economics

    ECO5 B07

- ➢ Students define and differentiate public finance and private finance and to generalize the concept of maximum social advantage
- ➢ Students understand and explain the public expenditure and the effects and importance of public expenditure in India
- ➢ Students understand the cost-benefit analysis and apply its principle in the day today economic life.
- ➢ Students understand various concepts of tax, explain the tax and non tax revenue and compare and contrast the direct tax and indirect tax and its benefits.
- ➢ Students understand and develop the skill to calculate personal, corporate income tax and other taxes
- ➢ Students explain the types of public debt and analyse how debt is repaid.
- ➢ Students describe government budget and budgeting and understand the different aspects of federal finance and local finance
- ➢ Students understand the federal finance, function of finance commissions and analyse Centre State financial relations
- ➢ Students understand NITI Aayog and explain local finances and functions and revenues.

Course Category Core Course 8

Course Title and Code Indian Economic Development

    ECO5 B08

- ➢ Students explain the growth and structural changes happened in Indian economy from British period to till date.
- ➢ Students understand the background and programmes under new economic policy.
- ➢ Students Understand the place of Agriculture, Industry and service sector in India "economy.
- ➢ Students describe the causes and magnitude of poverty and unemployment in India.
- ➢ Students analyse various economic issues happening around us. Analysing

- Students understand and evaluate numerical information relating to various aspects of Indian economy and India's economic policies.

- Students refer books related to Indian economy, collect clippings and articles from newspapers and magazines and also follow economic survey, economic review and RBI Bulletin.

- Students explore beyond the texts, conducts field visits and report economic events from field visits.

- Students analyse the basic characteristics of Kerala economy and evaluate the Kerala model with other economies.

Semester V

Course Category Core Course 9

Course Title and Code Export Marketing

   EFT5 B09

- Students will be able to interpret about different modes of entry in to international marketing

- They understand about the role of culture in international business

- students manage export marketing activities Analysing

- Students organise how to mix the elements for effective international marketing

- Students demonstrate about different trading blocs and economic integrations and their role in international trade

- Students summarise about various aspects of logistics in e commerce Understanding

- Students interpret about fixation of export price and their importance in export trade

- Students examine about how product can be designed according to the taste and preference of overseas buyers

- students summarize various facets of foreign exchange Understanding

- Students evaluate the international monetary position of a country

Semester V

Course Category Core Course 10

Course Title and Code Foreign Trade Documentation and Logistics

EFT5 B10

➢ Students explain the different documents used in international trade Explaining

➢ Students identify the rationale behind documentation Applying

➢ Students analyse the procedures involved in exporting and importing Analysing

➢ Students identify the different intermediaries in export marketing Applying

➢ Students develop an idea about the concept of logistics and its various facets Creating

➢ Students identify different distribution channels in international n trade Applying

➢ Students understand various facets in international marketing Understanding

➢ Students differentiate between merits and defects of outsourcing Analysing

➢ Students explain the concepts related to logistic

Semester VI

Course Category Core Course 11

Course Title and Code Shipping and Insurance

EFT6 B11

➢ Students summarise about various types of ships and services Understanding

➢ Students discuss the problems and current status of Indian shipping Discussing and Creating

➢ Students identify the role of containers in export and import Identifying

➢ Students make use of information about marine insurance and its claim procedure

➢ Students build idea about different types of risks in international trade Applying

➢ Students understand about the role of ECGC in international trade Understanding

➢ Students understand more on Marine Insurance

Semester VI

Course Category Core Course 12

Course Title and Code International Economics

ECO6 B12

➢ Students identify the basic difference between inter-regional and international trade and understand how international trade has helped countries to acquire goods at cheaper cost, and explain it through the various international trade theories.

➢ Students evaluate how international trade promotes economic development.

- Students compare and contrast different trade theories.

- Students understand the ways in which free trade and restrictive trade policies could be practiced

- Students identify the issues and prospects of current international trade order with respect to India and its major trade partners Identifying

- Students understand the functioning of foreign exchange markets in the world

- Students relate different exchange rate systems with the current systems of foreign exchange determination across the globe Relating

- Students calculate the Balance of payments (BOPs) of nations and analyse different instruments to clear BOP disequilibrium

- The students are expected to acquire skill that will help them to take rational decisions in issues related to international economics.

- Students understand the role of international agencies in promoting world trade and economic cooperation.

Semester VI
Course Category Core Course 13
Course Title and Code Foreign Trade Financing and Procedure
EFT6 B13

- Students understand various export promotion activities and the incentives by Govt of India

- Students make use of availing export finance and the formalities and procedures involved

- Students get an idea about the methods of availing export finance

- Students understand about the methods involved in receiving payments

- Students familiarise about different acts relating to foreign exchange

- Students identify different aspects related to foreign exchange

- Students evaluate India's BOP position Evaluating

- Students develop an idea about externalities of international policy coordination

- Students understand the causes of BOP deficit and remedies to overcome it

Semester VI
Course Category Core Course 14
Course Title and Code Economics of Growth and Development
ECO6 B14

- Students understand the theoretical framework for growth and development discourses under different schools of economic thoughts and develop better insights and knowledge on issues and challenges on economic development.

- Students analyze the factors affecting the long run economic growth, both from a positive and negative sense.

- Students understand various theories of growth and development and analyze the problems of the developing world.

- Students differentiate growth and development and measures growth and development by using different techniques like HDI, HPI etc.

- Students develop attitudes towards the problems of underdevelopment and evaluate different policies and theories to overcome the issues of underdevelopment.

- Students analyse and evaluate Neoclassical growth models. Analysing & Students identify the problems of poverty and inequality and analyse the measures and Students internalize the concept of Sustainable development,

- identify various environmental issues and appreciate the values of sustainable development.

Semester VI
Course Category Core Course 15/Project
Course Title and Code Project work/Research Methodology
ECO6 B15
    No. of Credits 2

- Students understand the importance of research methodology and its basic tools for understanding the social reality

- Students understand different types of research and familiarize the student with the quantitative and qualitative strategies of research in social science.

- Students understand the importance of literature review in the projects and review various journals and research papers for their projects.

- Students analyse various research design and methods Analysing

- Students understand the methods of collecting data and analyse hypothesis.

- Students report projects in a systematic way.

Semester VI
Course Category Elective Course

Course Title and Code Basic Econometrics
ECO6 B16

➤ Students define econometrics and understand the basic econometric techniques and their applications.

➤ Students analyse empirical work in economics and use actual economic data to test economic theories.

➤ Students understand and analyse statistical concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models etc

➤ Students with foundation in econometric analysis, develop skills required for empirical research in economics

➤ Students analyze and solve simple Linear Regression Model and theories related to it

➤ Students analyze two variable regression models and multiple regression models and apply these theories for the empirical analysis of data available to them

➤ Students analyse and solve Econometric Problems like Multicollinearity and Heteroskedasticity

➤ Students develop an attitude for conducting empirical works in economics and they appreciate the econometric works.

OPEN COURSES
(For Non-economics Students)
Semester V
Course Category Open Course
Course Title and Code Economics in Everyday Life
ECO5 D01

➤ Non economic students understand the basic concepts in economics and recognize the importance of economic science in their everyday life.

➤ Students understand and explain basic concepts from micro and macro economics

➤ Students develop interest to understand the working of an economy.

➤ Students understand and evaluate the working of budgetary system in an economy

COMPLEMENTARY COURSES
Introductory Economics
SEMESTER I/II
Course Category Complementary Course
Course Title and Code Introductory Economics I

ECO1(2) C01

➢ Students explain what Economics is and explain why it is important

➢ Explain how economists use economic models Explaining

➢ Understand the scarcity and choice in the economy and the basic problems of an economy.

➢ Explain and illustrate the basics of market demand and supply and the concept of market equilibrium and disequilibrium.

➢ Students illustrate the concepts of elasticity of demand and cost functions.

➢ Define the term production and explain what a production function is;

➢ define and differentiate between marginal, average and total product;

➢ compute and graph marginal, average and total product and explain marginal productivity theory.

➢ Students distinguish various concepts of national income and estimate the national income of a country.

➢ Define and differentiate the basic premises of classical and Keynesian economics.

SEMESTER III/IV
Course Category Complementary Course
Course Title and Code Introductory Economics II
ECO4(3) C01

➢ Students define the concept of money and explain different concepts and theories of money.

➢ Students understand the basics elements of public finance and explain the theory of maximum social advantage

➢ Students understand the principle of federal finance and explain the role of finance commission.

➢ Students explain and illustrate the basics of international trade and analyse various concepts associated with trade.

➢ Students understand the basic characteristics of Indian economy and analyse various economic issues of Indian economy.

➢ Students define NITI Ayog and understand the functions of it.

BA HISTORY

INTRODUCTION

BA history education will help pupils to gain a coherent knowledge and understanding of past and that of the wider world. Teaching should equip pupils to ask perspective questions , think critically, with evidence ,sift arguments and develop wide knowledge about past 'The study of history which help the students to understand the past events and to compare the present and to correct the mistakes of the past. This knowledge helps the students to mould the future wisely. In addition to this the study of history which help the students to understand the society and various culture. It will help the students to foster humanity.

Program outcome :

The students acquire knowledge in the field of social sciences, literature and humanities .which make them sensitive and sensible enough.

- The BA graduates will be acquainted with the social economical , historical . geographical, political ,ideological and philosophical tradition and thinking
- The program also empowers the graduates to appear for various competitive examinations or choose the part graduate program of their choice.
- The BA program enables the students to acquire the knowledge with human values framing the base to deal with various problems in life, courage and humanity.

Outline of the course

The basic goal of the Degree in history is to provide students with a rational and critical knowledge of the past of humanity in order to enable them to understand the present. Only historians are able to understand how event and processes in the past influence those in the present.

Objective s of the course

1. Understand the methods of historical enquiry including how evidence is used rigorously to make historical claims and interpretations of the past have been constructed.
2. Inculcating curiosity about past.
3. Imparting   intellectual skills to make sense of the past.
4. Developing the   critical   thinking of the students.
5. Developing an understanding of the   present.
6. Imparting knowledge of our heritage.

Learning Objectives

Learning objectives :   Students can be based on three areas of learning knowledge, skill and attitudes. They help to clarify organize and prioritize learning. And students evaluate progress and encourage them to take responsibility for their learning.

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Learning outcomes

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After the completion of the BA History course ,following learning outcomes are expected.

1. The learner starts to think critically.
2. The learner becomes socially responsible person with great ethical values.
3. The learner solves the social problems by applying human values.
4. The learner develop good communication skills.
5. The learner shows interest to understand India s cultural heritage.

Subject- wise Learning Outcomes
Semester 1

SL No	Course	Title	Learning Outcome
1.	Core	HIS1B01 Trends in Historiography	Students will be able to identify the different views of historiography

Semester II

Sl. No	Course	Title	Learning Outcomes

SL NO	Course	Title	Learning Outcomes
1.	Core	**HIS2B02 Trends in Indian Historiography**	➢ **Students will be able to understand the different methods of Indian Historiography.**
2	Complementary	**HIS1(2)CO5- Archaeology in India**	➢ **Students will be able to understand the importance of Archaeology in Indian history.**

Semester III

SL NO	Course	Title	Learning Outcomes
1	Core	**HIS3BO3- INFORMATICS AND HISTORY**	➢ **The learner realizes the importance of Information technology for teaching, learning and research in history**
2	Core	**HIS3B04 History of Early India**	➢ **Students will learn about the prehistoric period, in ancient India. They can acquire knowledge about the Vedic period and the rise of Jainism and Buddhism in India.**
3	Complimentary	**HY3CO5- Archaeological**	➢ **Students will learn about**

		Excavations in India	the various excavations conducted in India.

Semester IV

SLNO	Course	Title	Learning Outcomes
1.	Core	**HIS4B05 HISTORY OF THE MEDIEVAL WORLD**	➢ **Students acquire knowledge about the growth of medieval world**
2	Core	**HIS4B06 METHODOLOGY OF HISTORICAL WRITING**	➢ **Learner will develop and demonstrate skill in historical research.** ➢ **To be aware of Historiographyas a field of study in history.**
3	**Complementory**	**HY4C05 MODERN TECHNIQUES IN ARCHAEOLOGY**	➢ **Students acquire knowledge of various dating techniques in Archaeology and the importance of Marine Archaeology in India.**

Semester V

SLNO	Course	Title	Learning Outcomes
1.	Core	HIS5B07 KERALA SOCIETY AND CULTURE ANCIENT AND MEDIEVAL	➢ The learner understand the formation of Kerala society and culture.
2	**Core**	**HIS5B08**	➢ **Critically discuss**

		HISTORY OF MEDIEVAL INDIA	major social ,political and economic events in the medieval period especially in the period of Delhi Sultanate, Mughals etc.
3	Core	HIS5B09 HISTORY OF MODERN INDIA	➢ Learner understand how the British established their Colonialism in India. ➢ Students acquire knowledge of the various socio-religious movements in India ➢ Understand the Freedom Movement of India
4	Core	HIS5B010 HISTORY OF MODERN WORLD	➢ The learner acquire knowledge about the rise of Modern age. ➢ The scientific inventions in the world etc.
5	Open Course	HIS5D01 HERITAGE STUDIES	➢ It enable the students to understand our culture and heritage and the need to preserve our heritage.

Semester VI

SL NO	Course	Title	Learning Outcome
1	Core	HIS6B11 HISTORY OF MODERN KERALA	➢ The learner understand the emergence of Kerala state .
2	Core	HIS6B12HISTORY OF CONTEMPORARY INDIA	➢ The learner understand the events of contemporary India.
3	Core	HIS6B013 CONTEMPORARY KERALA	➢ Identify & analyze the political ,economic experience of Kerala. ➢ Locate the issues in Contemporary Kerala. ➢ Analyze the reform movements in the making of modern Kerala.
4	Core	HIS6B14 GENDER STUDIES	➢ Learner can analyze a gender issue and plan it in a societal and cultural as well as in interdisciplinary perspectives.
5	Peoject	HIS6B15 DISSERTATION	➢ Understand the methods of historical writing ➢ Understand the Importance of Local history writing

6	Elective	HIS6E04 HUMAN RIGHTS	➢ Understand the historical growth of the human rights. ➢ Understand the importance of the human rights act.

BA SANSKRIT

BA DEGREE PROGRAMME- SANSKRIT
(2020 -21 COURSE OUTCOME)

COURSE CODE	COURSE NAME	EXPECTED OUTCOME
SKT IA 07(01)	संस्कृतसाहित्यसमीक्षा-I (KAVYA LITERATURE AND APPLIED GRAMMAR)	• Attain general awareness of Sanskrit Kavya Literature. • Evaluate the Sanskrit Kavya Literature, its origin, and development, and understand the basic principles of grammar. • Cultivate moral values among students through the study of Subhashitas.
SKT1B01	भाषानुशासनम् (METHODOLOGY OF SANSKRIT SAHITYA)	• Understand the traditional methodology of learning the Sanskrit language • Critically analyze the linguistic components in ancient and modern literature.
SKT1C01(01)	COMPLEMENTARY COURSE I स॰ाहि॰ित्यमीमांसा-I (HISTORY OF SANSKRIT LITERATURE)	• Understand the history of Vedic literature, classical Sanskrit literature, ancient Indian astronomical system, medical science, and architecture. • Evaluate the contemporary relevance of ancient Indian science.
SKT1A07(02) B Com /BBA	संस्कृतसाहित्याध्ययनम्‍-I (PROSE, SUBHASHITAS, AND BASIC GRAMMAR)	Understand the world of poetry, popular tales, and fables in Sanskrit literature. Familiarize the basic grammatical peculiarities of the Sanskrit language through simple stories. Get transformed into a better human.
SKT2A 08 (01)	संस्कृतसाहित्यसमीक्षा-II (PROSE AND APPLIED GRAMMAR)	• Attain general awareness of Sanskrit prose literature. • Evaluate modern Sanskrit prose literature through the study of the text and understand the tradition of Sanskrit fables.

SKT2B02	<u>महाकाव्यपठनम</u>	• Attain awareness about the origin and development of poetry in Sanskrit. • Cultivate a deep level of appreciation of poetry through the study of Alankaras and Vrttas.
SKT2C03(01)	<u>शास्त्रमीमांसा-I</u> (LINGUISTICS)	• Know the basic Indian concept of Linguistics • Understand the peculiarities of genders, numbers, suffixes, and prefixes.
SKT 2A08 (02) B Com /BBA	संस्कृतसाहित्याध्ययनम् II (ANCIENT STATE CRAFT & TRANSLATION)	Understand ancient Indian culture and lifestyle. system of trade, commerce, and management. Apply the language skills
SKT09(01)	Drama and Alankara	Knows the characteristics of Sanskrit drama and features of Alankra
SKT3B03	Methodology of Ancient Indian Tradition	Thorough Knowledge of the Methodology of Learning Sanskrit
SKT3B04	Gadyakavya	Familiarize the Gadyakavya of Sanskrit
SKT3C05(01)	Linguistics-I	Knows the history of Language
SKT4C08(01)	Indian Philosophy Non Vedic Schools	Sound knowledge about Indian system of Vedic Schools
SKT4A10(01)	History of Sanskrit Literature, Kerala Culture and Translation	Aware about Epic Literature, Historical Kavyas and Chambu Literature
SKT4B(05)	Vyakarana and Nyaya-I	Improved Language skills
SKT4B06	Nataka	Knowledge about visual arts as well as Sanskrit poetry
SKT4C07(01)	Indian Literary Theories	Familiarize the Indian literary theories and authors
SKT4C04(02)	Drama and Kerala Sanskrit Theatre	Knowing the general features of drama and dramatic works
SKT5B07	Veda Smrithi and Upanishad	Awareness of the Vedic Culture and Texts
SKT5B08	Vyakarana and Nyaya-II	Developed language skills
SKT5B09	Bhagvatgita and Arthasastra	Values and strategies to live
SKT5B10	General Informatics	Application of technology to the Sanskrit language
SKT5D(01)	Management Principles in Sanskrit	Familiarize the management principles
SKT5D(02)	Ancient Indian Law	Knowing the ancient Indian law
SKT5D(03)	Scientific Literature in Sanskrit and Kerala	Knowing the diversity of Sanskrit literature, especially the scientific literature

	Project	
SKT6B11	Alankara Sastra	Knowledge about poetics of Sanskrit especially the views of Mammata
SKT6B12	Natyasidhantha	Knowledge of Dramaturgy depicted in Sanskrit
SKT6B13	Sankhya and Vedantha	Awareness of Indian philosophy
SKT6B14	Elements of Indian Culture and Environmental Science	Knowledge about the cultural history of India
SKT6B15(E01)	Malayalam Writers on Sanskrit	Familiarize the Malayalam writers
SKT6B15(E02)	Sanskrit Theatre of Kerala	Knowledge on Kudiattam and Nangiarkuttu
SKT6B15(E03)	Kavisiksha	Familiarize the instructions to poet laid down in texts of Alankarasastra in Sanskrit

B.SC. MATHEMATICS

2.6.1. Programme Outcome (PO) and Course Outcome (CO) (10)

PO: 1.To develop critical thinking and reasoning .

2.acquire good knowledge and understanding in advanced area of mathematics

3. stimulate an interest in all aspects of   mathematics .

4. develop skills like problem solving, numerical skills, analyzing things etc.

BSc Mathematics

Course Outcomes
MTS1B01 BASIC LOGIC AND NUMBER THEORY

Logic ,the study of principles of techniques and reasoning ,is fundamental to every branch of learning. Besides being the basis of all mathematical reasoning, it is required in the field of computer science for developing programming languages and also to check the correctness of the programmes. The classical number theory is introduced and some of the very fundamental results are discussed in this course. Number theory is an ideal topic   for a beginner to illustrate how mathematicians do their normal business.

Objectives
1)Enable the students to enjoy and master several techniques of problem solving such as recursion,induction,etc,the importance of pattern recognition in mathematics, the art of conjecturing and a few applications of number theory.

2)acquire knowledge to read and enjoy on their own a few applications of number theory in the field of art ,geometry and coding theory.

Learning outcomes

1)understand the theory and method of solutions   of LDE
2)Uderstand the theory of congruence and a few applications.
3)Solve linear congruent equations
4)Learn three classical theorems Wilson"s theorem ,Fermatt"s Little theorem and
.Eulers theorem and a few important consequences.

MTS2B02 CALCULUS OF SINGLE VARIABLE -1

The Mathematics required for viewing and analyzing the physical world around us   is contained in calculus. While algebra and geometry provide us very useful tools for expressing the relationship between static quantities ,the concepts necessary to explore the relation between moving/changing objects are provided in calculus.

Objectives

1) The objective of the course is to introduce students to the fundamental ideas of limit,continuity, and differentiability and also to some basic theorem of of differential calculus.

2) It also helps to know how these ideas can be applied in problem of sketching of curves and in the solution of some optimization problem of of interest in real life.

Learning outcomes

1. understand the fundamental ideas of limit,continuity and differentiability
2. understad the branch of integral calculus.
3. understand the concept of definite integrals.
4. learn the fundamental theorem of calculus.

MAT4 B04: Theory of Equations, Matrices & Vector Calculus

This course details about polynomial equations and fundamental theorem of algebra. Explain the rank of matrices and its Canonical form, Normal form. Discusses about Expressing Systems of Linear equations in matrix form and to find the solution of the systems. Characteristic roots and characteristic vectors are also introduced.

> Objectives
> 1) Introduce concept of rank of a matrix and methods to find the rank
> 2) Discuss the fundamental theorem of algebra and polynomial eqns.
> 3) Study about system of equations and methods to solve them.

> Learning Outcomes
> 1) Students will be able to find rank of matrices and apply them in practical problems. and use Cayley Hamilton theorem to compute inverse of matrices.
> 2) They can solve system of linear equations .
> 3) They will get knowledge about polynomial equations and Algebra.

MAT5 B05: Vector Calculus

Course gives an introduction to function of several variables and partial differentiation. Terms like directional derivatives, gradient vectors are defined and analyzed. The course discusses triple integrals, Line integrals and Green's and Stoke's Theorems.

> Objectives
> 1. Introduce concepts of functions of several variables and Partial differentiation.
> 2. Discuss directional derivatives, double integrals and Lagrange multipliers
> 3. Introduce Triple integrals, Line integrals and study about these integrals in Cylindrical and Spherical coordinates.
> 4. Study about Green's, Stoke's Theorems and applications.

> Learning Outcomes
> 1. Students can find derivatives of functions of several variable using chain rules and apply the technique of partial differentiation effectively.

2. Students can understand the concept of directional derivatives, saddle points and apply the theory of double integrals.
3. Students will get an idea of the coordinate systems and higher integrals.
4. They can apply Green's and Stokes's theorems in practical problems.

MAT5 B06: Abstract Algebra

This course serves an introduction to abstract algebra. The course aims at an attempt to introduce axiomatic treatment of mathematics. Course aims to teach students about groups rings and fields.

Objectives
1. Introduce the idea of groups, rings and fields.
2. Give a peek to the axiomatic approach of mathematics
3. Define and study about Integral domains and Field of quotients.

Learning Outcomes

1. Students will get a deep and fundamental knowledge about Groups, rings and Fields.
2. Students can understand the basic properties of these structures.
3. Students will get the basic idea of integral domains.
4. The students will be able to understand and prove mathematical statements in a logical and rigid manner.

MAT5 B07: Basic Mathematical Analysis

This course provides a quick review of sets and mathematical induction. Course tries to spread light on the real number line and the properties of real numbers. Sequences and subsequences are also discussed in this course.

Objectives
1. Give a basic idea of real number system
2. Discuss the important properties of real numbers.
3. Define sequences and subsequences of real numbers
4. Study about limits and discuss limit theorems.

Learning Outcomes
1. Students will get an in-depth knowledge about real numbers and their properties.
2. Students will be able to understand and analyze the properties of real sequences.

MAT5 B08: Differential Equations

This course studies about the ordinary differential equation involving one independent and one or more dependent variables. The integrals of ordinary differential equation are evaluated and are found to be plane curves. Differential equation involving one dependent and more than one independent variables are studied.

Objectives
1. To classify differential equations
2. Discuss the methods to solve first and second order equations
3. Introduce Laplace Transforms and PDE
4. Solve boundary value problems, study about Fourier series

Learning Objectives

1. Students can use the idea of differential equations in engineering problems.
2. Students will get a basic idea of important equations like wave equation and heat equations.
3. Students can use the technique of Fourier series to solve wave and heat equations effectively
4. The students will know relation between heat equation and Laplace eqns.

MAT6 B09: Real Analysis

This course provides a quick review of continuous functions and continuity. The idea of Riemann integral is introduced. Course gives a brief discussion about series of real numbers, Improper integrals, Beta and Gamma functions.

Objectives

1. To study about Riemann integrals and its applications
2. Review series of real numbers and their convergence
3. Define and in depth study of Improper integrals
4. Introduce Beta and Gamma functions.

Learning Outcomes

1. Students can understand and apply the concepts of Riemann integrals
2. Students will be able to find convergence of real series
3. Students can evaluate improper integrals using various techniques
4. Facilitate use of Beta and Gamma integrals in various situations.

MAT6 B10: Complex Analysis

This course introduces the concepts analytic function, elementary complex functions, and their properties, basic methods of complex integration and its applications in contour integration.

Objectives: The course aims

1. To explain the fundamental ideas of Analytic functions
2. To discuss basic methods of complex integration
3. To introduce elementary complex functions
4. To discuss power series expansion of analytic functions

Learning Outcomes: On completion of this course, the students willbeable to

1. Conceive the concept of analytic functions and will be familiar with the elementary complex functions and their properties
2. They will be familiar with the theory and techniques of complex integration
3. Apply the theory of the power series expansion of analytic functions.

MAT6 B11: Numerical Methods

This course aims to familiarize students with different methods of Numerical Analysis. Course also discusses the methods to solve Linear Systems including ODE.

Objectives

1. To equip the student with the computer based numerical and statistical methods.
2. Explain and analyze errors in computation and their minimization
3. Discuss normal and iterative methods to solve linear equations, ODE
4. Study about curve fitting, Numerical differentiation.

Learning Outcomes

1. Students can use numerical methods to solve mathematical problems
2. They will get an idea of numerical differentiation and integration
3. Students will get a better understanding of finite differences
4. Students will be able to find numerical solutions to ODE and linear eqns

MAT6 B12: Number Theory and Linear Algebra

The course gives a brief introduction to theory of numbers. Important theorems like Fermat's theorem and Wilson's theorem is discussed. The concepts of Vector space and linear transformations are introduced.

Objectives

1. To introduce results of basic number theory
2. Introduce divisibility theory and Congruences
3. Study Fermat's and Wilson's Theorem
4. Impart basic idea of vector spaces and linear transformations

Learning Outcomes: After completion of this course students

1. Can use the theory of numbers, division algorithm and congruences in the field of Computer science and Mathematics.
2. Can apply these ideas in studying cryptography and network security
3. Will get a brief idea about vector spaces and related concepts

MAT6 B13 (E01): Graph Theory

This course introduces the Graphs and allied properties. Various types of graphs are discussed along with the techniques of coloring graphs, Planarity and Matchings.

Objectives
1. Introduce graphs and its origin as an important tool of computation.
2. Study about various types of graphs like line graphs, Eulerian and Hamiltonian graphs.
3. Discuss properties of graphs, like isomorphic graphs.
4. Define colorings, Matching and study about Planarity and Chromatic polynomials in graphs.

Learning Outcomes

1. Facilitate the use of graphs as an important tool in day-to-day activities in life like navigation and root maps.
2. Students can understand the intrinsic, structural properties of graphs
3. Students can get a better understanding of various aspects of graphs like planarity and coloring.

MAT5 D18: Mathematics for Natural Sciences

This course aims to introduce fundamental mathematical concepts to students of branches other than Mathematics. It gives a glimpse to statistical data collection and other concepts like moments and central tendencies in statistics.

Objectives
1. Familiarize the students with sets and operations on sets.
2. Introduce the idea of frequency distribution and data analysis
3. Define and analyze measures of central tendencies
4. Study about the theory of probability and probability distributions.

Learning Outcomes

1. Students shall get basic idea about sets
2. Students will have an understanding of frequency distributions and data tabulation.
3. They will get an idea of measures of central tendencies
4. Students will get familiarized with probability distributions.

Master of Commerce (M.Com) - Finance

Introduction

The world is witnessing a high-tech revolution with changes in science, technology, commerce and industry. The world now believes that knowledge is everything. With opening up of world economy by way of globalization, liberalization and privatization processes, all the business sectors are witnessing a tremendous growth. The whole economy is undergoing a tremendous transformation with many new sunrise sectors like financial services, consultancies etc coming up. The service sector is outstripping the manufacturing sector in growth. A career in these sectors involves challenging work, high growth opportunities, lucrative pay packets and a professionally challenging work environment. It is in this context, University of Calicut revised the syllabus of Master of Commerce (M.Com.) with an intention to prepare the students to meet the need of the changed business environment.

The M.Com. programme has a distinct objective to equip the students with knowledge, skills and attitude to become more suitable for the present and emerging job market. The courses are intended to impart intensive knowledge and training in the subject and help the students to acquire wider perspectives both for research and for professional application. The syllabus has been designed student-centered where there is flexibility for the students to have a greater choice of courses appropriate to their interests, needs, and sustainability and long term goals.

Objectives of M.Com. Programme

1. To provide foundation for further advanced studies and research in the area of Commerce such as M.Phil. and Ph. D. programmes.

2. To allow M.Com. graduates to choose for further advanced studies in different specialization of Commerce such as Accounting, Taxation, Finance, Human Resource, Marketing etc.

3. To enable M. Com. graduates for a wide range of career dealing with the flow of money, from accountant to investment banker, money manager to personal finance consultant.

4. To enable master graduates in Commerce to qualify UGC-NET/SET and JRF examinations so that they can take-up the work of teaching or research of high quality.

5. To impart entrepreneurial skills for starting new business ventures.

Learning Outcomes

1. The learner shows interest and curiosity to study more in the field of Commerce.

2. The learner tries to get in-depth knowledge related to Commerce such as Accounting, Taxation, Finance, Human Resource, Marketing etc.

3. The learner shows great confidence for a wide range of career dealing with the flow of money, from accountant to investment banker, money manager to personal finance consultant.

4. The learner shows great confidence in competitive examination to qualify UGC-NET/SET and JRF examinations so that they can take-up the work of teaching or research of high quality.

5. The learner searches for all the opportunities for starting new business ventures.

Subject-wise Learning Outcomes

Semester I

Sl.No.	Title	Learning Outcomes
1	MCM1C01 Business Environment & Policy	• The learner develops deeper understanding in the concepts of macro -economic environment in which a business organization operates. • The learner develops the skill to analyze and understand the macroeconomic policies of the Government and assess their impact on business.
2	MCM1C02 Corporate Governance &Business Ethics	• Learner acquires the knowledge of corporate ethics • Learner understands the emerging trends in good governance practices. • Acquires the skill to create corporate financial reports in the global and Indian context.
3	MCM1C03 Quantitative Techniques for Business Decisions	• The learner develops the ability to use the quantitative techniques in managerial decision making.
4	MCM1C04 Management Theory and Organizational Behaviour	• The learner develops the understanding regarding the basic concepts of the Organizational Behaviour and also skills of interaction between the individual and the organizations.
5	MCM1C05 Advanced Management Accounting	• The learner understands and apply tools, techniques, and concepts in managerial decision-making process. • Learner develops analytical skills in interpreting and diagnosing business problems

Semester II

Sl.No.	Title	Learning Outcomes
1	MCM2C06 Advanced Corporate Accounting	• The learner develops deeper understanding regarding the concepts related to corporate accounting, and • The learner develops the skill to solve problems relating to Company Accounts, Valuations and Special types of situations.
2	MCM2C07 Advanced Strategic Management	• The learner develops awareness regarding the nature, scope, structure and operations of strategic management techniques.
3	MCM2C08 Advanced Cost Accounting	• The learner is capable of designing and Implementing cost control, cost reduction programme and different cost systems, and • The learner gets adequate knowledge on cost accounting practices.
4	MCM2C09 International Business	• The learner develops awareness regarding the nature, scope, structure and operations of International Business.
5	MCM2C10 Management Science	• The learner understands the concepts and techniques of Operations Research and the use of OR tools for business decision making. • The learner develops the required skills to solve various problems in OR.

Semester III

Sl.No.	Title	Learning Outcomes
1	MCM3C11 Financial Management	• The learner develops the basic knowledge and understanding regarding the business and management.
3	MCM3C12 Income Tax Law, Practice and Tax Planning I	• The learner develops the ability to apply the principles and provisions of Income Tax Act 1961, amended up to date.
3	MCM3C13 Research Methodology	• The learner understands the process of doing research and its importance, and • The learner acquires required skills to undertake research projects as a part of the curriculum and to solve business problems.
4	MCM3EF01 Investment Management	• Learner develops a conceptual framework for the study of security analysis and portfolio management and also develops the ability to understand and utilize the skill of optimizing returns.
5	MCM3EF02 Financial Markets & Institutions	• Learner develops a sound information and knowledge of broad framework of financial markets and institutions and also develops an understanding of the inter-linkages and regulatory framework within which the system operates in India.

Semester IV

Sl.No.	Title	Learning Outcomes
1	MCM4C14 Financial Derivatives & Risk Management	• The learner becomes efficient in the area of derivatives, by giving them the knowledge of basics in options, futures, swaps etc.
2	MCM4C15 Income Tax Law, Practice and Tax Planning II	• The learner develops theoretical and practical knowledge of assessment and tax planning of different assesses. • Learner becomes aware about major and latest provisions of the India tax laws and related judicial pronouncements pertaining to various assesses with a view to derive maximum possible tax benefits admissible under the law.
3	MCM4EF03 International Finance	• Learner develops understanding about the concept and significance of international finance, international financial markets and exchange theories and foreign exchange exposure and risk management
4	MCM4EF04 Advanced Strategic Financial Management	• Learner develops understandings about the concepts, vital tools and techniques used for financial decision making by a business firm.

M.Sc. COMPUTER SCIENCE –CBCSS
(EFFECTIVE FROM 2020 ADMISSION ONWARDS)

The course of the MSc (Computer Science) Programme is designed with the following objectives:

1. To equip students to take up challenging research-oriented responsibilities and courses for their higher studies/profession.

2. To train and equip the students to meet the requirements of the Software industry in the country and outside.

3. To motivate and support the students to prepare and qualify challenging competitive examinations such as JRF/NET/JAM/GATE etc.

PROGRAMME OUTCOME (PO)

After the successful completion of the Post Graduate Programme, M.Sc Computer Science at University of Calicut, a student would have :

PO1: Attained in depth knowledge of foundations of computing.

PO2: Development of soft skills and practicing professional ethics.

PO3: An ability to understand, analyze and design efficient algorithms.

PO4: Apply computer science theory and software development concepts to construct computing-based solutions.

PO5: To make them employable according to the current demand of the IT Industry and responsible citizens.

PO6: An ability to understand and solve emerging research problems.

PO7: Develop programming skills to implement research projects.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Evaluate complex real-world problems by applying principles of theoretical computing, engineering and Mathematical models.

PSO2: Modern Tool usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PSO3: Understand all dimensions of the concepts of software application development and projects.

PSO4: Aware the students to publish their work in reputed journals.

PSO5: Conceive Project Management capabilities to solve real world problems in accordance to the needs of the industry, in a specific time frame.

PSO6: Design and develop computer programs/computer-based systems in the field of Computer Sciences viz. Computational Intelligence, Machine learning, Web technology, Information Retrieval Systems, Data Analytics, Communication and networking.

PSO7: To prepare the students to address the challenging requirements coming from the enterprise applications

COURSE OUTCOME

SEMESTER	COURSE	COURSE OUTCOME
SEMESTER I	CSS1C01 – DISCRETE MATHEMATICAL STRUCTURES	CO1: Verify the validity of an argument using propositional and predicate logic. CO2: Understand allocations of set theory by applying operations on set. CO3: Apply operations of relations and functions in discrete structures. CO4: Understand applications of Lattices and Boolean algebra in computer science domain. CO5: Identify Group, Ring and Field in Group Theory CO6: Understand applications of Graph Theory and Tree CO7: Apply the concepts of graph theory and trees to formulate problem solving
	CSS1C02 – ADVANCED DATA STRUCTURES	CO1: Summarize different categories of data structures. CO2: Design algorithms to perform

		operations with linear and non – linear data structures.
		CO3: Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and used by algorithms.

CO4: Describe common applications for arrays, linked lists, stack, queue, tree and graphs.

CO5: Demonstrate different methods for traversing trees.

CO6: Design and implement an appropriate hashing function for an application.

CO7: Discuss the computational efficiency of the principal algorithms for sorting, searching and hashing.

CO8: Describes various types of trees and heap structures. |
| | CSS1C03 – THEORY OF COMPUTATION | CO1: Describe broad overview of the theoretical foundations of computer science.

CO2: Understand regular languages and finite automata. CO3: Apply the concept of context free languages in problem solving.

CO4: Solve various problems of applying normal form techniques, push down automata and Turing Machines.
CO5: Propose solutions for the problems based on computability and decidability. |
| | CSS1C04 – THE ART OF PROGRAMMING METHODOLOGY | CO1: Improve ability to develop effective algorithms.
CO2: Understand the fundamental principles of problem-solving using computers.
CO3. Demonstrate the applications of the programming constructs including decision making, looping, arrays and strings. |

		CO4. Conceptualize modular programming basics using functions, structures and Unions CO5. Understand features like pointers and macros and to become familiar with programming with files CO6: Design, develop, implement, test and document well-structured and reliable computer programs using the C programming language.
	CSS1C05 – COMPUTER ORGANIZATION & ARCHITECTURE	CO1: Identify, understand and apply different number systems and codes. CO2: Understand the digital representation of data in a computer system. CO3: Understand the general concepts in digital logic design and their use in sequential and combinational circuit design. CO4: Describe fundamental organization of a computer system. CO5: Explain addressing modes, instruction formats and program control statements. CO6: Understand computer arithmetic formulae and solve problems. CO7: Distinguish the organization of various parts of a system memory hierarchy. CO8: Identify and compare different methods for computer I/O.
	CSS1L01 – PRACTICAL I	CO1: Develop programming skills using the fundamentals and basics of C language. CO2: Develop programs using the basic elements like control statements, arrays and strings. CO3: Design and implement the effective usage of arrays, structures, functions and pointers. CO4: Implement files handling and command line arguments. CO5: Demonstrate the concepts of stack, queue and linked list and apply various operations on them.
	CSS1A01 – INTRODUCTION TO RESEARCH (ABILITY ENHANCEMENT AUDIT COURSE)	CO1: Understand research terminology. CO2: Apply the ethical principles of research. CO3: Identify the components of a literature review process. CO4: Critically analyze published research works.

SEMESTER	COURSE	COURSE OUTCOME
		CO5: Innovate and apply research methods in the discipline of computing.

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SEMESTER	COURSE	COURSE OUTCOME
SEMESTER II	CSS2C06 – DESIGN AND ANALYSIS OF ALGORITHMS	CO1: Design algorithms in context of space and time complexity and apply asymptotic notation. CO2: Analyze the problem and develop the algorithms related to these problems. CO3: Classify the problems and apply the appropriate design strategy to develop algorithms. CO4: Analyze the problem and develop the algorithms related to these problems. CO5: Demonstrate the use of parallel algorithms.
	CSS2C07 – OPERATING SYSTEM CONCEPTS COURSE	CO1: Understand the basic components of a computer operating system. CO2: Compare and interpret the applications of Process and threads. CO3: Describe the policies for scheduling, deadlocks, synchronization, system calls, and file systems. CO4: Illustrate the functioning of process management, memory management and file management Modules present in an OS. CO5: Differentiate various types of scheduling algorithms. CO6: Understand the concepts of Three-Tier Client/Server Architecture, Middleware and the characteristics of mobile operating systems.
	CSS2C08 – COMPUTER NETWORKS	CO1: Understand the basics concepts of computer network organization and implementation. CO2: Describe theoretical understanding of layered network models - OSI and TCP/IP Models. CO3: Illustrate the functionalities of different network layers. CO4: Analyze the network application such as data transmission between client and

		server, file transfer, real-time and multimedia transmission. CO5: Explain the security aspects in networks and principles of cryptography.
	CSS2C09 – COMPUTATIONAL INTELLIGENCE	CO1: Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems. CO2: Conceptualize various knowledge representation techniques. CO3: Analyze the problem-solving methods and algorithms related to searching, reasoning, game playing and machine learning. CO4: Understand the functioning of expert systems and its importance. CO5: Demonstrate the implementation various AI algorithms to solve real life problems.
	CSS2C10 – PRINCIPLES OF SOFTWARE ENGINEERING	CO1: Understand the software process and development models. CO2: Understand the software design process and structured analysis of systems. CO3: Distinguish different types of modelling like DFD and UML. CO4: Illustrate the knowledge about the design of user interface. CO5: Apply the skill of project management and report preparation.
	CSS2L02 – PRACTICAL II	CO1: Discuss and formulate the problems based on the basic principles of networks. CO2: Implementation of different memory management techniques in OS. CO3: Implement various system operations of the operating system and also the various process scheduling algorithms. CO4: Understand the TCP/IP configuration for Windows and Linux. CO5: Design and implement various network applications such as data transmission between client and server, file transfer, real-time multimedia transmission. CO6: Understand different Linux/UNIX shell scripts and execute various shell programs.

SEMESTER	COURSE	COURSE OUTCOME
	CSS2A02 – TERM PAPER (PROFESSIONAL COMPETENCY AUDIT COURSE)	CO1: Apply critical thinking skills analytical ability in problem solving. CO2: Apply foundational research skills to address research problem. CO3: Innovate, experiment and analyze research findings. CO4: Demonstrate capacity to lead and manage change through a collaborative environment. CO5: Innovate, experiment and analyze research findings and practice the process of scientific publishing.

SEMESTER	COURSE	COURSE OUTCOME
SEMESTER III	CSS3C11 – ADVANCED DATABASE MANAGEMENT SYSTEM	CO1: Explain the basics of database management system, concepts of relational data model, entity-relationship model, relational database design, relational algebra and calculus. CO2: Apply the normalization techniques to improve the database design. CO3: Describe various database manipulation commands in SQL. CO4: Understand Transaction Processing & Locking using the concept of Concurrency control. CO5: Conceptualize advanced features of Object-Oriented Database Management Systems and Distributed databases.
	CSS3C12 – OBJECT ORIENTED PROGRAMMING CONCEPTS	CO1: Recall the object-oriented programing concepts and basics of Java. CO2: Design and implement object-oriented programs including packages and interfaces. CO3: Explain and handle exceptions and threads. CO4: Develop interactive programs using applets, AWT and swings. CO5: Explain the concepts of JDBC, sockets and gives an introduction to Unified Modelling Language (UML).

	CSS3C13 – PRINCIPLES OF COMPILERS	CO1: Understand the major phases of compilation, identify tokens of a typical high -level programming language, define regular expressions for tokens, design and implement a lexical analyzer. CO2: Develop the parsers and experiment the knowledge of different parsers design without automated tools. CO3: Construct the intermediate code representations and generation. CO4: Explain the role of different types of runtime environments and memory organization for implementation of typical programming languages. CO5: Apply the optimization techniques to have a better code for code generation.
	CSS3L03 – PRACTICAL III	CO1: Design and development of relational database systems. CO2: Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger and views. CO3: Apply various software to design and build ER Diagrams, UML, Flowchart for related database systems. CO4: Design and implement database applications on their own. CO5: Apply JDBC to provide a program level interface for communicating with database using Java programming. CO6: Use an integrated development environment to write, compile, run, and test simple object- oriented Java programs. CO7: Understand Java programming concepts and utilize Java Graphical User Interface in program writing. CO8: Design and develop Java programs that solve real-world problems
	ELECTIVE I	
	CSS3E01a – COMPUTER GRAPHICS	CO1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics. CO2: Extract scene with different clipping methods and its transformation to graphics display device.

		CO3: Explore projections and visible surface detection techniques for display. CO4: Explore object representations and surface detection methods. CO5: Understand techniques and OpenGL programming concepts.
	CSS3E01b – INTRODUCTION TO SOFT COMPUTING	CO1: Understand soft computing techniques and their role in problem solving. CO2: Conceptualize and parameterize various algorithms in problem solving. CO3: To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations. CO4: Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic. CO5: Conceptualize advanced topics of evolutionary algorithms and swarm intelligence.
	CSS3E01c – WEB TECHNOLOGY	CO1: Understand the basics of HTML, XML and CSS. CO2: Learn client-side programming and basics of Javascript. CO3: Explore web servers and server-side technologies. CO4: Able to do server-side programming with PHP. CO5: Illustrate and apply content management systems and its features.
	CSS3E01d – BIOINFORMATICS	CO1: Understand the basic concepts of Bioinformatics and its significance in Biological data analysis. CO2: Demonstrate various techniques, algorithms and tools employed in computational biology. CO3: Identify steps in sequence alignment. CO4: Analyze various databases and tools on nucleic acids and protein. CO5: Understand the types of data found at NCBI and EBI resources.

		CSS3E01e – COMPUTER OPTIMIZATION TECHNIQUES	CO1: Understand linear programming methods and formulate real world problems into mathematical problems. CO2: Apply linear programming methods like transportation and network problems. CO3: Understand different linear programming methods and applications. CO4: Understand integer linear programming and algorithms to solve it. CO5: Understand the basics of dynamic programming and nonlinear programming
		CSS3E01f – NUMERICAL AND STATISTICAL METHODS	CO1: Recognize the error in the number generated by the solution. CO2: Compute solution of algebraic and transcendental equation by numerical methods like the Bisection method and Newton Rapshon method. CO3: Understand the concepts of solving integrals mathematically. CO4: Understand different probabilities and its properties. CO5: Solve linear programming problems.
	ELECTIVE II		
		CSS3E02a – PATTERN RECOGNITION	CO1: Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques. CO2: Recognize the principles of Bayesian parameter estimation. CO3: Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis. CO4: Apply pattern recognition techniques for pre-processing, feature extraction and feature selection. CO5: Understand supervised and unsupervised classification methods to detect and characterize patterns in real-world data.
		CSS3E02b – WIRELESS & MOBILE NETWORKS	CO1: Understand the fundamental concepts of wireless and mobile networks. CO2: Illustrate the wireless application protocols for mobile content development. CO3: Analyze various wireless mobile programming methodologies. CO4: Understand security aspects of wireless networks.

		CO5: Understand TCP/IP extensions for wireless mobile networking.
	CSS3E02c – CRYPTOGRAPHY AND NETWORK SECURITY	CO1: Understand the fundamentals of cryptography. CO2: Describe data integrity, authentication, digital signatures. CO3: Analyze different network security applications CO4: Familiarize standard algorithms that provide confidentiality, integrity and authenticity. CO5: Understand network security technologies.
	CSS3E02d – ADVANCED WEB TECHNOLOGY	CO1: Understand the concepts of Web 2.0. CO2: Conceptualize web services and its architecture. CO3: Develop applications using Python programming language. CO4: Analyze server-side programming with Python. CO5: Develop applications with Python-SQLite integration.
	CSS3E02e – VIRTUALISATION AND CLOUD COMPUTING	CO1: Understand the basics of cloud computing. CO2: Describe different types of virtualization. CO3: Identify the cloud infrastructure and the key application features delivered on virtual infrastructures. CO4: Describe parallel and distributed programming models and programming paradigms. CO5: Understand mapping applications and Hadoop configuration. CO6: Analyze security challenges in the cloud.
	CSS3E02f – DATA WAREHOUSING AND DATA MINING	CO1: Understand the basic concepts of Data mining and warehousing. CO2: Identify the different techniques of data preprocessing. CO3: Analyze patterns that can be discovered by classification and clustering.

SEMESTER	COURSE	COURSE OUTCOME
		CO4: Understand data mining techniques of clustering. CO5: Identify complex data types based on spatial and web mining.

SEMESTER	COURSE	COURSE OUTCOME
SEMESTER IV	CSS4P01 – PROJECT WORK	CO1: Demonstrate a depth of knowledge of modern technology. CO2: Practice to communicate effectively and to present ideas clearly and coherently to specific audiences in both the written and oral forms. CO3: Understand the project requirements, reflect on their learning and take appropriate actions to implement it. CO4: Estimate, plan, calculate, and adjust project variables. CO5: Understand the importance of iteration, evaluation and prototyping in design of a software system.
	ELECTIVE III	
	CSS4E03a – DATA COMPRESSION	CO1: Understand various database systems, data models and schemas. CO2: Understand database architecture, ER and duties of DBA. CO3: Analyze compression techniques for strings and images CO4: Illustrate various relevant transforms in image compression. CO5: Recognize video-audio file formats and the compression techniques used CO6: Compare and analyze different algorithms used in audio and video file formats
	CSS4E03b – PERVASIVE COMPUTING	CO1: Familiarize conceptual foundation in pervasive computing area. CO2: Understand various application fields associated to pervasive computing CO3: Identify the devices, interfaces, security and protocols in pervasive computing field.

		CO4: Understand pervasive computing in web applications CO5: Understand the WAP architecture, languages and security issues. CO6: Apply knowledge on personal digital assistant devices and java programming for pervasive computing CO7 Understand pervasive computing web application architecture, MVC and user interfaces.
	CSS4E03c – SYSTEM SECURITY	CO1: Familiarize with different types of securities in information systems, security goals and CIA. CO2: Illustrate computer system threats and various types of system attacks CO3: Identify different issues associated with system attacks and how attacking occurs; and various types of attackers CO4: Provide knowledge in operating system security, file protections, security assurance CO5: Understand important elements of Database security CO6: Define security planning, various types of security policies and risk analysis
	CSS4E03d – MOLECULAR SIMULATION AND MODELLING	CO1: Understand different molecular modelling methods and model types. CO2: Illustrate concepts, principles of mathematical modelling and discrete system simulation. CO3: Analyze different mapping techniques and Microarray technology CO4: Analysis of different prediction strategies of Structural Modelling CO5: Demonstrate protein structure classification and prediction CO6: Familiarize steps in molecular visualization, protein family databases, software tools and basic operations
	CSS4E03e – FUNDAMENTALS OF BIGDATA	CO1: Understand basic concepts of Bigdata, its dimensions and currently available other Databases. CO2: Describe bigdata analytics and familiarize data analytics using a tool – R

		CO3: Understand NOSQL databases and introduce MongoDB CO4: Understand in basic functions of NOSQL database CO5: Illustrate the basics of the HADOOP Ecosystem CO6: Understand the elementary concepts of MapReduce.
	CSS4E03f – WEB ENGINEERING	CO1: Understand basic concepts Web engineering CO2: Describe Requirements Engineering (RE) for web applications and familiarize Web application architecture and architecture for multimedia data. CO3: Understand NOSQL databases and introduce MongoDB CO4: Understand the basics of Modelling web applications and web application design CO5: Understand the elementary concepts of testing web applications.
	ELECTIVE IV	
	CSS4E04a – DIGITAL IMAGE PROCESSING	CO1: Understand the fundamental concepts of a digital image processing CO2: Apply various image enhancement techniques CO3: Describe various image enhancement techniques CO4: Implement algorithms for handling intensive image restoration problems. CO5: Identify and compare various image segmentation and representation techniques CO6: Understand various image compression procedures.
	CSS4E04b – ADVANCED TOPICS IN DATABASE DESIGN	CO1: Understand the basic concepts of the database and data models. Design a database using ER and EER diagrams CO2: Familiarize the students to OPPS Database concepts and its features CO3: Understand the concepts of Object relational and extended database CO4: Describe the basics of Client server, distributed and parallel Databases. CO5: Exemplify XML data model and how-to retrieval information in Databases

		CSS4E04c – SOFTWARE DEVELOPMENT FOR PORTABLE DEVICES	CO1: Understanding on Mobile web and CSS3 CO2: Understand the role of jQuery - methods - manipulations CO3: Describe the basics of Android and smartphones its architecture, environment, life cycle and various XML layouts CO4: Understand the role of content providers and databases CO5: Understand networking and location-based services. CO6: Illustrate how exchange of data to and from a web server like JSON is taking place.
		CSS4E04d – STORAGE AREA NETWORKS	CO1: Understand basic networking and SAN topologies CO2: Illustrate SAN basics technology and configuration CO3: Understand storage networking architecture and SAN emerging technologies CO4: Illustrate the storage infrastructure and management activities CO5: Demonstrate how to build SAN and security guidelines.
		CSS4E04e – SEMANTIC WEB	CO1: Understand semantic web basics CO2: Represent data from a chosen problem in XML with appropriate semantic tags CO3: Conceptualize the phases of ontology learning, algorithm and evaluation CO4: Understand ontology management, tools and development CO5: Describe the implementation details of web services and security issues.
		CSS4E04f – ADVANCED JAVA PROGRAMMING	CO1: Understand advanced concept of Java Programming, RMI and servlets CO2: Develop manipulate servlets and configuration CO3: Illustrate the basic functionalities of JNDI and EJB CO4: Develop JSP pages by understanding the technology and execution

		CO5: Understand the basics of ORM environment configuration mappings and HQL foundations

M.SC. MATHEMATICS WITH DATA SCIENCE
POs AND COs
Program Outcome
Upon completing the M. Sc degree in the field of Mathematics and Data Science

- **Students shall have acquired foundations in mathematical, statistical and computational techniques that are applied in Data Science.**
- **They will be able to develop mathematical and statistical models for modelling data sets.**
- **Students will become capable to do programs for computational works required for estimation/fitting of real data applications.**

Course Outcomes

FIRST SEMESTER

ALGEBRA: **Upon the successful completion of the course students will:**

- Learn direct product of groups and factor group computation.
- Understand the notion of group action on a set.
- Understand the notion of free groups.
- Understand the concepts rings and ideals.
- Learn basic properties of field extensions.

LINEAR ALGEBRA: **Upon the successful completion of the course students will:**

- Learn basic properties of vector spaces.
- Understand the relation between linear transformations and matrices.
- Understand the concept of diagonalizable and triangulable operators and various fundamental results of these operators.
- Understand Primary decomposition Theorem.
- Learn basic properties inner product spaces.

REAL ANALYSIS: **Upon the successful completion of the course students will:**

- Learn the topology of the real line
- Understand the notions of Continuity, Differentiation and Integration of real functions.
- Learn Uniform convergence of sequence of functions, equicontinuity of family of functions and Weierstrass theorems.

MEASURE AND PROBABILITY: **Upon the successful completion of the course students will**

- Learn the concept of measures and measurable functions
- Learn Lebesgue integration and its various properties

- Learn the concept of random variables starting from axiomatic definition of probability up to limit theorem of probability.
- Understand probability distribution and distribution function and their properties.

STATISTICAL INFERENCE AND COMPUTING USING *R*: **Upon the successful completion students will**

- Understand the notion of point estimation of the parameters and properties of the good estimator
- Learn the approaches methods of point estimation
- Understand the concept of interval estimation
- Understand the concept of testing of hypothesis
- Understand and apply large sample and small sample tests using r in real data contexts.
- Understand the use of non-parametric tests using *R* in real data contexts.

Course Outcomes

SECOND SEMESTER

DISCRETE MATHEMATICS: **Upon the successful completion of the course students will:**

- Understand the fundamentals of Graphs.
- Learn the structure of graphs and familiarize the basic concepts used to analyze different problems in different areas of different branches.
- Acquire a basic knowledge of formal languages, grammars and automata.
- Learn the equivalence of deterministic and non-deterministic finite accepters.

NUMBER THEORY: **Upon the successful completion of the course students will:**

- Be able to effectively express the concepts and results of number theory.
- Learn basic theory of arithmetical functions and Dirichlet multiplication, averages of some arithmetical functions.
- Understand distribution of prime numbers and prime number theorem.
- Learn the concept of quadratic residue and Quadratic reciprocity laws.
- Get a basic knowledge in Cryptography.

DIFFERENTIAL EQUATIONS: **Upon the successful completion of the course students will**

- Learn the existence of uniqueness of solutions for a system of first order ODEs.
- Learn many solution techniques such as separation of variables, variation of parameter power series method, Frobenious method etc.
- Get an idea of how to analyse the behaviour of solutions such as stability, asymptotic stability etc.
- Learn a technique to solve first order first order PDE and analyse the solution to get information about the parameters involved in the model.
- Learn explicit representations of solutions of important classes of PDE Laplace equation and wave equation for initial value problems.

<u>TOPOLOGY:</u>   **Upon the successful completion of the course students will**

- Be proficient in abstract notion of a toplogical space, where continuous function are defined in terms of open set not in the traditional $\varepsilon - \delta$ definition used in analysis).
- Realize Intermediate value theorem is a statement about connectedness, Bolzano weierstrass theorem is a theorem about compactness and so on.
- Learn the concept of quotient topology.
- Learn five properties such as T_0, T_1, T_2, T_3 and T_4 of a topological space X which express how rich the open sets is. More precisely, each of them tells us how tightly a closed subset can be wrapped in an open set.

<u>REGRESSION TECHNIQUES AND TIME SERIES ANALYSIS:</u> **Upon completion Students will be able to**

- Develop the understanding of linear regression model
- Develop the ability to fit regression models for the real data.
- Develop the understanding of time series models
- Develop the ability to fit time series models for the real data

M.SC. MATHEMATICS WITH DATA SCIENCE POS AND COS
Course Outcomes

THIRD SEMESTER

<u>MULTIVARIABLE CALCULUS AND GEOMETRY</u>

Upon the successful completion of the course students will:

- Be proficient in differentiation of functions of several variables.
- Understand curves in plane and inspace.
- Get a deep knowledge in Curvature, torsion, Serret-Frenet formulae
- Learn Fundamental theorem of curves in plane and space.
- Learn the concept of Surfaces in three dimension, smooth surfaces, surfaces of revolution
- Learn explicitly tangent and normal to the surfaces.
- Get a thorough understanding of oriented surfaces, first and second fundamental forms surfaces,
    gaussian curvature and geodesic curvature and so on.

<u>COMPLEX ANALYSIS</u>

Upon the successful completion of the course students will:
- Learn the concept of (complex) differentiation and integration of functions defined on the
    complex plane and their properties.

- Be thorough in power series representation of analytic functions, different versions of Cauchy's
    Theorem.
- Get an idea of singularities of analytic functions and their classifications.
- Learn different version of maximum modulus theorem.

FUNCTIONAL ANALYSIS
Upon the successful completion of the course students will:
- Learn the concept of normed linear spaces and various properties of operators defined on them.

SAMPLING THEORY AND DESIGN & ANALYSIS OF EXPERIMENTS
Upon the successful completion of the course students will:

- Understand concept and usefulness of sampling.
- Understand different methods of sample selection.
- Understand Basic Principles of design and analysis of experiments
- Develop the ability to apply different designs in real situations.

MACHINE LEARNING ESSENTIALS (ELECTIVE PAPER)

Upon the successful completion of the course students will:

- Have a strong foundation for machine learning
- Understand and learn the differences between supervised and unsupervised learning
- Learn the reinforcement learning

M.SC. MATHEMATICS WITH DATA SCIENCE POS AND COS
Course Outcomes

FOURTH SEMESTER

MULTIVARIATE TECHNIQUES AND DATA SCIENCE
Upon the successful completion of the course students will:
- Understand concept and context of multivariate techniques
- Demonstrate the knowledge and skill of use of multivariate normal distribution.

- Develop the ability to perform multivariate analysis of classification, principal component, cluster
      and   factor analysis.
- Understand the concept of Multi dimensional scaling, Structure Equation Models.

ALGEBRAIC GRAPH THEORY (ELECTIVE PAPER)

Upon the successful completion of the course students will:
- Understand that theory of permutation groups may be used to study the graphs.
- Acquire a knowledge of various family of graphs.
- Learn mappings between graphs homomorphisms, isomorphisms and automorphisms.
- Develop basic properties of transitive graphs.

OPERATIONS RESEARCH (ELECTIVE PAPER)

Upon the successful completion of the course students will:
- Learn how to formulate and solve problems as networks and graphs.
- learn how to develop linear programming (LP) models for shortest path, maximum flow, minimal
      spanning tree, critical path, minimum cost flow, and transshipment problems.
- Learn how to construct linear integer programming models and discuss the solution techniques.
- Learn how to solve the integer programming models using branch-and-bound method.

DATA VISUALIZATION (ELECTIVE PAPER)
Upon the successful completion of the course students will:
- Get an idea of representing complex data in various type of data sources
- Understand the methodologies related to visualization of data sets
- Learn to use data visualization tool

PRINCIPAL
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