Program Course Outcome

Bachelor of Business Administration (BBA) Examination

Semester – I

1T1– English

CO: 1
The students are be able to understand basic grammar used in constructing a sentence as well as in speaking

CO:2
Students are taught to write application regarding various phenomena

CO:3
Students are made to experience and experiment various type of body language

CO: 4
The three stories allows the students to experience these types of narrative accounts which incorporates in human life.

Program Specific Outcome:
This program is an attempt to acquainted English language among the students so that they should be able to communicate efficiently. English is today a global language as well as the business language. The program will help the student to understand the business world and its elements associated to it.

1T2 – Fundamentals of Business Management

CO: 1
Students are taught the need of management in current aspect to bring effective and efficient results.

CO:2
The difference in management, and administration and the skills is to incorporate for a mangers and how to develop a manager to become a genuine leader.

CO:3
How planning is a fundamental process for to initiate a work, students here learn various stages of planning and the effectiveness on strategic timing in planning.

CO 4

Without choice there is no decision making. The idea of choice is explored throughout the Steps Involved in decision making. Students here also learn the various type of organisation.

Program Specific Outcome:

The program name itself express the importance, the Business Administration course initiates with what is management. It educates how to plan, organise, get the right person for the right job, leadership & motivation, decision making and lastly controlling. The aim of the work is in order to achieve effective & efficient results.

1T3 – Computer Applications for Business

CO:1

The students learn about computer and its various components associated to it.

CO:2

The application of Microsoft Office is taught in order to associate the various software tools in Business.

CO:3

The students learns business of 'e' which is explored to understand the modern arena of Business

CO:4

The service sector of prominence of not just Indian economy but also the world is the IT technology. The students are exploring to its significance of its growth and wide spread in the globe through the welcoming of the third generation.

Program Specific Outcome:

The modern world is more of digital book, everything today is accounted digitally, the business flourishes with technology which is not so new but it is very limited access due digital illiteracy. The students needs to be acquainted with Information Communication Technology. The growth in the business world is current scenario is more dependent on it. The ICT has become a necessary skill after English. The program teaches them.

1T4 – Cost Accounting

CO: 1

The students learn here about how to prepare various type of financial Statements by following accounting procedures.

CO:2

The students are taught the method of collecting and assigning the manufacturing cost to the units.

CO:3
The students are made familiar to the various cost associated for the operation of the business.

CO:4
the course helps the student to understand the variable and fixed cost and total revenue to which a firm can achieve Break Even Point.

Program Specific Outcome:
In Business Administration the importance accountancy is impeccable. As in business accountancy has happens to be language that communicates its status. One of the branches of accountancy is Cost Accounting, where students are acquainted with a systematic sets of procedures for recording or reporting measurements of cost of manufacturing goods & service. It help to determine the actual cost associated with it.

2T1– Principles of Marketing Management

CO:1
The persuasion methods to sell good & service is marketing and to manage it students are taught of various method and concepts

CO:2
The students are here able to partition markets through various methods such as demography, geography etc. and use the methods of targeting and positioning.

CO:3
How a product is evolved from the idea to its tangibility and then having a life, a name, the growth and the death. The students understand the value of its product to it market.

CO:4
The students experience the various types of behaviour associated to a consumer. The persuasion methods use to change the mind-sets of consumers to the products by the marketing team.

Program Specific Outcome:
The students taught Marketing Management for the very idea of managing the four P's of marketing such as Product, Price, Place and Promotion as each P connects each other. The program makes them learn, the reasons associated to why a product is need, why is so highly dependent on price, why is more or less specific to place and why there is a need to persuade to reach to it customer.

2T2 – Financial & Management Accounting

CO: 1
The student taught the importance of Financial Accounting. The get familiar with the rules and principles governing Double Entry Bookkeeping system.

CO: 2
The course helps the students acquainted accounting skills in order read, understand and prepare the financial statements so to know the performance of the company.

CO: 3
The students are trained to Analysis of Financial Statements using ratio analysis-simple ratios, also make them aware of difference between Financial Accounting and Management Accounting

CO: 4
The students are acquainted with a system of procedure used to ensure that an organisation actual revenue and expenditure adhere, obey and follow closely to its financial plan.

Program Specific Outcome:
The program helps the students to understand the need and importance of accounting in business. Financial Accounting plays a vital role as it communicates business condition of a firm. It also helps in tracking revenue & expenditure, ensure statutory compliance and provides management, investor, stake holders & government with Quantitative and Qualitative information for various business decision making.

2T3– Micro-Economic Fundamentals

CO: 1
The students learn the meaning of Economics is a study about allocation of resource to satisfy unlimited wants

CO: 2
The students understands the ideas of the pillars of economics i.e. demand & supply.

CO:3
The Land, Labour, Capital &Entrepreneur the four factors for production, each factor has an equal importance for production as also students learns the significance of Cost and its economies.

CO: 4
A market in economics is not a place but a product and various products associated to it and its price based on such Students are able to identify various type of market.

Program Specific Outcome:
The need creates demand, demand invents it supply, supply breeds factor of production, the production generates cost, cost determines the price, the price settles profits. It necessary for a students who is learning business to know economics as Micro Economics helps to understand this phenomena.

2T4 - ENGLISH

CO: 1

The students get familiar with grammar this will help to communicate as grammar lays ground work effective communication and effective speaking to powerful writing.

CO: 2

The students are trained to write various businesscorrespondences. This exercise willfacilitate them to communicate the requirement in writing for the organisation

CO: 3

The students improve their communication, one way of doing is Prose. It assist them in speaking, writing as prose adds style, pace and flow. Students will benefit them in business as this form of communication awards confidence.

CO: 4

Stories allows the students to experience numerous types of narrativeaccounts which incorporates in human life.

Program Specific Outcome:

The specific outcome of this program is to develop articulation among the students on while doing that the above is good for it. English is not just a global language but a language connects the world and a language of modern business world. Grammar, correspondence and prose altogether builds up the command on the English language. As it is a matter of practice for students.

Improvement in English is enhancement in skill, a skill that can shape a sharp career

3T1 – Principles of Financial Management

Credits: 4

CO:1

The students are made familiar to funds and credit employed to the business for its efficient functioning

CO:2

The students are made familiar with the particular distribution of Debt & Equity that makes up the finance of a company.

CO:3

The students are taught the idea of Required Rate of Return on a company's existing securities and also to evaluate the new project that company wish to venture on**.**

CO:4

The students are acquainted with the business strategy which designed to ensure that company operates efficiently by monitoring and using its Current Assets & Liabilities to its best use.

Program Specific Outcome:

The program helps the students to be acquainted with dealings and analysis of money flow for investment in business such that it in decision making. The program focuses on ratios, debt & equity, distribution of dividends, capital raising, hedging and even looking after fluctuation of foreign currency and business cycle.

BBA Sem III

3T2 – Basic Statistical Techniques

CO: 1

The student here understand the need of statistical tools as method to communicate the business condition through numerical, data, tabulation, frequency distribution, diagrams & graphs.

CO:2

Students are able to calculatemean, median, mode and the relevance to business

CO: 3

Students are able to calculate range, quartile deviation, mean deviation, standard deviation and coefficient of skewness and how a formula is used in different equation.

CO:4

The idea of correlating two subjects and find its relevance through statistical enquiry. The students learn to calculate coefficient of correlation and probable error

Program Specific Outcome:

The program help to develop a quantitative mind, where facts with help of statistical tool becomes data. It covers mean, median, mode, range, quartile deviation, mean deviation, standard deviation and coefficient of skewness& coefficient of correlation. The students learns, understands and communicates in data, tabulation, frequency distribution, diagrams & graphs forms.

3T3 – Evolution of Business & Commercial Geography

CO: 1

The students understands the history of business and economy. They understand how trade created power and how power created wars and how war created peace and how peace started trade peacefully.

CO:2
The process of evolution from first generation to second generation to third generation. Each generation witnessed currency in gold, oil and ITC.

CO:3
The students learn every country is different to each other to its characteristics and those are climate, water bodies, soils, vegetation, animals, minerals, Cultural environment, settlements, etc. Each country is rich in some elements but not all.

CO:4
Students are recognise the Role of industries in Economic development from economic growth. The Challenges to make India not just economically developed but also SuperPower.

Program Specific Outcome:
History belong in the past, understanding it is the duty of the present. Withoutknowing the history how can one understand the present and predict the future. The program is collections of our past, it accounts the events that happened. The economics of early days where there were just Mother Nature with different geography with different climate, vegetation, beliefs.

3T4 – Environment Management

CO:1
The students started recognising the importance of environment for the sustaining of not just business but the planet earth.

CO:2
Students learns here various causes of pollutions and how all they are caused by humans to stasify their economics needs.

CO:3
Population explosion resulted extreme demand and to satisfy such human are taking help from the artificial source which results hazards disease

CO:4
The students explored various social environment issue and able to admit that policies or business can be benefiting one but harming another. Such shouldn’t a business choice.

Program Specific Outcome:
The program helps understands the Mother Nature or to be kind to planet earth. Management interacts and impact of human activities on the natural environment. Today’s student is tomorrow’s leader or at-least a manager. They should learn that business should make profit but not on the cost of consuming the environment.

BBA Sem IV

4T1 – Principles of Human Resource Management

CO:1

The students recognise the need for Human Resource Management for not just employee benefit but also for better functioning of a firm through a better HR department.

CO:2

The students learns the duty of an HR department is analysis what type of job work is it, the qualification required to perform the work, the amount of time and the worth of the job and also to find a suitable candidate to perform the job work who is

CO:3

A students experience the various process of HRM, which comprises of planning, estimating the man power needed and thereafter start recruiting, lastly selection of the right person for right job.

CO:4

The job of the HR department is to make their employee familiar to job and also to whom the job is done for. What is the firm all about? Its vision & mission, its various employees in the various hierarchies and the training is a major part of it. A candidate goes through various such processes and does the job. Thus the job makes his movement to its Placement, Transfer, Promotion, and Demotion.

Program Specific Outcome:

As the program name itself Principles of Human Resource Management, it suggest on investing on Human Capital. Here the students learn that HR department is an valuable division sd they ensure the right quality and quantity of staff in the workplace. It also motivates and facilitates individual or group of employee to grow furthermore advance in their career. Ultimately they find the right person for the right job.

4T2 – Money, Banking and Finance

CO:1

The modern world is a monetary world, every tangible thing has monetary value which into existence due to money. Our students recognise the fact that Money gives value to the commodity and service.

CO:2

The monetary world is monitored by the Central bank of the respective country. It is Banking that helps the circulation of currency. Students understand the need of RBI& various Banking institutions for the function of Indian Economy.

CO:3

The course helps the students to understand how a country growth is measured and also how exactly the value of currency (rupee ₹) is rises and falls/

CO:4

The students explore the need of policy making by govt. Fiscal & RBI Monetary for shaping the growth of economy furthermore, leading to economic development.

Program Specific Outcome:

The program help the student to grasp the idea that the modern world is Monetary. The fact that Money gives value to the commodity and service is one way of functional world. It helps to comprehend between real & nominal money. The measuring of economic growth as of per capita income as a result to various policy helps the student's analysis.

4T3 – Introduction to Sociology & Psychology

CO: 1

Herethe students explore the various element associated to a society beliefs, values and norms, what it is trying achieve is that student should know where, with whom and why they are living.

CO:2

The students explore various structural prospects of social system and change. It gives them the idea that the society we live in not static neither so dynamic. However, change is nature.

CO:3

The very aim of psychology is understand the human brain to its reaction. The course helps the students explore various methodology associated to psychology from its nature to our very own Nervous System

CO: 4

The last credit of this program is a combination of Sociology & Psychology to make the students aware of the social behaviour, to its various agents and how one perceive another.

Program Specific Outcome:

Every individual is different, every society is different. However, there are similar patterns to it. Sociology is a study of society, patterns of social relation and culture in our everyday life whereas Psychology is study of mind behaviour. Social Psychology is a study of how thoughts, feeling & behaviour of individuals are influenced by the actual, imagined and implied presence of other. Hence, a program that helps to know about people in society whom will work for them.

4T4 – Business Legislations

CO:1

The students are taught that every conduct of business should be lawful or else the business becomes illegal.

CO:2

The students are made familiar to the English Common Law which is applicable to all the states of India even today i.e. Indian Contract Act 1857 that prescribe the law relating to contract.

CO:3

The students are made acquainted to an important piece of legislation that empowers the central govt. to formation, finance, functioning and winding up of companies.

CO:4

The students are made aware of their consumer rights through this course. This helps them to protect them from exploitation that business practices to make profits.

Program Specific Outcome:

Not knowing the law is not an excuse. The program helps the students to be acquainted with Business Law, the rules, the guild lines or the framework. The program conversant with various law which is associated in business such as **Indian Contract Act (1872), The Companies Act (1956) & Consumer Protection Act, 1986.** Exploring these laws a student becomes familiar to the business law in the society. We need nurture the students in such a way that we may procure a responsible citizen.

Kamla Nehru Mahavidyalaya,Nagpur

B.Com.(Computer Application)(BCCA)

Program Outcome	
P01	The undergraduate will become successful professional by demonstrating logical and analytical ability.
P02	The undergraduates learn the latest trends in Information technology and software development.
P03	The undergraduates learn the essential skills as demanded by global software industries.
P04	The undergraduates enhance their analytical skills, communication skills and audio visual presentations skills.
P05	The undergraduates learn to identify, formulate and solve engineering problems related to information technology.
P06	The undergraduates are able to develop hands on experience on operating system and different application software's.
P07	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to team environment

Course outcomes		
B.Com.(Computer Application) Semester -I		
Subject- 1CAT2 – Financial Accounting		
C01	Students are enabled with the Knowledge in the practical applications of accounting.	At its
C02	At the end of the course the student will able to understand basics of financial accounting, its principles and procedures.	
C03	The student will able to prepare financial statements, Reconciliation of Bank Pass Book and Cash Book and methods of depreciation	
C04	The student will able to understand inventory valuation, how shares are issued and related accounting statements.	
C05	Students will be able to analyze and interpret the financial statement through ratio analysis.	

Course outcomes	
B.Com.(Computer Application) Semester -II	
Subject- 2CAT2 – Principles of Business Management	
C01	The course will enable the students to understand and differentiate management an administration
C02	The student will able to learn organisational structure, departmentalization.
C03	It will also help the students to understand staffing, informal groups and group dynamics become a leader and display leadership skill that will be helpful to control the organizational management.

Course outcomes	
B.Com.(Computer Application) Semester -III	
Subject- 3CAT1 – Environmental Studies	
C01	Students will understand the importance of various aspects of environment
C02	Students will become aware of various contemporary issues related to the environment
C03	Students awareness and knowledge on environment will make them a responsible person towards the environment.

Course outcomes	
B.Com.(Computer Application) Semester -III	
Subject- 3CAT2 – Business Economics	
C01	Students will come to know about basics of economics and its practical applications like market equilibrium.
C02	"Students will understand important concepts for business decisions such as optimum production level ".
C03	Students will come to know about various types of markets and practical methods of pricing in various markets.
C04	Students will be familiar with concepts like wages, rent, interest and profit.

Course outcomes	
B.Com.(Computer Application) Semester -IV	
Subject- 4CAT2-Business Law	
C01	At the end of the course the student will be able to apply legal concepts while drafting a contract.
C02	The student will understand the various compliances in a corporate body.
C03	The student will understand the basics of law relating to consumer protection, E-commerce and cyber laws.

Course outcomes	
B.Com.(Computer Application) Semester -V	
Subject- 5CAT1-Computerized Accounting using Tally	
C01	At the end students will learn the use of voucher entry.
C02	They will how to create company with their details.
C03	At the end of the course the students will understand concepts of voucher entry, budget, and inventory.
C04	Students will learn the new Trend of accounting by using Computerized accounting software.

Course outcomes	
B.Com.(Computer Application) Semester -V	
Subject- 5CAT4- DSE – I : **Cost & Management Accounting**	
C01	To understand Basic Cost concepts, Elements of cost and cost sheet.
C02	Providing knowledge about difference between financial accounting and cost accounting. Ascertainment of Material and Labor Cost.
C03	Student's Capability to apply theoretical knowledge in practical situation will be increased.

Course outcomes	
B.Com.(Computer Application) Semester -VI	
Subject- 5CAT3- DSE – II : **Company Law and Secretarial Practice**	
C01	To impart students with the knowledge of fundamentals of Company Law and provisions of the Companies Act.
C02	To apprise the students of new concepts involving in company law regime
C03	To acquaint the students with the duties and responsibilities of Key Managerial Personnel.

B.Com

Programme Outcomes

PO1 To build a strong foundation of knowledge in various fields of commerce

PO2 To develop the skill of applying methods & techniques used in commerce

PO3 To develop an attitude for working effectively and efficiently in corporate world

PO4 To blend knowledge, skill and positive attitude that will sustain an innovative and creativity atmosphere within the students

PO5 To develop students for becoming influential entrepreneur's of tomorrow

Course Outcomes of Bachelor of Commerce (B.Com)

Semester I

Paper-1 Financial Accounting-I

CO1 Conceptually define accounting and bookkeeping

CO2 Identify the accounting rules required for business enterprises

CO3 Apply the accounting rules in determining financial results, prepare financial statement compare the specificity of different accounts within the accounting policies

CO4 Can able to prepare trading, profit and loss account and balance sheet with adjustments

Paper-2 Business Organization

CO1 To encourage students who will become entrepreneur's for social responsibility of business towards various sectors.

CO2 To understand the concept of Company, Classification, advantage its role in economy.

CO3 To understand the nature and types of business organization

CO4 To know about the usage of equipments and computers for e- business

Paper-3 Company Law

CO1 To make students aware about the fundamentals of company Law-2013

CO2 Gain knowledge on the various laws pertaining to commercial activities

CO3 To understand the working of share capital and formation of Companies

CO4 To know the entire work culture of management of a company

Paper-4 Business Economics

CO1 To know about the basics of business economics

CO2 To understand the concept of Laws of Demand and Supply

CO3 To apply the Theory of Production

CO4 To know the concept of Theory of Cost and Revenue

Semester II

Paper-1 Statistics and Business Mathematics:

CO1 To make students aware about the different types of series

CO2 To make students aware about tabulation & classification of data

CO3 Students will be made aware about the dispersion and skewness series

CO4 Students will be equipped with calculation of ratios, percentages, simple and compound interest

Paper-2 Business Management:

CO1 To enable the students to know the concept of business management.

CO2 To understand the different techniques of planning and decision making

CO3 To understand the concept and application of Delegation of Authority and Co-ordination & Controlling.

CO4 To make students aware about the Recent trends in management.

Paper-3 Secretarial Practice:

CO1 To understand the provisions of company act and secretarial work relating to companies act

CO2 To Gain knowledge on the role of company secretary in the regular business activities of company.

CO3 To know legal provision on the board of directors, their qualifications and powers

CO4 To understand the concept of e-governance

Paper-4 Business Economics – II:

CO1 To study the types of markets and their features

CO2 To study the Perfect & Imperfect Competition Markets.

CO3 To study the various Theories of Distribution

CO4 To make them aware about fluctuation in Trade Cycles & National Income.

SEMESTER - III

Paper-1 Financial Accounting - II:

CO1 To make them understand concept of consignment accounting

CO2 To understand the concept and application Branch Accounting (Excluding Foreign Branch)

CO3 To know the concept of Joint Stock Companies and their Capital Structure.

CO4 To prepare the Final Accounts of Joint Stock Companies with adjustment.

Paper-2 Business Communication & Management:

CO1 To understand the various modes and forms of communication in business

CO2 To understand and know the modern trend of communication applicable to business with customers.

CO3 To make them aware about the use of Technologies for business communication

CO4 To learn the basic concepts of MS-office for business communication

Paper-3 Business Law:

CO1 To make students aware about different business Laws and their necessities relating to Business.

CO2 To understand the Essentials in law of contract and agreements

CO3 To develop in the student an understanding of the free enterprise system and the legal safeguards of the same.

CO4 To make students aware about Laws relating to Consumers, environment and Information Technology

Paper-4 MONETARY ECONOMICS-I:

CO1 To know the concept, types and evolution of Money

CO2 To understand the concept of Inflation & Deflation

CO3 To study the Money Market Operations & Policies

CO4 To know the concept of Public Finance

SEMESTER - IV

Paper-1 Financial Accounting - III:

CO1 To makes students aware about the financial statements of Banking Companies

CO2 makes students aware about the financial statements of General Insurance Companies

CO3 To understand the concept and methods of valuing goodwill

CO4 To gain the knowledge on the accounting procedures followed during the liquidation of companies.

Paper-2 Skill Development:

CO1 To assist in developing their personality

CO2 To develop soft skills among the learners enabling them to communicate effectively and efficiently

CO3 To help the students in developing their communication skills through effective use of English

CO4 To develop entrepreneurship skills amongst the students for their growth

Paper-3 Income Tax:

CO1 To acquire knowledge of basic principles of Income Tax law-1961

CO2 To acquire knowledge of Computation of Income from Salary

CO3 To acquire knowledge of Computation of Income from property

CO4 To gain the knowledge of Computation of Income from other sources and other deductions

Paper-4 MONETARY ECONOMICS-II:

CO1 To make students aware about basic concept of commercial banking

CO2 To make students aware about concept of e-banking and core banking

CO3 To help students understand banks, customers relationship and services

CO4 To gain the knowledge about role and functions of central bank

Semester V

Financial Accounting

CO1: Understand the concept of Amalgamation and absorption of companies and accounting procedure followed for this

CO2 : Understand the concept of Internal and External reconstruction of companies and its procedure

CO3 : To acquire knowledge of Double Accounting System and its application

CO4 : To get the knowledge, how valuation of share is done?

Cost Accounting

CO1 : To know the difference between Cost accounting and Financial Accounting, and learn how the cost sheet is arrived

CO2 : To understand the need of reconciliation of profit shown by Financial and cost accounting and to learn the methods of reconciliation

CO3: Write up the process costing by understanding the concept of normal and abnormal loss

CO4 : To make students aware about contract costing with elements and nature of contract

Management Process

CO1 : Understand the Concept ,objective and importance and functions of Management and Administration

CO2 : To understand the need of managerial skill required for manager

CO3 : To acquaint with managerial style and significance of professional manager in present scenario

CO4 : To understand importance of motivation in an organization

Indian Economics

CO1 : Understand the objectives of economic Planning and strategy of India's development plans.

CO2 : To get the knowledge of economic growth and economic development of India

CO3 : To acquire the causes of population explosion and its relation with unemployment

CO4 : To understand meaning and role of public revenue and public expenditure in Indian

Business finance

CO1 : To understand meaning and sources of Business Finance

CO2 : To understand the theoretical approach of Project finance and its appraisal

CO3 : Calculate the assignment of working capital requirement

CO4 : Understand the difference between debtors management and creditors management

Computerized Accounting

CO1 : To know the difference between computerized and manual accounting

CO2 : To learn Tally software and its various features

CO3 : To learn the practical approach of Tally

CO4 : To learn Inventory management in Tally and its reporting

Semester VI

Financial Accounting

CO1: To know the concept of Holding Company, Subsidiary Company and acquire the knowledge of Consolidated Balance -sheet.

CO2 : Understand the concept of Insurance claim for loss of stock

CO3 : Understand what is Investment Accounting and to know valuation of securities

CO4 : Elucidate the features and computation of Profit Prior to Incorporation

Management Accounting

CO1 : To compare difference between cost accounting and management accounting

CO2 : To understand concept of Budget and budgetary control

CO3 : To learn the application and inferences of various ratios.

CO4 : Students will able to know difference between Funds flow statement and Balance sheet

Advanced Statistics

CO1 : Learn to calculate coefficient of correlation in given frequency

CO2 : Learn to evaluate regression analysis, for a bivariate frequency table

CO3 : Study uses of Index number with time reversal test

CO4 : Learn to calculate simple problems on trend, short term variation & irregular variation

Indian Economy

CO1 : To Understand the nature, role of agriculture in Indian economy

CO2 : Analyse and understand Indian Industry and industrial policy 1991

CO3 : Understand the contribution of service sector to India's GDP

CO4 : To get overall idea of India's International Trade

Human Resource Management

CO1 : Understand the definition, objectives, function, scope, importance of human resource Management

CO2 : Understand Recruitment, selection and Training process

CO3 : To enable the students to know the labour welfare policy and its impact

CO4 : To understand the concept of Human resource planning and its accounting

Business Finance

CO1: To know significance of Financial market in India

CO2 : To understand the concept of primary market and secondary market in stock exchange

CO3 : To gain knowledge on dividend policy

CO4 : To acquire knowledge of Cash flow statement and its provision in Accounting Standard 3.

KAMLA NEHRU MAHAVIDYALAYA

Department of Economics

COURSE OUTCOMES (UG)

B. A.l (Micro economics)

1. Analyze theTraditional and Modern Definitions of economics.
2. Understand the various methodologies in economics.
3. Analyze and evaluate the performance of firms under different market structures.
4. Elaborate the working of input markets.

B. A. ll (Macro Economics)

1. Analyze and evaluate the forces that affect the aggregate level of economic activity.
2. Analyze the impact of fiscal and monetary policy in the economy.
3. Evaluate the determinants of international trade and financial flows.
4. Develop an in-depth understanding of the new Banking system.
5. Acquire knowledge of Health Economics.

B. A. lll (Indian Economics)

1. Explain the Basic features of Indian Economy.
2. Understand the concept of poverty and inequality
3. Annotate the Types of Tax and the Indian Tax structure.
4. Acquire problem solving skills and develop a logical way of dealing with various economic issues.

Programmers Specific Outcomes (PSO'S)

1. Students shall be able to develop an awareness about career choices.
2. Students will be able to demonstrate quantitative reasoning skills
3. Students will be able to analyze human behavior.
4. Students will get knowledge about the benefits of saving.

Department of Economics

M. A.

COURSE OUTCOMES: (PG)

1. To analyze the Behavior Pattern of the Firms.
2. To grasp knowledge regarding Different Pricing Strategy
3. To be aware about Price determination of firms
4. To have better awareness
6. Help the students to apply knowledge and analytical skills.
7. Students will get an idea of the range of methodology.

Programme Specific Outcomes:

1. Students will be able to improve their economic vocabulary**.**
2. Students will be able to demonstrate quantitative reasoning skills
3. Student develops an awareness of career choices & the option higher studies
4. Students will get information about the genesis of Economics and its modern scenario.
5. Making awareness about selfemployment through various local business

Kamla Nehru Mahavidyalaya
Department of English
Programme, Specific Programme and Course Outcomes
2019-20

Program Outcomes:

With the given programme contents, the students will be able to:

1. Comprehend the theories and practices of language use.
2. Demonstrate advanced critical thinking skills along with literacy.
3. Communicate in a variety of contexts and genres.
4. Equip oneself with a wide range of writing and speaking skills.
5. Inculcate an ability to use, analyze, and learn communication technologies.
6. Develop communication abilities with diverse audiences.

Programme specific Outcomes (PSO's)

1. Availing job opportunities in translation, transformation and media.
2. Developing a critical attitude about literary studies
3. Imbuing literary research attitude.

Course Outcomes:

BA I (English)

1. To understand the interrelationship between literature and society.
2. To explain the nature of language and literature.
3. To obtain the skill of literary criticism.
4. To imbue the skills of essay writing.
5. To be able to illustrate the nature of literary forms like one-act-play, travelogue and short story.

BA II (English)

1. To relate with the Old English Language and literature.
2. To develop an inclination towards contemporary literary works.
3. To acquire the skill of translation
4. To explicate the need and significance of editing.

BA III (English)

1. To get acquainted with oriental poetry.
2. To develop an understanding about the nature and features of poetry.
3. To acquire the skill of critical appreciation of a poem.
4. To device poetic devices and their usages.

English Literature

Programme outcome

• To enhance the reading of poetry, drama and classics in all its contours

• To create awareness of poetry/drama and classics as a part of modern life • To help students learn and practice critical thinking — develop problem solving/ decision making

• To put forward innovative and creative ideas with trained activities

• To help realise cultural differences and accept them as they are

• To understand the importance of Intercultural learning To assist students in the development of intellectual flexibility, creativity, and cultural

Specific Programme Outcome

• Students will be familiar with representative literary texts within a given historical, geographical, and cultural context.

• Students will be able to apply critical and theoretical approaches to the reading and analysis of literary and cultural texts in multiple genres.

• Students will be able to identify, analyse, interpret and describe the critical ideas, values, and themes.

• Students will learn to put forth ideas, values, and themes which inform and impact culture and society, both now and in the past.

• Students should be able to write analytically using language competence

• Students will be familiar the different variety of literatures in all forms available

• Students will be able to imbibe ethical, moral, national and cultural values in an academic context.

MA (English)

Specific Course Outcome

- During the two years Post Graduation Course in English, the students studied various genres of English Literature.
- They will study Indian English Literature as well.
- They will become familiar with miscellaneous approaches such as Post Colonialism, Feminism etc.
- They will study the historical development of literature , miscellaneous movements in poetry, types of drama, etc.
- They will become aware of the Indian, American, African and other world literature in English as well.
- They will learn to explain the text and to express their views in detail on literary topics.
- They will also learn the development of language and language teaching.
- To introduce England from the late Fourteenth to the early Seventeenth Century with its social,)political, religious and economic conditions.
- **To** trace the evolution of English Parliament from Plantagent period to endeavoring of blending the ;pirit of the Renaissance and the Reformation.
- To give an account of the development of poetry and its different forms.

Course Outcomes

Students will be able to understand

- e changes that took place taking English Literature on the path of modernization Different forms of poetry.
- The reasons behind the undercurrents of upheavals and disturbances prevalent in working classes reading to generation of a Progressive Spirit.
- The students will come to know about the beginning of English drama and what role did the initial contributors play to give this well-developed English theatre.
- Students will acquire knowledge about the different Genres of drama during this era.
- The learners will be able to critically examine the form of drama adopted by the predecessors who provided a solid foundation to great Shakespearean dramas and the dramatists who followed in the Jacobean period.

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF HISTORY

Programme Outcome & Specific Programme Outcome

Bachelor of Arts (B.A.) History

2019-20

Programme Outcome

∗ Students are able to understand the genesis of history and development of history writing indifferent country as well as in India.

∗ Sources of ancient India, Civilizations like Indus and Aryan, political and religious changes in 6^{th} century B.C., Mauryan Empire etc are studied.

∗ Students will distinguish between primary and secondary sources and identify and evaluate evidence.

∗ Students will demonstrate in discussion and written work their understanding of different peoples and cultures in past environments and of how those cultures changed over the course of the centuries.

∗ Students will demonstrate in written work and class discussions the ability to recognize and articulate the diversity of human experience, including ethnicity, race, language, gender, as well as political, economic, social, and cultural structures over time and space.

Programme Specific Outcome

∗ Archaeologist: Archaeological Survey of India with private Firms related to archaeology.

∗ Historian: With so much debate over the authenticity of historical books, there is ever increasing demand for historians.

∗ Public Service: For History graduate, the option of public service like UPSC,APSC are always open.

∗ Teacher: After B.A. in history one can always find employment as a history Teacher.

∗ Writer/Subject Expert: Nowadays a lot of publishing houses seek subject matter experts for publication of school textbook or supplementary reading materials.

∗ Travel and tourism expert: With an extensive knowledge of history and historical monuments, history graduates can work as a travel expert for tourist spot of historical importance

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF HISTORY

Programme Outcome & Specific Programme Outcome

Master of Arts (M.A.) History

2019-20

Programme Outcome

∗ Capacity to explain how and why important events happen.

∗ Understanding of the historical method of study.

∗ A clear understanding of evidence collected from historical sources.

∗ Critical understanding of developments in historiography.

∗ Knowledge of the history of the India and 20th Century Modern World.

∗ Understand the skills that historians use in research.

Programme Specific Outcome

∗ Develop interests in the study of history and activities relating to history

∗ The study of history helps to impart moral education

∗ History installs the feeling of patriotism in the hearts of the pupils.

∗ Social Worker: NGO and Social Welfare Organizations also employ History Graduates.

Kamla Nehru Mahavidyalaya, Nagpur

Department of Chemistry

COURSE OUTCOMES HOME ECONOMICS

Course Outcomes Home Economics

B.A. I Semester – I

By completion of this course students will able –
1) To understand the field of Home Economics.
2) To invent an awareness among the students about resources and their management in the family.
3) To make aware about decision making and to enhance the decision making capability of the women
4) To provide knowledge and develop skills regarding principles and methods of interior decorations.
5) To develop skill regarding preparing the Bouquets and Flower Arrangements for decoration and enhance the chances of **self employment**.

B.A. I Semester II

By completion of this course students will able –
1) To acquire basic knowledge of principles involved in planning of residential house.
2) To learn and use various methods and techniques of the work simplification.
3) To develop employability skills and the **'skill of earning while learning'.**
4) To bring awareness about waste management and water conservation for environmental protection.
5) To train the students from self employment of view.

B.A. II Semester – III

By completion of this course students will able –
1) To understand the basic concept of Nutrition.
2) To understand the knowledge of food, food functions and Nutritive value of foods.
3) To develop abilities to plan Diets for Various stages.
4) To develop the Entrepreneurial skills

B.A. II Semester – IV

By completion of this course students will able –
1) To understand the basic concept of related Nutrition.
2) To development abilities to plan diets for various diseases.
3) To understand the methods of food preparation and food preservations.
4) To encourage the students for self employments.
5) To aware the work of different agencies in the area of health.

B.A. III Semester – V

By completion of this course students will able –

1) To understand the concept of Human Development.
2) To know the factors affecting of human Development.

B.A. III Semester – VI

By completion of this course students will able –

1) To understand the role of heredity and environment in development.
2) To state the role of parent and teacher in child development.
3) To understand the problems of child.
4) To develop skill based activity.

Kamla Nehru Mahavidyalaya

Department of Library And Information Science

Program Outcome: MLISc.

2019-20

Course Outcomes:

1. To achieve a professional degree in the field of Library Science.
2. To acquire technical education of library management.
3. To demonstrate digital literacy with reference to ICT tools.
4. To comprehend current and advanced trends in dissemination of educational material.

Kamla Nehru Mahavidyalay

Department Of Library And Information Science

Program Outcome: MLISc.

2019-20

Specific Program Outcomes:

1. Carry out various operations of Library and Information Centres.
2. Acquire knowledge of Intellectual Property Rights.
3. Explore, collate and facilitate access to the electronic resources, such as ejournals, e-books, databases and institutional repositories
4. Demonstrate leadership and other managerial roles in library
5. Create a base for research and doctorate in Library Science.
6. Inculcate reading habits in students.

Kamala Nehru Mahavidhyalaya

Department of Marathi

Program Outcomes:

1. Developing a comprehensive understanding of the theories and practice of language use.
2. Demonstrating advanced critical thinking skill along with literacy.
3. Communicating in a variety of contexts and genres.
4. Equipping the students with a wide range of writing and speaking skills.
5. Students will have the ability to use, analyze, and learn communication technologies.
6. Students will develop communication abilities with diverse audiences.

Course Outcomes:

B.A I (Marathi)

1. To understand the interrelationship between literature and society.
2. The students will be able to explain the nature of language and literature.
3. To obtain the skill of literary criticism.
4. To imbue the skills of essay writing.
5. To illustrate the nature of literary forms like one-act-play, travelogue and short story.

B.A.II (Marathi)

1. To familiarize students with the medieval Marathi language and literature.
2. To develop students' interest in contemporary literary works.
3. To acquire the skill of translation.
4. To understand the need and significance of editing.

B.A.III (Poetry):

1. The students will be able to get acquainted with oriental poetry.
2. To develop an understanding about the nature and features of poetry.
3. To inculcate the skill of critical appreciation of a poem.
4. The students shall develop the poetic devices and their usages.

B.A.III Linguistics:

1. To get acquainted with modern linguistics.
2. To develop an understanding of origin, nature and functions of language.
3. To obtain information about phonetics.
4. To enhance the interest in Marathi language.

Programmes Specific Outcomes (PSO's)

B.A. (MARATHI)

1. Creating an interest in literature.
2. Availing new job opportunities in translation, transformation and media.
3. Developing language.
4. Developing a critical attitude about literary studies.
5. Imbuing literary research attitude.

Program outcome and course outcome of MBA course

MBA PROGRAM OUTCOMES

Pos describe what students are expected to know or be able to do by the time of graduation from the programme. MBA is an accelerated, highly flexible and career focused degree program and provides graduates with competencies that are in demand by the fasted growing professions and industries. Graduates of the Master of Business Administration degree program will be able to :

PO1 Communicate effectively in a variety of formats.

PO2 Utilize qualitative and quantitative methods to investigate and solve critical business problems.

PO3 Integrate tools and concepts from multiple functional areas (i.e. Finance ,marketing ,Human resource ,operation etc.) to solve business problems.

PO4 Evaluate and integrate ethical considerations when making business decisions.

PO5 Incorporate diversity and multicultural perspectives when making business decisions.

PO6 Graduates will develop interpersonal skills such as negotiating and interpersonal ,conflict management and leading others through the problem solving process.

PO7 They will be able to demonstrate knowledge and skills in all disciplines of business management.

Subject	**INDUCTION cum FOUNDATION COURSE** **Course Code 00**
Co1	Given a presentation/ debatable topic, discussion, training, the students will be able to **understand** voice modulation, nuances of diction and articulation which will in turn help them in **developing** effective communication skills.
Co2	Given a workplace setting, the students will not only be **aware** about their inner qualities, inner potential and importance of human qualities but also will be able to **critically assess** the relationship between theory and practice in the formulation of values.
Subject	**MANAGERIAL ECONOMICS - Course code- 1T1**
Co1	Given the details regarding price and quantity, the future manager will be able to **calculate** and **interpret** price elasticity, income elasticity and cross-price elasticity of demand and will also be able **examine** the uses and abuses of demand forecasting techniques
Co2	Given the information about scale of production, the future manager will be able to **analyze** various aspects of empirical production functions and also will be able to **comprehend** the difference sources of economies and diseconomies of scale.
Subject	**MANAGEMENT INFORMATION SYSTEM - Course code - 1T2**
Co1	The student will be able to **describe** different types of management information system from management activity point of view and will also be able to **identify** and **work out** KRAs, BOPs and BPPs for various organisations/systems.
Co2	The student will be able to **identify** the master data, **draw** report format and interface matrix while making a **model** of DSS.
Subject	**BUSINESS RESEARCH - Course code- 1T3**

Co1	In context of research, the student will be able to **define** business research problems and will also able to formulate an abbreviated version of research proposal.
Co2	The student will be able to **describe** and **choose** appropriate sampling design and will also be able to **estimate** appropriate sample size.
Subject	**ORGANIZATIONAL BEHAVIOUR Course code – 1T4**
Co1	Students will be able to **identify** the components of Individual Behaviour and **apply** the concept of Learning, Perception, Attitudes and values.
Co2	Students will be able to **explain** the concept of Organisation Design and **determine** the factors that affect Organisation Design.
Subject	**FINANCIAL REPORTING, STATEMENTS AND ANALYSIS Course code - 1T5**
Co1	Given an accounting situation Students will be able to **evaluate** selected accounting standards and **perform**their application in actual practice
Co2	Given the Trial Balance and accompanying financial adjustments the future manager shall be able to ***prepare*** the financial statements and ***calculate*** the profit or loss of a firm as at the end of the financial year.
Subject	**BUSINESS STATISTICS & ANALYTICS FOR DECISION MAKING Course code - 1T6**
Co1	For a given dataset, the student should be able **estimate** the dispersion / variance & symmetry of the data using various measures and **draw** inferences to facilitate decision making.
Co2	For a given dataset, the student should be able **assess** the level of association between given variables in the data using various types of correlation analysis techniques. The students should also be able to **predict** the values of a variable using regression analysis techniques.

Subject	**Legal and business environment - Course code – 1T7**
Co1	Given the circumstances, the learner will be able to **infer** legal aspects of doing business &**plan** business activities. In a given situation, the learner will be able **make use of** provisions of the Contract Act to **evaluate** a contract used in commercial practice.

Co2	In a given situation, learner will be able to **distinguish** between various types of Companies and **explain** their comparative advantages and disadvantages. The learner will be able to **explain** the legal process involved in formation of a company and **understand** the relationships amongst the various stakeholders of the company.
Subject	**MANAGERIAL SKILLS FOR EFFECTIVENESS - Course code – 1T8**
Co1	The student will be able to **make proper use** of group of words, synonyms and antonyms, phrases, idioms, proverbs for effective verbal communication
Co2	The student will be able to **write** essays and CV using Word Processor
Subject	**FINANCIAL MANAGEMENT Course code - 2T1**
Co1	Given financial cost parameters, the future manager will be able to **calculate** specific cost of capital (i.e. Cost of debt, preference, equity and retained earnings) and the weighted average cost of capital for any specific given firm.
Co2	Given different financing options, the future manager will be able to analyze the effect of operating and financial leverage on EPS and **recommend** a suitable long term financing mix for an organization by **applying** EBIT-EPS analysis, Indifference Level of EBIT and Financial Break-even Analysis for given financing options.
Subject	**MARKETING MANAGEMENT Course code - 2T2**
Co1	For a given marketing objective of a company the student manager will be able **to develop** a suitable marketing mix.
Co2	For a given product the student managers will be able **toapply** the three steps of target marketing: market segmentation, target marketing, and market positioning.
Subject	**HUMAN RESOURCE MANAGEMENT Course code - 2T3**
Co1	Students should be able to **explain** the importance of Human Resource Management for an organisation and also distinguish between Personnel and HR Management.
Co2	For a given job profile, students should be able to **develop** a job analysis and produce a job description and job specification
Subject	**OPERATIONS MANAGEMENT Course code - 2T4**
Co1	At the end of the course the students can **apply** the concept of operations management in manufacturing and service sector and will be able to **plan** and **implement** production and service related decisions.
Co2	At the end of the course the student will be able to **plan** production schedules and plan resources (material and machine) required for production

Subject	INTERNATIONAL BUSINESS - Course code - 2T5
Co1	Students should be able to **understand** various concepts and terminologies involved in International Business and importance of international trade
Co2	Students should be able to **evaluate** various modes of entry in to International business and should be able to **select** the best mode of entry given a situation.
Subject	CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABILITY Course code - 2T6
Co1	Given the concept of CSR, the future manager will be able to **identify** the various activities which can benefit the organization under the banner of CSR.
Co2	Given a chance, the future manager will be able to **frame** and **recommend** the CSR policy according to sustainable development.
Subject	COST ACCOUNTING Course code - 2T7
Co1	Given an information about basic conceptual framework of cost, the student will be able of **identify**/ **classify** different elements/ classification of cost and will be able to **prepare** cost sheet and prepare quotations for various business proposals
Co2	Given an information about cost, volume and profit for specific product for mention time period, a student will able to **compute** Break-even point, Marine of safety, Profit volume ratio, desired profit / desired sales as well as able to **evaluate** the decision making proposals(suitable product mix / dropping a product line / fixation of selling price / make or buy decisions/Key Factor Analysis)
Subject	MANAGEMENT CASE ANALYSIS Course code - 2T8
Co1	Given a situation a student will be able to **construct** SWOT for a concerned orgnaisation or situation as well as he/she will be able to indentify key actors/stakeholders in the given situation
Co2	A student will be able to **evaluate** the dilemma (Problem/ Issues/ Concerns) in the case.
Subject	SUMMER INTERNSHIP PROJECT (SPECIALIZATION BASED) Course code - 3P1
Co1	Student is able to **construct** the company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for his / her organization of internship.
Co2	For his / her organization of internship, the student is able to **assess** its Strengths, Weaknesses, Opportunities and Threats (SWOT). Student is able to **determine** the challenges and future potential for his / her internship organization in particular and the sector in general.
Subject	SALES AND DISTRIBUTION MANAGEMENT Course code - 3T1

Co1	Given a situation, student manager will be able to **identify** appropriate Sales Forecasting method to be adopted by a company.
Co2	Given a situation of newly launched company, student manager will be able to **design** an effective Sales Compensation Plan for Sales Executive.

Subject	**DIGITAL AND SOCIAL MEDIA MARKETING Course code - 3T2**
Co1	On studying this module, the students will be able to **understand** the concept of marketing in digital environment. They will also be able to **relate** traditional
Co2	They understand digital platforms where product can be promoted ,can learn about consumer behaviour
Subject	**INTEGRATED MARKETING COMMUNICATION AND BRAND MANAGEMENT Course code - 3T3**
Co1	At the end of the course the student manager shall be able to **Design** the Integrated marketing communication Process for a company/product
Co2	At the end of the course the student manager shall be able to **develop** a creative message strategy for a product and execute it.
Subject	**INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT - Course code - 3T1**
Co1	The student will be able to **apply** concept oftime value of money in computing the value of fixed income securities. The student will also be able to **understand** the relationship between interest rates, yield and bond prices.
Co2	The student will be able to **compute and compare** the value of a company's equity share with other company's equity by using various methods and tools of equity valuation
Subject	**PROJECT APPRAISAL AND FINANCE Course code – 3T2**
Co1	The student will be able to **assess** capital budgeting decisions under uncertain and risk bearing situation and will also be able to **build** and **interpret** the decision tree approach for decision making
Co2	The student will be able to **choose** between acquisition of long term assets either through lease or financing methods and will also be able to **learn** process of Private Equity and Venture Capital
Subject	**FINANCIAL DERIVATIVES Course code – 3T3**
Co1	The student will be able to **describe** the concepts of derivatives and its trading and settlement procedures
Co2	The student will be able to **calculate** the value of Futures and **apply** it for risk managed trading strategies
Subject	**MANPOWER PLANNING, RECRUITMENT AND SELECTION Course code - 3T1**
Co1	Students should be able to **explain** the factors affecting HRP and HRP process of an organisation.

Co2	Students should be able to **determine** the process of demand and supply forecasting while doing human resource planning.

Subject	**PERFORMANCE MEASUREMENT SYSTEM Course code - 3T2**
Co1	Students should be able to **distinguish** the concept of Performance appraisal & Performance Management and also should be able to establish relationship of performance management with Strategic Planning.
Co2	Students should be able to **determine** the Mechanism of Performance Management, and also explain the various steps in performance planning and performance execution.
Subject	**COMPENSATION AND BENEFITS MANAGEMENT Course code - 3T3**
Co1	Students should be able to **compare** the applicability of various Job Evaluation methods under given situations.
Co2	Students should be able to **determine** the Mechanism of Performance Management, and also explain the various steps in performance planning and performance execution.
Subject	**PROJECT WORK AND VIVA VOCE Course Code - 4P5**
Co1	In a specialization domain of his / her choice, student manager will be able to choose an appropriate topic for study and will be able to clearly formulate& state a research problem
Co2	For a selected research topic, student manager will be able to compile the relevant literature and frame hypotheses for research as applicable

M.Com

Programme Outcomes

PO1 To inculcate the knowledge of business and the techniques of managing the business with special focus on marketing, Insurance and banking theory law and practices.

PO2 To impart the knowledge basic accounting principles and the latest application oriented corporate accounting methods.

PO3 To develop the decision making skill through costing methods and practical application of management accounting principles.

PO4 To enhance the horizon of knowledge in various field of Direct and Indirect Taxes and International Business Policy for entrepreneurial development.

PO5 To create awareness in application oriented research through research for business decisions.

Course Outcomes (M.Com.)

SEMESTER - 1

ADVANCE FINANCIAL ACCOUNTING

CO1 To make Students understand how accounts are prepared by using accounting standards.

CO2 How to prepare various types of records viz. statutory books, statutory reports etc. with the help of accounting software.

CO3 To helps students acquire the knowledge about the new trends in accounting.

CO4 To get the knowledge about the hire purchase accounting, fire insurance claim, valuations of goodwill & valuation of shares etc.

INDIAN FINANCIAL SYSTEM

CO1 To make Students aware about the financial market & capital market

CO2 Students will be familiar with the applicability of banking & Technology.

CO3 To know the overall functioning of insurance sector and regulation by IRDA.

CO4 To acquire knowledge about the primary market secondary market functioning of SEBI.

MANAGERIAL ECONOMICS

CO1 To make aware about Micro-Macro Economics

CO2 To know the Demand analysis and Demand forecasting of different goods

CO3 To know about the price policy of company and administered price policy of government

CO4 To make them aware about different market Structure and fluctuation in business cycle in economy

MARKETING MANAGEMENT

CO1 To make students familiar with the philosophies of marketing environment

CO2 To give thorough knowledge about Marketing Information System and techniques of Marketing Research

CO3 To acquire knowledge about the product & promotion strategies.

CO4 To know vertical marketing systems & New trends like Globalization, Consumerism, Green marketing

SEMESTER - II

RESEARCH METHODOLOGY

CO1 To develop the research attitude in students

CO2 To know significance of research & techniques of research designing

CO3 To understand methods of data Collection primary data & secondary data

CO4 To aware about the procedure for hypothesis testing and report writing

ADVANCE COST ACCOUNTING:

CO1 Preparation of various types of cost statements & Concept of Cost Control, Cost Reduction, Control System and Reporting

CO2 To make them aware about Cost audit and Process accounting

CO3 To give them basic knowledge of Variance analysis and Contract Costing

CO4 Know the advanced costing systems like ABC. & identify costs relevant for decision making and those which are irrelevant.

CO-OPERATION

CO1 To students aware about the co-operative movement in India.

CO2 To study the co-operative credit institutions in india.

CO3 To integrate knowledge, skill & attitude of co-operatives & rural economy.

CO4 To understand the basic concept of globalization & co-operation

HUMAN RESOURCE MANAGEMENT

CO1 To know the meaning, role & significance of HRM

CO2 To make students aware about Recruitment and selection and Interview procedures, promotion and transfer

CO3 To understand the concept & procedures of job evaluation and job design

CO4 To understand and significance of employee welfare & social measures.

Semester III

Advance Management Account

CO1 To make them aware of basic concepts, tools and techniques of management accounting along with ratio analysis

CO2 To prepare, explain and evaluate budgets and capital expenditures proposals.

CO3 To make them understand concepts like Marginal costing and Break even analysis for effective decision making .

CO4 Evaluate management control and performance using relevant numerical and analytical statements like, fund flow & cash flow.

STATISTACAL TECHNEQUE

CO1 To make them understand Statistical decision & Sampling and test of

CO2 Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

CO3 How to apply discrete and continuous probability distributions to various business problems & Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.

CO4 Compute and interpret the results of Regression and Correlation Analysis, for forecasting.

Direct Taxes

CO1 To acquire knowledge of principles of Income Tax law-1961

CO2 To acquire knowledge of Computation of Income from Business and profession

CO3 To acquire knowledge of Computation of Income under the head capital gain

CO4 To gain the knowledge of Computation of tax liability for individual & company, Slab rates of individual, firm and company, Advance Payment of Tax & Assessment Procedure

Service Sector Management

CO1 To make them understand strategies and concepts of Service sector management.

CO2 To make them aware about IT and ITES sectors, Future of IT industry in India & Journey of financial service sector from PSU's to Private companies.

CO3 To make them aware about Quality Management in services sector, Customer Focused Services & Market Access . Market Extension, Market Creation

CO4 To make them understand about distribution pattern of services & its challenges, sales promotion in service industry & customer Satisfaction

IV SEMESTER

International Business Environment

CO1 To know the nature significance & elements of economic environment in current scenario
CO2 To integrated knowledge of international economic coopration 7 agreements among FIT investments Euro/ADR issue, mergers & acquisitions.
CO3 To expose students about theories of International business, Exim policy, Export promotion & Impact substitution.
CO4 To learn about Globalization & International Investments

Indirect Taxes

CO1 To know the basics of Custom Law and Calculation of FOB and CIF Value
CO2 To know the basics of GST, Registration procedures and detail concepts of SGST, CGST & IGST
CO3 To expose students to calculate the GST liabilities, Filling of Return of GST, Cenvat credit rules & practical problems on GST.
CO4 To learn about Central Sales Tax Law and MSVAT laws, Procedures and forms under CST Act, practical problems on Central Sales tax and MSVAT

Company Law

CO1 Provide the knowledge of Companies Act 2013, Formation of AOA & MOA
CO2 To acquire knowledge about IPO & FPO and different Types of Shares
CO3 To acquire knowledge about AGM, EGM and Maintenance of Minutes and annual returns
CO4 To know the Qualifications and Disqualification of Auditors and Directors & Types of Directors.

Kamla Nerhu Mahavidyalaya

Department of Music

Course Outcomes: With the given course contents the students will be able to:

B.A. I (Music)

1. Acquire knowledge of Layas (Tempo).
2. Get the basic and complete knowledge of Swaras (Notes) and their position in octaves.
3. Use the Swaras (Notes) to synthesize different Alankaars.
4. Use the Swaras (Notes) to compose different Khyalas(small songs).
5. Acquire basic practical and theoretical knowledge of Classical Music.
6. Get to know about the instruments used in Classical Music.

B.A. II (Music)

1. Use the various Thaatas to synthesize different Alankaars.
2. Gather knowledge of various Layas (Tempo) like Dugun, Chaugun of Taalas (Rhythm).
3. Discern various Music Maestros and their lives.
4. The students shall learn about various Music instruments and their components.
5. The student will be able to classify the Raagas according to their Swaras (Notes).
6. With the given knowledge the student shall learn Folk Music and Light Lusic to understand & Preserve the same.

B.A. III (Music)

1. To integrate knowledge of different Gharanas and the manner in which the songs are sung in different Gharanas in Classical Music.
2. To develop a competency of composing new songs.
3. To get the knowledge of various Granths and their authors.
4. To develop an efficiency to classify Raagas based on different criterias.
5. To encompass knowledge of various Angas like Kannada Anga, Malhar Anga, Nat Anga etc.

Programme Specific Outcomes:

1. Develop the technical skills of musical performance with harmony.
2. Study the theoretical details of ragas and talas with their practical performance.
3. Study the contribution of the renowned musicians.
4. Learn to write the practical compositions according to the Notation system.
5. Study about the theoretical aspects of the prescribed ragas.

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF POLITICAL SCIENCE

Programme Outcome & Specific Programme Outcome

Bachelor of Arts (B.A.) History

2019-20

Programme Outcome

∗ Write clearly and with purpose on issues of international and domestic politics and public policy.

∗ Use electronic and traditional library resources to research key local, state, national and international policy issues and present results;

∗ Discuss the major theories and concepts of political science and its subfields; and

∗ Demonstrate competency with basic tools underlying modern social science research including competency in statistics and qualitative analysis

∗ Deliver thoughtful and well articulated presentations of research findings.

Programme Specific Outcome

∗ Understand the contribution of the main traditions of western political thinkers to political thought.

∗ Understand the processes and dynamics of Indian government and politics. It also familiarize with the vital contemporary emerging issues of centre-state relation, political parties, emergence of new leadership at different levels, demand for autonomy movement, ethnic conflicts etc.

∗ Understand the basic concept and ideological orientations of political science discipline.

∗ Understand the contribution of the main traditions of Indian Political Thought.

∗ Acquaint with the basics of International Law and the new trends in the realm of International law.

∗ Understand the basic concept and issues concerning human rights and challanges.

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF POLITICAL SCIENCE

Programme Outcome & Specific Programme Outcome

Master of Arts (M.A.) History

2019-20

Programme Outcome

∗ Students will be familarised with the different dimensions and the contemporary relevance of different concepts and theories, which would be applied in studying other papers.

∗ Students will be shaped as citizens who are aware of the ideals and philosophies of the Indian Constitution, Constitutional rights and duties, governmental institutions, centre - state relations and electoral politics in India. Students will also be made conscious of the social, cultural, economic and political environment that affects politics in India, at the national as well as regional level.∗ A clear understanding of evidence collected from historical sources

∗ The expected outcome of the paper is to familiarise students with the workings and functioning of International Organisations, especially the United Nations and enable them to understand the different issues taken up by the UN.

∗ Students will be shaped as citizens who are aware of the ideals and philosophies of the Indian Constitution, Constitutional rights and duties, governmental institutions, centre - state relations and electoral politics in India. Students will also be made conscious of the social, cultural, economic and political environment that affects politics in India, at the national as well as regional level.

Programme Specific Outcome

∗ Acquaint with the diverse political systems especially the developed countries including China and Switzerland.

∗ Sensitise with the sensitive peripheral state of India with special reference to Northeast India.

∗ Familiarise with the problems and prospects of rural development of India.

∗ Understand the cultural, social, political, economic and constitutional environment as a historical perspective of Indian Administration.

∗ An understanding the evolution, development and trends of India’s foreign policy

Kamla Nehru Mahavidyalaya, Nagpur
Department of Sociology
2019-20

PROGRAM OUTCOMES

Program Outcome of Bachelor of Arts (B.A.)

Student seeking admission for B.A. programme are expected to imbue with following quality which helps them in their future life to achieve the expected goals.

1. Realization and adaptation of human values and develop a sense of social service.
2. Imbibe qualities and responsibilities of a dutiful citizen.
3. Understand the discipline of sociology and the sociological perspective, and the contribution to our understanding of social reality.
4. Annotate how sociology differs from and is similar to other social sciences.
5. Apply the sociological imagination and sociological concepts and principles in one's own life. and participate actively in civic affairs.
6. Understand the role of theory in sociology, define theory, describe and illustrate its role in building sociological knowledge.
7. Analyse and demonstrate how theories reflect the historical and social contexts of the times and cultures in which they were developed.

B.A. SOCIOLOGY

Program Specific Outcomes:

1. Acquaintance with social transactions, social relations, social formations, social control, social values and culture.
2. Knowing the significance of social institutions, caste system, religion, nationalism, integrity, equality and justice.
3. Acquiring knowledge of the works of social reformers all over the nation.
4. Ability to follow a new stream of thoughts and theories of social thinkers.
5. Getting the deep knowledge about various social groups like tribal communities, women bulk etc.
6. Inculcate the skill to deal with research in sociology.

Course outcomes B.A. part-I, Semester I&II

Paper -I: - **Introduction to sociology & Paper No-II:-Principles of Sociology**

1. Comprehend the basic concept of Sociology, subject matter & importance of Sociology and origin and development of sociology.

2. Acquiring knowledge of human Society and Sociology.

B.A. Part-II, **Semester III & IV**

Paper-III: Foundation of Sociological Thought

1. Acquaintance with the sociological thought of the Pioneers of Sociology.

2. Creating and awareness of the perennial of structure versus agency.

Paper- IV Indian Sociological Tradition

1. Attributing the diversification in Indian society through the different ideologies given by various Indian Sociologists.

2. Sensitization of contemporary Indian issues.

B. A. part - III.

Sem. V: **Indian society : the Structural Issues**

1. Getting acquainted with the structure and changing nature of Indian society
2. Understanding various segments and unity of the Indian society
3. Discussing a brief outline of the making of the Indian Society

Paper No-VI: - Current Social Problems in India

1. Analysing major Social Problems and challenges before the problem of the Indian society.

2. Developing an awareness of Contemporary Social Problems in India

M.A. Sociology,

Program Outcome

On successful completion of this program, students would be able to:

1. Develop scientific outlook and attitude to understand human behavior, social issues and phenomena.
2. Acquire sociological knowledge in the form of theories and methods to be a good social scientist.
3. Develop a critical and social thinking through acquired sociological knowledge
4. Inculcate skills required for qualifying UPSC, MPSC/ UGCNET/JRF/ and other examinations of Social Welfare Departments.
5. Tap employment opportunities in the Teaching, Research, NGOs and Private sectors.

Course Outcomes:

1. Inculcate abilities required to get placed in fields of teachings, research, NGOs, corporate sectors and Governmental sectors.
2. Acquire knowledge required to qualify the NET/JRF/SET and Competitive Exams such as MPSC/UPSC/Social Welfare Departments and others.
3. Develop a deep insight about human behavior, prevailing social issues and related phenomena.
4. Display skills, knowledge and attributes expected by policy makers, developmental organizations.
5. Demonstrate abilities of being a good researcher, social activist and social scientist.
6. Differentiate between common sense knowledge and sociological knowledge through scientific vocabulary, terms, concepts, methods and perspectives in accessing the social issues, events and problems.
7. to be able to use the sociological knowledge in the social engineering and social reconstruction of the social structure.
8. Develop employability skills encompassing rational, critical and logical thinking.

Kamla Nehru Mahavidyalaya

Department of Biochemistry

Program Outcomes (Pos) and Program Specific Outcomes (PSOs)

B.Sc.- Biochemistry

Program Outcomes (POs)

After completion of Biochemistry program students will able

PO1. To get exposed to strong theoretical and practical background in fundamental concepts.

PO2. To get insights of multiple important technical areas of Biochemistry.

PO3. To apply contextual knowledge and modern tools of biochemical research for solving problems.

PO4. To make them able to express ideas persuasively in written and oral form to develop their leadership qualities.

PO5. To demonstrate professional and ethical attitude with enormous responsibility to serve the society.

Program Specific Outcomes (PSOs)

PSO1.Comprehending fundamental concepts in modern biology to meet the emerging trends

PSO2.Handling microbial and biochemical systems

PSO3.Acquire hands on real time experience in industries

Course Outcomes (COs)

B. Sc. Part I – Semester I - PAPER I (BIOMOLECULES & HUMAN PHYSIOLOGY)

CO1 **Describe the structure and chemistry of carbohydrates and its classification.**

CO2 **Understand different biological importance of carbohydrates**

CO3 **Understand the structure and chemistry of lipids**

CO4 **Analyze different properties of fats using various chemical reactions.**

CO5 **Understand the basic physiology and sliding mechanism of muscles.**

CO6 **Understand the process of digestion and absorption of carbohydrates, Fats and Proteins.**

CO7 **Describe basic structure of Plasma Membrane and discuss different modes of cellular transport.**

B. Sc. Part I – Semester I - PAPER II (MICROBIOLOGY & VIROLOGY)

CO1 **Understand basic history and development of Microbiology**

CO2 **Explain the concept of Microscopy and discuss different types of Microscopes with their applications.**

CO3 **Comprehend principle of staining and discuss different types of staining.**

CO4 **Discuss general characteristics of Viruses and its life cycle.**

CO5 **Describe detailed classification of Microorganisms.**

CO6 **Understand the morphology and different characteristic features on bacteria.**

CO7 **Understand different parameters used to study growth of bacterial population.**

B. Sc. Part I – Semester II - PAPER I (HUMAN PHYSIOLOGY

CO1 **Understand the process and regulation of Excretion.**

CO2 **Explain brief account of process of reproduction and reproductive organs.**

CO3 **Explicate composition of blood, function of blood cells and mechanism of transport of O2 and CO2 by blood.**

CO4 **Describe detailed account of structure of Neuron and process of impulse generation.**

CO5 **understand the mechanism of synaptic transmission.**

CO6 **Describe endocrine glands and the hormones secreted by them.**

CO7 **Discuss the concept of secondary messengers.**

B. Sc. Part I – Semester II - PAPER II (MICROBIOLOGY & IMMUNOLOGY)

CO1 **Understand the basic concept of nutrition and classification on bacteria on the basis of nutritional requirement.**

CO2 **Discuss the process of pure culture.**

CO3 **Classify the factors influencing antimicrobial activity.**

CO4 **Explain immune system with respect to active and passive immunity.**

CO5 **Discuss the concept of immunoglobulin structure and their functions.**

CO6 **Illustrate different types of complement system and brief account of cell mediated immunity.**

B. Sc. Part II – Semester III - PAPER I (MACROMOLECULES)

CO1 **Understand structure and properties of proteins. Apply the different reactions for determination and identification of proteins.**

CO2 **Understand different structures and functions of proteins**

CO3 **Analyze the structure, function and forces stabilizing Nucleic Acids.**

CO4 **Understand various method used for sequencing Nucleic acids.**

CO5 **Recognize different structures of RNA.**

B. Sc. Part II – Semester III - PAPER II (BIOPHYSICAL TECHNIQUES I)

CO1 **Describe the concept of electromagnetic radiation and applications of UV- Visible spectrophotometry.**

CO2 Explain absorption and emission flame photometry

CO3 Discuss the mechanism of pH and Buffer action and its physiological importance

CO4 Understand the concept of Partition chromatography and its various types and applications.

CO5 Describe the concept of gel filtration chromatography and its applications

CO6 discuss concept of ion exchange and affinity chromatography.

B. Sc. Part II – Semester IV - PAPER - I (ENZYMOLOGY)

CO1 Discuss the basic enzyme substrate reaction and classification of enzymes.

CO2 Compare different types of enzymes and reactions catalyzed by them

CO3 Understand mechanism of enzyme action and role of various factors affecting on enzyme substrate reaction

CO4 Explain Enzyme kinetics and writing of derivation of single and double reciprocal plots.

CO5 Understand the enzymes as biocatalyst and its regulation. Apply the different methods for enzyme isolation and purification and its industrial applications.

B. Sc. Part II – Semester IV - PAPER – II (BIOPHYSICAL & BIOCHEMICAL TECHNIQUES)

CO1 Understand the concept of Electrophoresis and its different types.
CO2 Explain SDS electrophoresis and understanding concept of isoelectric focusing.
CO3 Describe the process of immune electrophoresis and ELISA
CO4 Understand Radioactive and Stable Isotopes, instrument used for measuring radioactivity and applications.
CO5 Understand basic principle of centrifuge, classify types of centrifuge and its application especially in isolation of cellular components.

B. Sc. Part III –Semester V - PAPER – I (METABOLISM I)

CO1 Explain the concept of Energy, High energy phosphate bond and its relation to metabolic regulations.
CO2 Understand different techniques used to study metabolic activity.
CO3 Discuss different metabolic process involved in carbohydrate metabolism
CO4 Elucidate the process of conversion of fats in to carbohydrates and gluconeogenesis.
CO5 Describe Electron Transport chain and process of ATP synthesis.

B. Sc. Part III –Semester V - PAPER – II (MOLECULAR BIOLOGY)

CO1 Understand basic process of DNA replication with different models.
CO2 Explain various polymerases and steps involved in DNA replication
CO3 Describe regulation of Replication and concept of C and D values.
CO4 Discuss various DNA Damage repair mechanism.
CO5 Illustrate basic structure of RNA and process of Prokaryotic transcription.
CO6 Explain regulation of prokaryotic gene expression (Operon concept)

B. Sc. Part III –Semester VI - PAPER – I (METABOLISM II)

CO1 Discuss process of hydrolysis of Lipids and transport of fatty acids into mitochondria (beta oxidation).
CO2 Understand the process of biosynthesis of fatty acids.

CO3 Knowledge about different chemical reactions happened during protein metabolism.
CO4 Understand process of biosynthesis of purine and pyrimidine nucleotides and its regulation
CO5 Illustrate catabolism of Purines and Pyrimidin.

B. Sc. Part III –Semester VI - PAPER – II (MOLECULAR BIOLOGY & rDNA TECHNOLOGY)

CO1 Knowledge about genetic codes and synthesis of amino acyl synthatase

CO2 Understand the process of translation by knowing role of different elongation factors.
CO3 Explain nature and function of different restriction endonucleases and ligation molecules.
CO4 explain the concept of Vectors and their applications
CO5 Describe different methods involved in transformation and transfection.
CO6 Knowledge about genomic and cDNA library, Polymerase Chain Reaction, and application of recombinant DNA technology.

Kamla Nehru Mahavidyalaya

Department of Biochemistry

Program Outcomes (Pos) and Program Specific Outcomes (PSOs)

M.Sc.- Biochemistry

Program Outcomes for M.Sc. Biochemistry Program

The M.Sc. Biochemistry program offered by RTM Nagpur University is a Two Years full time program. In order to make students more career oriented and nurturing their scientific temperaments students will get exposure to the depth of core understanding of various dimensions of Biochemistry during these two years the study. The training provided will give students the breadth and depth of scientific knowledge.

Program Outcomes for the students graduating from Biochemistry Program will have

PO1. A strong understanding of fundamentals of biochemical process at an advanced level.

PO2. Better understanding of major thrust areas of the discipline

PO3. Knowhow on current developments in the biochemical research

PO4. Capacity to identify, analyze and design safe experimental process to provide efficient solutions by fair interpretation of data

PO5. Perfect gain insight into biochemical research ethics for production of quality research and publication.

PO6. An ability to get engages them in lifelong learning to foster their growth as a successful researcher and established as an entrepreneur in the field of biochemistry.

Program Specific Outcomes (PSOs)

PSO-I: Application of knowledge and techniques of Biochemistry

PSO-II: Scale up of biochemical process after designing, optimization and analysis for developing products required for society.

PSO-III: Compilation and interpretation of Biological data using computer software.

Kamla Nehru Mahavidyalaya

Department of Biotechnology

Session 2019-20

Bachelor of Biotechnology

Programme Outcomes (U.G.)

General Outcomes (U.G.)

- Students get acquainted to strong technical and practical background in fundamental concepts related to biotechnology phenomenon and their importance in diverse field
- They got insights into multiple important technical areas of Biotechnology
- Generate know how of tools and technique related to biotechnology and their application in different sector along with better understanding of their limitation.
- Graduate students develop the capability of research mindset in order to generate the scientific qualities to be applied in Research field in India and abroad.
- Student can apply for all Government competitive exams including MPSC, UPSC, Research Industry, Technical post, where graduation is necessary.
- Students can apply for higher education in the fields of M.Sc., M.S., M.B.A etc.

Specific Programme Outcomes

- The course gives fundamental concepts in modern biology and technology to meet the emerging trends.
- It provides technical know how about handling microbial and biotechnological system
- Acquire hands on working experience of industries whose concept can be further used to start-up its own industry
- Further education in Master of Biotechnology Degree and Doctoral Research gives an option for becoming Research scientist or for applying in educational field as professor.

Bachelor of Biotechnology

Course Outcomes (U.G.)

B.Sc. Sem I Paper I (MICROBIOLOGY)

- The students acquainted details about Microbial structure, growth cycle and their nutrition requirement and they can apply this knowledge in research related to Microbiology

B.Sc. Sem I Paper II (MACROMOLECULES)

- Students get to known about the significant macromolecules which are inseparable part of biochemical reaction and can utilized this information for detection of macromolecules

B.Sc. Sem II Paper I (MICROBIOLOGY & CELL BIOLOGY)

- Also, study related to Microbial growth & Cell biology can further be utilized in to understand Microbial growth pattern, cell engineering and research

B.Sc. Sem II Paper II (CELL CONSTITUENTS & ENZYMOLOGY)

- The students get benefited about cell constituents and enzymes involved in biochemical reaction. This will help in future to apply in Biotech Industry, food industry, etc.

B.Sc. Sem III Paper I (METABOLISM)

- Detail study of Metabolism can further be utilized in R & D of Medical research, Industry, etc.

B.Sc. Sem III Paper II (BIOPHYSICAL TECHNIQUE I)

- The study of advance Biophysical technique like Spectrophotometer, Chromatography can further be applied in day-to-day analysis, separation by quantitative/qualitative method of different macromolecules like DNA, Protein etc.

B.Sc. Sem IV Paper I (IMMUNOLOGY)

- The Immunology studies can be further used in Medical R & D, Biotech industries, Vaccine preparation, research laboratory, etc.

B.Sc. Sem IV Paper II (BIOSTATISTIC & BIOPHYSICAL TECHNIQUE)

- In future, Biostatistics learning have application in validation of diverse biological data
- Biophysical technique like Electrophoresis, radioactive compound, centrifugation have wide application in Genetic research and chemical laboratory

B.Sc. Sem V Paper I (MOLECULAR BIOLOGY)

- Molecular biology learning of DNA replication, Mutation, Transcription are further application in details research related to genetics and Biotechnology industry

B.Sc. Sem V Paper II (MOLECULAR BIOLOGY & rDNA TECHNOLOGY)

- & rDNA technology information can be further used in broad spectrum in Genetic Engineering and Biotechnology product formation, can become entrepreneur for biotechnology industry setup

B.Sc. Sem VI Paper I (APPLICATION OF BIOTECHNOLOGY)

- The Students get to know about different sector having application of Biotechnology study
- They will get idea to apply their skill as entrepreneur, research labs, industry, etc

B.Sc. Sem VI Paper I (PLANT & ANIMAL BIOTECHNOLOGY)

- The studies benefited to be applied for advancement in the sector of plant and animal biotechnology. This knowledge can applied in Biotechnology research and industry.

Master of Biotechnology

Programme Outcomes (P.G.)

Course Outcomes

- It can provide strong insight of application of basic science at Industrial and technology generation
- After the successful completion of the Master of BioTechnology (BT) study programme one can pursue their career opportunities in field of R & D industry, Research, teaching, etc.
- Imbibe better understanding of major thrust area of the discipline.
- Students develop research aptitude by identification, analysis and experimental design with result interpretation with strong technical writing skills for advancement in research front related to human welfare

Specific Programme Outcomes

- The course will inculcate the attitude about application of knowledge and techniques of Biotechnology
- One can start R & D Labs, Quality control Labs for testing and development of biotechnology process generated product.
- Acquire know how of biotechnological process for Industrial and research application and thus can develop products having societal benefit
- Develop ability of compilation and interpretation of biological data using computer software related to Bioinformatics

Kamla Nehru Mahavidyalaya

Department of Botany

Session 2019-2020

Bachelor of Science

Course Outcomes (UG)

B.Sc. Semester I

Paper I

Virus

- Learned about the general characteristics features of virus.
- Students able to understand about the structure and nature of virus.
- Students came to know about structure of TMV, Structure and multiplication of T_4 – Bacteriophage.
- Students came to know about economic importance of virus.

Bacteria

- Students learned about the cell structure of bacteria.
- Students got idea about the type of reproduction in bacteria.
- Students came to know about economic importance in bacteria.

Cyanobacteria

- Students learned about the ultra cell structure and reproduction in cyanobacteria group.
- Students came to know about characteristics features of cyanobacteria.
- Students came to know about economic importance of cyanobacteria.
- They studied about the *Nostoc*, member of cyanobacteria.

Algae

- Students learned about the general characteristics feature of Algae.
- Students learned Classification of algae given by Fritsch 1954.
- Students learned about the life history of *Oedogonium* and *Chara*.
- Students learned about the life history *Vaucheria* and *Ectocarpus*.
- Students came to know about economic importance of Algae.

Paper II

Fungi

- Students learned about general characteristics of Fungi.
- Students learned about classification of fungi given by Alexopoulos 1996
- Students came to know about economic importance of fungi.
- Students learned about the life history *Albugo* and *Mucor*.

- Students learned about the life history of *Puccinia* and *Cercospora*.

Lichens

- Students learned about the different types of lichens.
- Students came to know about reproduction in lichens.
- Student came to know about economic importance of lichens.

Plant Pathology

- Students learned about different types of diseases occurring in plants.
- Students learned about the host and pathogen interaction.
- Students came to know about how to identify the symptoms of a disease on host.
- Students learned about disease like leaf curl of papaya, citrus canker and red rot of sugarcane.

Bryophyta

- Students learned about the classification of Bryophyta given by Proskauer 1957.
- Students learned about general characters of Hepaticopsida, Anthocerotopsida and Bryopsida.
- Students came to know about economic importance of Bryophyta.
- Students learned about alteration of generation of Bryophyta.
- Students learned about life history of *Riccia Anthoceros* and *Funaria*.

B.Sc. Semester II

Paper I

Pteridophyta

- Students learned classification of Pteridophytes given by Smith 1952.
- Students learned about general characters of Psilopsida, Lycopsida, Sphenopsida and Pteropsida.
- Students came to know about economic importance of Pteridophytes.
- Students learned about alteration of generation in pteridophytes.
- Students learned about life history of *Rhynia* and *Selaginella*.
- Students learned about life history of *Equisetum.*
- Students learned about the concept of Apospory, Apogamy, Heterospory and seed habit in Pteridophytes.
- Students got idea about stellar system in pteridophytes.

Gymnosperms

- Students learned about classification of Gymnosperm given by Stewart 1982.
- Students learned about general characters of Gymnosperms.
- Students came to know about economic importance of Gymnosperms.
- Students learned about alteration of generation in Gymnosperms.
- Students learned about the life cycle of *Cycas.*

Paper II

Palaeobotany

- Learned about Geological time scale.
- Learned about fossilization replacement theory and infilteration theory.
- Learned about types of fossil Impression, Compression and Petrifaction.
- Gain the knowledge about fossil plants *Glossopteris* (Leaf, Scutum).

Root morphology

- Learned about different types of roots.
- Learned about root modifications for storage.
- Learned about respiration and reproduction.

Stem morphology

- Learned about different aspects of stem like shape, texture, nature, branching patterns of stem.
- Learned about modifications in stem

Leaf Morphology

- Learned about different types of leaves.
- Learned about different aspects of leaf like Phyllotaxy and venation.
- Learned about modifications of leaf.

Inflorescence

- Learned about different types of inflorescence in plants.

Flower

- Learned about the flower structure and different whorls in the flower.
- Learned about different aspects of flower parts calyx, corolla , Androecium and Gynoecium

Fruit

- Gain the Knowledge about different types of fruit.
- Learned about simple, aggregate and composite type of fruits.

B.Sc. Semester III

Paper I

Angiosperms

- Learned about origin of angiosperms, Phylogeny of angiosperm.
- Learned about Homology, Monophyly, Polyphyly and clads.
- Learned about fossil angiosperms Sahanianthus flower.

- Learned about angiosperm taxonomy and came to know about the concepts of Floras, Herbarium, Keys, Holotype, Lectotype, Neotype.
- Learned about system of classification of angiosperm given by Bentham & Hooker, Engler & Prantl along with merits and demerits
- Learned about modern trends in taxonomy including cytotaxonomy, Phytochemistry and taximetrics to taxonomy.

Families

- Learned about different dicot aand monocot families in plants.

Paper II

Structure of plant cell

- Learned about the detailed structure of plant cell
- Gained the knowledge about utrastructure and function of cell wall, cell membrane, Nucleus and endoplasmic reticulum.
- Gained the knowledge about ultrastructure and functions of Golgi complex, Vacuoles, Ribosomes , Mitochondria and Chloroplast.

Chromosome

- Learned about morphology of chromosome.
- Learned about molecular organization of chromosome.
- Gained knowledge about sex chromosomes in plants.
- Gained knowledge about cell division in plants, Mitosis and meiosis and their significance.

Plant Breeding

- Came to know about plant breeding and objectives in plant breeding.
- Learned about methods in plant breeding
- Learned about the concept of hybridization and heterosis.

Biostatistics

- Learned about concepts and to calculate the mean, mode, median standard deviation, standard error and Student's t test.

Evolution

- Learned about the origin of life and miller's theory.

B.Sc. Semester IV

Paper I

Meristems

- Gained Knowledge about meristems and their types based on origin and position.

- Learned about permanent tissue and their functions.
- Learned about type of simple tissue and complex tissue.
- Learned about Apical meristem in root and shoot.

Primary growth

- Learned about primary structure of root in dicot and monocot plants.
- Learned about primary structure of stem in dicot and monocot plants.
- Learned about types of vascular bundles in dicots and monocots.
- Came to know about cambium.

Secondary growth

- Came to know about the periderm, growth ring, sap wood and heart wood.
- Learned about secondary growth in dicot and compared the anomalous secondary growth between *Bignonia* and *Dracena* stem.
- Learned about anatomy of dicot and monocot leaf.
- Came to know about the concepts of Plant senescence and abscission of leaves.

Embryology of angiosperms

- Came to know about pollination types and adaptation of plants for particular pollination, also learned its significance.
- Learned about the structure of anther, process of microsporogenesis and male gametophyte.
- Learned about different types of ovules in angiosperms , also came to know about the development of female gametophyte and megasporogenesis.
- Gained knowledge about fertilization in plants, about double fertilization and triple fusion in angiosperms.
- Gained knowledge about the endosperm and its types .
- Learned about the structure of dicot and monocot embryo.

Paper II

Mendelism

- Learned about laws of inheritance given by Mendel.
- Gained knowledge about interaction of genes and their patterns.

Linkage

- Came to know about concepts of linkage and its theories and types of linkage.
- Got about significance of linkage.
- Learned about crossing over, its theories and significance.

Chromosomal aberrations

- Learned about variation in chromosome number and their significance.
- Learned about structural changes in chromosomes and their significance.

Structure of DNA

- Learned about the Watson and Crick model of DNA.
- Gained knowledge about the semi-conservative method of DNA replication in eukaryotes.
- Came to know about the concept of gene like Benzor's concept and got idea about cistron, mutons, recons and jumping gene.

Mutation

- Learned about the concept of mutation.
- Got idea about the types of mutations and can differentiate between the induced and spontaneous mutation.
- Got idea about different types of mutagens chemical and physical and their difference and mode of action.
- Came to know about the applications of induced mutations in crop improvement.
- Got an idea about DNA damage and repair.

Type of DNA

- Learned about satellite and repetitive DNA.
- Got an idea about genetic code and its characteristics.

Structure of t-RNA

Learned about the detailed structure of clover leaf model of t-RNA.

Gene expression

- Learned about process in transcription and translation in prokaryotes.
- Learned about regulation of gene expression by Lac operon model.

B.Sc. Semester V

<u>Paper I</u>

Carbohydrates

- Learned about the properties and role of carbohydrate.
- Learned about classification of carbohydrate.
- Came to know about the structure of starch and glucose.

Lipids

- Learned about properties and role of lipids.
- Came to know about fatty acids, oils and waxes.
- Learned about beta oxidation.

Amino acids

- Learned about the chemistry of amino acids present in proteins
- Came to know about the classification of proteins

Enzymology

- Learned about characteristics and properties of enzymes.
- Came to know about the nomenclature of enzymes.
- Got an idea about the factors affecting enzyme activity.
- Learned about the terms holoenzyme, apoenzyme, coenzyme and co-factors.
- Learned about the regulation of enzyme activity and mechanism of action.

Plant water relations

- Got an idea about properties of water.
- Learned the concept of diffusion, diffusion pressure deficit and its significance.
- Learned about the concept of osmosis, Its types, potential and significance.
- Came to know concept of imbibition and significance.

Water conduction through xylem

- Learned about root pressure theory and cohesion –adhesion theory
- Came to know about the concepts of transpiration and stomatal opening mechanismwith reference to k+ malate hypothesis.

Phloem transport

- Learned about the mechanism in phloem transport and munch hypothesis.

Mineral Nutrition

- Learned about the macro and micro nutrients requirement of plants.
- Came to know about the deficiency symptoms of mineral nutrition in plants.

Solute transport

- Learned about the solute transport in plants and its types.

Lipid metabolism

- Learned the process of respiration where students came to know about structure and types of ATP.
- Got an idea of aerobic and anaerobic type of respiration.
- Learned about respiratory substrate and respiratory quotient.
- Learned the biochemical pathways of glycolysis, kreb's cycle and oxidative phophorylation.
- Came to know about chemiosmotic potential theory.
- Learned about fermentation process.
- Learned phototranspiration and glyoxylate cycle.

Photosynthesis

- Learned about the concept of photosynthesis and its role.
- Got an idea about the photosynthetic pigments and their important role in photosynthesis.
- Got the concept of action spectra, emerson's enhancement effect, red drop mechanism and
- photolysis of water.

- Learned about cyclic and non cyclic respiration.
- Learned about light dependent reactions C_3, C_4 and CAM pathways and their significance.
- Learned factors affecting photosynthesis.

Nitrogen metabolism

- Learned about mechanism of biological nitrogen fixation and importance of enzyme nitrate reductase.

Paper II

Ecology

- Learned about definition, introduction, branches and significance of ecology.
- Learned about different climatic factors and their effect on vegetation.
- Learned edaphic factors like properties of soil and soil profile.
- Learned physiographic factors like biotic factor and their interactions

Biogeochemical cycles

- Learned about Nitrogen and Phosphorous cycle

Ecosystem

- Learned about the biotic and abiotic components of ecosystem.
- Learned the concepts of food chain, food web and ecological pyramids.
- Came to know about autecology
- Learned the concepts of ecad, ecotype and their characteristics and importance.
- Learned about synecology including study of community and their analytical and synthetic characters.

Phytogeography

- Learned about the principles of phytogeography
- Learned about distribution of species and types of distribution.
- Came to know about climatic regions of India and phytogeographic regions of India.

B.Sc. Semester VI

Paper I

Growth

- Learned about the concepts and growth curve and phases of growth.

Phytochromes

- Came to know about role and significance of both type of phytochromes Pr and Pfr.

- Learned circadian rhythms and biological clock.

Plant growth regulators

- Learned about different types of plant growth regulators and their roles in growth and development of plants.

Plant movements

- Learned tropic and nastic movements in plants.

Photoperiodism

- Learned about the effects of light on flowering.
- Came to know about the concept of photoperiodism and vernalization
- Learned about the flowering inducing hormone florigen.

Seed dormancy

- Learned about the concept of seed dormancy, factors causing seed dormancy and methods to break dormancy.

Plant defence

- Learned about different mechanism of plant defence in plants.
- Came to know about the secondary metabolites and their roles.

Plant tissue culture

- Learned about different concepts in plant tissue culture.
- Learned about the methods of sterilization and preparation of culture media.
- Learned about the applications of tissue culture.
- Learned callus and organ culture and its application
- Cybrid production and its application.

Genetic engineering

- Learned about the tools that is enzymes required in genetic engineering.
- Learned about plasmid and its application as vector. Structure of Ti plasmid.
- Learned about the DNA library
- Learned about the gene transfer by *A. tumifaciens*
- Came to know about advantages and disadvantages of transgenic plants.

<u>Paper II</u>

Plant succession

- Learned about the concept of succession and its types.
- Got a knowledge about the causes of succession.

Plant adaptations

- Learned about different adaptations in plants morphological and anatomical .
- Learned physiological responses of hydrophytes, xerophytes and halophytes.

Environmental pollution

- Learned about different types of pollution agricultural, noise and thermal pollution.
- Got the knowledge about how to control the environmental pollution.
- Learned about environmental management.
- Learned and acquired knowledge of natural resources, their types, factors responsible for depletion of resources and conservation methods of forest and water resources.

Microscopy

- Learned and acquired the knowledge of different types of microscopy and their principle.

Electrophoresis

- Learned and acquired knowledge of electrophoresis method by SDS – PAGE and Agarose.

Spectroscopy

- Learned about the technique and its application

Chromatography

- Learned and acquired the knowledge of different types of chromatography technique.

Utilization of plants

- Learned about the morphology, utilization and important chemical constituents of food like wheat, oil like ground nut, fibre like cotton, spices like clove, beverages like coffee, medicinal plant like neem and rubber.

Ethnobotany

- Got introduced with ethnobotany, its branches and importance.

Kamla Nehru Mahavidyalaya

Department of Botany

Course outcomes of MSc Botany

Session 2019-2020

Botany 1T1- Core : Microbiology, Algae and Fungi

Outcomes: After completion of the course, the student will be able to

1. Identify the structure, life cycles, economic importances etc of bacteria, virus, arhaebacteria, algae, fungi and apply this knowledge
2. Based on symptoms, identify plant diseases and apply knowledge for control of diseases
3. Perform various microbial culture techniques and apply for development of various cultures.

1T2- Core: Bryophytes & Pteridophytes

Outcomes: After completion of the course, the student will be able to

1. Learn various types of bryophytes, Pteridophytes characters for identification in lab and nature.
2. Understand various types of fossils in bryophytes and Pteridophytes
3. Understand evolutionary trends in bryophytes and pteridophytes

1T3- Core: Paleobotany and Gymnosperms

Outcomes: After completion of the course, the student will be able to

1. Identification, nomenclature, reconstruction of fossils and their significance in time scale
2. Identification of various gymnosperms, evolution of gymnosperms and their relationships.

1T4- Core: Cytology and Genetics

Outcomes: After completion of the course, the student will be able to

1. Know various types of inheritances in biological organisms and analyse inheritance patterns
2. Understanding population genetics and equilibrium affecting various factors
3. Understand the molecular mechanism of mutations and its role in crops improvement

2T1- Core: Plant Physiology and Biochemistry

Outcomes: After completion of the course, the student will be able to

1. Understand the aspects of plant respiration and photosynthesis.
2. Understand the aspects of metabolism of different components
3. Perform and check the enzymatic activities of different components.

2T2- Core: Plant Development and Reproduction

Outcomes: After completion of the course, the student will be able to

1. Know the basic growth kinetics and role of phytohormones in plant development
2. Know the molecular mechanism of growth and differentiation of root, leaf flowers and seeds
3. Learn to use biomolecules for flower formation, seed setting, senescence effects.

2T3 - Core: Cell and Molecular Biology-I

Outcomes: After completion of the course, the student will be able to

1. Know the cell wall & cellular organization of the eukaryotic and prokaryotic cells
2. Learn the cell cytoskeleton and its role
3. Learn and apply techniques of stress related problems in plants

2T4 –Core :Angiosperms-I and Ethnobotany

Outcomes: After completion of the course, the student will be able to

1. Learn basic structure of flowers for identification and distinguish them
2. Apply taxonomic tools in taxonomic classification, modern and numerical taxonomy and phylogeny

3T1 - Core : Plant Ecology and Conservation Biology

Outcomes: After completion of the course, the student will be able to

1. Learn structure and function of ecosystems and their succession and climax formation

2. Learn and apply the knowledge of conservation methods.
3. Learn and apply techniques of Botanical gardens etc.

3T2 - Core : Angiosperms-II

Outcomes: After completion of the course, the student will be able to

1. Learn and apply knowledge basic structure of flowers for identification and distinguish them family wise.
2. Training in usage of floras for identification of species, field trips for preparation of field notes and compilation of plant data.

3T3- Core Elective I:(Molecular Biology and Plant Biotechnology- I)

Outcomes: After completion of the course, the student will be able to

1. Learn the structure, replication of DNA etc.
2. Learn the transcription, translation etc.
3. Learn and apply bioinformatic tools for analysis of bioinformation data.

3T4 – Core : Aesthetic Botany

Outcomes: After completion of the course, the student will be able to

1. Learn phytogeographical regions of India, world, scope of gardening, landscaping.
2. Learn designing of lawns and cactus, ornamental gardens

4T1 - Core : Cell and Molecular Biology-II

Outcomes: After completion of the course, the student will be able to

1. Learn structure and functions of ribosomes, mechanism of transcription and translation.
2. Learn gene structure and regulation of gene expression
3. Learn mechanism of cell cycle, apoptosis, application of cell biology techniques.

4T2 - Core: Plant Biotechnology and Plant Breeding

Outcomes: After completion of the course, the student will be able to

1. Learn gene cloning, recombinant DNA technology etc.
2. Learn tissue culture methods.
3. Learn and apply bioinformatic tools for analysis of bioinformation data

4T3 -Core Elective II:(Molecular Biology and Plant Biotechnology - II)

Outcomes: After completion of the course, the student will be able to

1. Learn gene transfer methods, transgenics, molecular farming etc.
2. Learn tissue culture methods.
3. Learn and apply DNA finger printing techniques for analysis of molecular markers.

4T4- Core : Plant Resources

Outcomes: After completion of the course, the student will be able to

1. Learn the importance of economic botany
2. Learn evaluate about plant drugs
3. Learn and apply photochemical experiments

KAMLA NEHRU MAHAVIDYALYA, NAGPUR

DEPARTMENT OF CHEMISTRY

Programme Outcomes: B. Sc Chemistry

Department of Chemistry	After successful completion of three year degree program in Chemistry a student should be able to;
Programme Outcomes	PO-1. Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions. PO-4. Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community. PO-5. To inculcate the scientific temperament in the students and outside the scientific community. PO-6. Use modern techniques, decent equipments.

Programme Specific Outcomes B.Sc	PSO-1. Gain the knowledge of Chemistry through theory and practical's. PSO-2. To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions. PSO-3. Identify chemical formulae and solve numerical problems. PSO-4. Know structure-activity relationship. PSO-5. Understand good laboratory practices and safety. PSO-6. Develop research oriented skills. PSO-7.Make aware and handle the sophisticated instruments/equipments.

Course Outcomes B. Sc Chemistry

Semester-I

Course	**Outcomes** After completion of these courses students should be able to
Physical Chemistry CH-102	CO-1. Understand the basic of Thermodynamics CO-2.Understand the term specific volume, molar volume and molar refraction CO-3. Understand Gaseous state of matter & their behaviuor & Properties CO-4 Understand the Properties of Liquids, Classification of Liquid Crystal & applications in Real world.
Inorganic Chemistry CH-101	CO-1. Understand the Atomic structure & Periodic Properties. CO-2. Understand Theories of Bonding. CO-3 Understand S-Block, P-Block & Noble gases: their Properties, Bonding Appication.

Course Outcomes B. Sc Chemistry **Semester-II**	
CH-201 Organic Chemistry	CO-1. Define structure & Bonding of Hydrocarbon, Mechanism of Common Organics reactions. CO-2. Distinguish between geometrical and optical isomerism. CO-3. Discuss mechanism of Alkanes & Cycloalkanes Reactions.of Alkanes & Cycloalkanes Reactions. CO-4. Understand the Nomenclature & Aromaticity of Benzene derivatives.
CH-202 Physical Chemistry	CO-1. Know the Second law of Thermodynamics & Fuctions related with them. CO-2. Write an expression for rate constant K for third order reaction CO-3. Solve the numerical problems based on Rate constant CO-5Know the meaning of phase, component and degree of freedom
Course Outcomes B. Sc Chemistry **Semester-III**	
CH-301 Inorganic Chemistry	CO-1. Know the Chemistry of Lanthanides & Actinides CO-2. Errors in Chemical analysis. CO-3. Able to understand the Chemistry of Transition Series elements.
CH-302 Organic Chemistry	CO-1. Understand the Classification & reaction mechanism of Alcohols & Phenols. CO-2 Understand the Reaction mechanism of Aldehydes & Ketones. CO-3. Understand the Reaction Mechanism of carboxylic acids

Course Outcomes B. Sc Chemistry **Semester-IV**	
CH-401 Inorganic Chemistry	CO-3. Know the limitations of VBT CO-4. Know the shapes of d-orbital‟s and degeneracy of d-orbital's CO-5. Draw the geometrical and optical isomerism of complexes CO-1. Know the meaning of various terms involved in co-ordination chemistry CO-2. To understand Werner‟s formulation of complexes and identify the types of valences
CH-402 Physical Chemistry	CO-1.Solve the cell reaction and calculate EMF.. CO-2. Calculate interplanar distance in solids. CO-3. Understand The Roational & Vibrational Spectra of Particles. CO-4. Understand basics of Quantum mechanics. CO-5. Understand De-Broglie hypothesis and Uncertainty principle CO-6. Derive Schrodinger‟s time dependent and independent equations
Course Outcome B.Sc Chemistry **B.Sc -VI**	
CH-501 Organic Chemistry	CO-1.To study UV, IR spectroscopy. CO-2. Discuss different types of rearrangement reactions. CO-3. Understand the Chemistry of Heterocyclic Compounds
CH-502 Physical Chemistry	CO-1.Understand the tHermodynamics of cell Reactions. CO-2. Understand the physical picture of Orbital through the applications of Quantum mechanics.. CO-3. Understand Photochemistry& Raman Spectra & its application. CO-4. Understand the Chemistry of Macromolecules.
Course Outcome B.Sc Chemistry **B.Sc -VI**	

CH-601 Inorganic Chemistry	CO-1. Understand the Electronic Transition of Metal Complexes. CO-2 Understand the Magnetic Properties, Kinetic & Thermodynamic aspects of Transition metals. CO-3. Understandthe Bondinf, Nomenclature of Organometallic Compounds
CH-602 Organic Chemistry	CO-1. Can Elucidate structure of Organics cOmpounds on the basis of NMR. CO-2. Understand the function of dyes, paints andpigments. CO-3. Understand study the various type of surfactants. CO-4. Understand the Chemistry of Drugs & dyes.

Programme Outcomes: M. Sc Organic Chemistry

Department of Chemistry	After successful completion of two year degree program in chemistry a student should be able to;
Programme Outcomes	. PO-1. Determine molecular structure by using UV, IR and NMR. PO-2. Study of medicinal chemistry for lead compound. PO-3. Improve the Skill of student in organic research area. PO-4. Synthesis of Natural products and drugs by using proper mechanisms. PO-5. Study of Asymmetric synthesis. PO-6. Determine the aromaticity of different compounds. PO-7. Solve the reaction mechanisms and assign the final product.
Programme Specific Outcomes	PSO-1. Know the structure and bonding in molecules/ ions and predict the Structure of molecule/ions. PSO-2. Understand the various type of aliphatic, aromatic, nucleophilic substitution reaction. PSO-3. Understand and apply principles of Organic Chemistry for understanding the scientific phenomenon in Reaction mechanisms. PSO-4. Learn the Familiar name reactions and their reaction mechanisms. PSO-5. Understand good laboratory practices and safety. PSO-6. Study of organometallic reactions. PSO-7. Study of free radical,bycyclic compound, conjugate addition of Enolates and pericyclic reactions. PSO-8. Study of biological mechanisms using amino acids.
Course Outcomes M. Sc Organic Chemistry **Semester-I**	

Course	Outcomes After completion of these courses students should be able to;
1T3 Physical Chemistry	CO-1. Realize the terms ionic strength, activity coefficient, DHO equation. CO-2. Know the Eigen function, Eigen value, operator and postulates of quantum mechanics. CO-3. Learn two and three dimensional box, mechanics of particle.
1T1 Inorganic Chemistry	CO-1 Determine and Learn about Dipole moment and bond order of The inorganic molecule. CO-2. Learn about geometry and shape of the molecule. CO-3. Known the preparation and properties of transition metal carbonyls CO-4. To understand the 18 electron rule and its application. CO-5. Find out the point group of inorganic molecules. CO-6. Learn molecular orbital and its orientation. CO-7. Learn concept of symmetry elements in molecules.
1T2 Organic Chemistry	CO-1. Learn SN1, SN2 and SNi Mechanism and stereochemistry. CO-2. Learn classical and non-classical carbocation, NGP by pi and sigma bonds. CO-3. Solve the elimination problems. CO-4. Distinguish between type of addition, elimination and substitution reaction. CO-5. Learn E and Z nomenclature inC,N,S,P containing compound ,Stereo chemical principal, enantiomeric relationship R and S.
1T4 Analytical Chemistry	CO-1. Study the importance of safety and security, responsibility types of hazards and risk in chemical laboratory. CO-2. Understand the use of personal protective and other safety equipments, handling of chemical in laboratory. CO-3. Understand the route of explores for toxic chemicals. CO-4. Learn good laboratory practices and its applications.

Semester-II	
2T3 Physical Chemistry	CO-1. Learn the thermodynamic description of exact, inexact differential and state function. CO-2. Know the qualitative properties of solution, the depression in freezing point, elevation in boiling point and osmotic pressure. CO-3. Know the statistical thermodynamics and various partition functions. CO-4. Study the steady state approximation michaelis- menten mechanism, lindemann-hinshelwood mechanism, chain reaction, Rate determining stapes and consecutive elementary reactions.
2T1 Inorganic Chemistry	CO-1. Understand the mechanism in transition metal complexes, Born Haber cycle to calculate lattices energy. CO-2. Learn the use of catalyst, radius ratio rule of coordination number 3, 4. CO-3. Study the structure of atom, Hunds rule, term symbol, calculation of microstate and selection rule. CO-4. Understand the metal complexes in biological system.
2T2 Name reaction ,synthetic Organic Chemistry and spectroscopy	CO-1`. Study the various name reaction with examples. CO-2. Learn the mechanism of rearrangement reaction, use synthetic reagent of oxidation and reduction for solving the problems. CO-3. Understand the factors affecting UV-absorption spectra, Interpret IR-spectra on basic values of IR-frequencies. CO-4. Discuss the problem of UV, IR and NMR.
2T4 Analytical Chemistry	CO-1**.** Study the instrumentation, sample injection system, columns for HPLC and GC, Solvent treatment system and choice of mobile phase. CO-2. Learn instrumentation of mass spectrometry, fragmentation, structure determination. CO-3. Solve mean and standard deviation problems. CO-4. Understand the accuracy and precision and classification error.

	CO-5. Learn distillation, solvent extraction, crystallization, and other separation techniques.
Semester-III	
3T1 Organic reaction mechanism	CO-1. Study of carbanion-formation, stability and related name reaction, enemies and its applications. CO-2. Understand the NGP. CO-3. Learn the carbines and nitrenes. CO-4. Study of free radicals: generation of radicals, Nucleophilic electrophilic radicals, inter and intra molecular C-C bond formation via mercuric hydride. CO-5. Study of oxidative coupling and SNAr reaction.
3T4 Spectroscopic methods in structure determination.	CO-1. Study ^{1}H NMR Spectroscopy: Chemical Shift, deshielding, correlation for protons bonded to carbon and other nuclei. CO-2. Study of ^{13}C NMR spectroscopy: FT- NMR, type of ^{13}C NMR spectra, proton decoupled , off resonance, APT, INEPT, DEPT, Chemical

	shift, nuclear and hetero nuclear coupling constant CO-3. 2D NMR techniques: COSY, homo and hetero nuclear 2D resorts spectroscopy, NOESY and the applications CO-4. Study of mass spectrometry: Instrumentation, various methods of ionization, SIMS, FAB, MALDI. Different detectors rules of fragmentations of different functional groups.
3T2 Organic stereochemistry	CO-1. Study of stereochemistry of six member ring. CO-2. Learn the stereochemistry of rings other than six members. CO-3. Understand fused bridge and Caged rings. CO-4. Learn resolution of racemic modification, stereochemistry of organic compound using NMR. CO-5. Determine geometrical isomerism and stereochemistry of olefins.
3T3 Polymer chemistry.	CO-1. Preparation and stuructures of olymers CO-2. Classification and molecular weight determinationtechniques of Polymers/
Semester-IV	
4T2 Chemistry of natural product	CO-1. Study structure and stereochemistry of hardwickiic acid, camptothecin and podothyllotoxin. CO-2. Study the synthesis of taxol, estorne and mefepristone, fredericamycin A. CO-3. Learn biogenesis terpenoides, alkaloids and shikimmte pathway.
4T1	CO-1.Study of transition metal complexes in organic synthesis.

4T3 Polymer Chemistry	CO-1: Applications of Polymers and methods of Polymerization CO-2: Characterization and Application of Polymers CO-3:
4T4 Spectroscoly	CO-1: Spectral analysis best on instrumental techniques. CO-2: Uv- vis Spectroscopy CO-3 : Application of NMR and Diffraction techniques.

Kamla Nehru Mahavidyalaya

Sakkardhara Square, Nagpur.

Department of Computer Science

Computer science is the study of the theoretical and practical aspects of computer technology and computer usage.

Courses are designed to give students a solid grounding in both theoretical and practical topics in computer science while leaving flexibility for a broad program of study, including many courses outside of science and engineering, or even for a double major in another discipline.

Bachelor in Computer Application (BCA)

Programme Outcomes

- To provide thorough understanding of nature, scope and application of computer and computer languages.
- To develop interdisciplinary approach among the students.
- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices.
- To create awareness about process and product standards
- To train students in professional skills related to Software Industry.
- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science
- To provide thorough understanding of nature, scope and application of computer and computer languages.
- To develop interdisciplinary approach among the students.

Program Specific Outcomes

After the completion of the course, a student is able to:

- Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.
- Design, implements, test, and evaluate a computer system, component or algorithm to meet desired needs and to solve a computational problem.
- To enhance skills and adapt new computing technologies for attaining professional excellence and carrying research.
- To pursue further studies to get specialization in Computer Science and Applications (MCA), business administration.
- To pursue the career in corporate sector can opt for MBA.
- To Work in the IT sector as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.
- To work in public sector undertakings and Government organisations.

B. Sc. (Computer Science)

Programme Outcomes

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices.
- To create awareness about process and product standards
- To train students in professional skills related to Software Industry.
- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science
- To provide thorough understanding of nature, scope and application of computer and computer languages.
- To develop interdisciplinary approach among the students.

Programme Specific Outcomes

- Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.
- Design, implements, test, and evaluate a computer system, component, or algorithm to meet desired needs and to solve a computational problem.
- To enhance skills and adapt new computing technologies for attaining professional excellence and carrying research.
- To pursue further studies to get specialization in Computer Science and Applications (MCA), Mathematics, business administration.
- To pursue the career in corporate sector can opt for MBA.
- To Work in the IT sector as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.
- To work in public sector undertakings and Government organisations.

Bachelor of Vocation (Software Development)

Programme Outcomes

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects.

Programme Specific Outcomes

- B.Voc. in Software Development course implements the inherent practical nature of B.Voc. Course in the domain of software and computer science.
- Vocationally qualified candidate is an easy absorb in the job market as he/she is already seen aware of the functioning and techniques in practical and industrial level. Hence, the employability prospects are boosted several times as compared to a traditional bachelor's graduate.
- Vocational studies as per their nature and course curriculum are seen focused towards discussing the practical and application based side of any subject. Thus, the domain of vocational studies exposes the student to industrial working well before their entry into the job market.
- To enhance skills and adapt new computing technologies for attaining professional excellence and carrying research.
- To pursue further studies to get specialization in Computer Science and Applications (MCA), business administration.
- To pursue the career in corporate sector can opt for MBA.
- To Work in the IT sector as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.
- To work in public sector undertakings and Government organisations.

Bachelor of Commerce (Computer Application) [B. Com (CA)]

Programme Outcomes

- Commerce with computer Application gives a deeper understanding of both information Technology and commerce, thereby enabling the budding graduates to pursue careers in either of the two fast-growing areas, viz. Lt Industry, Commerce, and Financial sector.
- To inculcate knowledge on RDBMS concepts and Programming with Oracle.
- This course could provide well trained professionals for the technology and allied industries to meet the well trained manpower requirements.
- The graduates will -get hands on experience in various aspects of information technology viz. Program developers, - software testing, BPO, web designer.
- The course will help the graduates to take up responsibilities in production, testing, designing and marketing in the information technologies and contribute for the growth of industry.

Programme Specific Outcomes

- Moulding the students in such a way which will make them having superficial knowledge about everything in commerce and in depth knowledge about core subjects.
- Students will demonstrate that they can present the results of their observations and research in a way that is objective, technically accurate and legally acceptable.
- Students will use effective technology .appropriately, such as PowerPoint, slides, posters, handouts, and transparencies in oral presentations.
- The ability to understand, analyze and develop software programs in the areas related to system software, multimedia, web design, application programme and database for efficient design of technology of varying complexity.

M. Sc. (Computer Science)

Programme Outcomes

- Apply knowledge of computing to produce effective designs and solutions for specific problems.
- Can communicate scientific information, challenges and findings to scholars as well as to general audience.
- Identify, analyze, and synthesize scholarly literature relating to the field of computer science Use software development tools, software systems, and modern computing platforms.
- Can initiate and lead projects within the scientific field and be responsible for the work of individuals and groups.
- Can decide which analytical methods and complex theories are applicable Can communicate statistical information.
- Able to developed the necessary learning skills and independence for further studies
- Can make decisions in an independent, professional manner and support them.
- Identify, analyze, and synthesize scholarly literature relating to the field of computer science Use software development tools, software systems, and modern computing platforms.

Programme Specific Outcomes

- Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics of varying complexity.
- Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems.
- Research

Master of Computer Application (MCA)

Course Outcomes:

- To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.
- To develop students to become globally competent.
- Produce knowledgeable and skilled human resources which are employable in IT and ITES.
- Function competently as an individual and as a leader in multidisciplinary projects
- Apply the inherent skills with absolute focus to function as an successful entrepreneur
- Create, identify and apply appropriate techniques, resources and modern computing tools to complex computing activities.
- Understand and commit to professional ethics and cyber regulations for professional computing practices.
- Identify the need and have the ability, to engage in independent learning as a computing professional.
- Understand and apply computing, management principles to manage multidisciplinary projects

Course Specific Outcome:

- MCA graduates will demonstrate analytical and design skills including the ability to generate creative solutions and foster team-oriented, professionalism through effective communication in their careers.
- MCA graduates who will exhibit effective work ethics and be able to adapt to the challenges of a dynamic job environment.
- Understand, analyze and develop computer programs in the areas related to algorithms, Process and solutions for specific application development using appropriate data modelling concepts.
- Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
- Apply the knowledge of computer application to find solutions for real-life application
- Ability to analyze, design, develop and maintain the software application with latest technologies
- Utilize skills and knowledge for computing practice with commitment on social, ethical, cyber and legal values.
- Inculcate employability and entrepreneur skills among students who can develop customized solutions for small to large Enterprises, IT Sector and software testing, database administration, System administrator, system analyst, etc.

Master of Computer Management (MCM)

Course Outcomes:

- Master of Computer Management Course is intended to create professionals for specialized commercial applications in software.
- The course equips students with adequate skills in software to meet up the changing demands of the current IT industry.
- The course study helps the candidate to gain knowledge base in areas of software programming, database applications, e-commerce fundamentals, business applications, software project management, and so on.
  The course is a great way of enhancing the knowledge of the computer and becoming more adept in different aspects of software such as programming, software testing, database management, network testing and so on.
- Apply knowledge of management theories and practices to solve business problems.
- Foster Analytical and critical thinking abilities for data-based decision making.
- Ability to develop value based leadership ability.
- Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to team environment.

Course Specific Outcome:

- Moulding the students in such a way which will make them having superficial knowledge about everything in commerce and in depth knowledge about core subjects and implement using computer.
- Ability to evaluate a business idea and formulate a feasible business plan.
- Recognize the need for and have the orientation and ability to engage in an independent & lifelong learning in a dynamic business environment.
- Ability to appraise and explain societal and environmental aspects of business.

POST GRADUATE DIPLOMA IN COMPUTER COMMERCIAL APPLICATIONS (PGDCCA)

Course Outcomes:

- The programme covers all aspects and basics in Computer Application.
- It also has projects for developing full software in various software languages along with real time environment.
- The programme prepares the student to undertake Master Programme(MCM-II) and for designing small business application software's as per the need of industry and real world.
- The course equips students with adequate skills in software to meet up the changing demands of the current IT industry.
- Apply knowledge of management theories and practices to solve business problems.
- Foster Analytical and critical thinking abilities for data-based decision making.
- Ability to develop value based leadership ability.
- Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to team environment.

Course Specific Outcome:

- PGDCCA graduates who will have successful careers based on their understanding of formal and practical methods of Application Development using the concepts of computer programming, software and design principles.
- PGDCCA graduates will demonstrate analytical and design skills including the ability to generate creative solutions and foster team oriented, professionalism through effective communication in their careers.
- PGDCCA graduates who will exhibit effective work ethics and be able to adapt to the challenges of a dynamic job environment.

Post B.Sc. Diploma in Computer Science and Application (PGDCS&A)

Course Outcomes:

- PGDC&A programme is aimed towards building prospective career in the field of computer application.
- The programme is designed with the objective to provide knowledge and skills in the various aspects of computer applications and core programming.
- Students will also be trained in the latest trends of information technology.
- The programme covers all aspects and basics in Computer Application.
- It also has projects for developing full software in various software languages along with real time environment.
- The programme prepares the student to undertake Master Programme (Direct second Year admission to MCA-II).
- The course equips students with adequate skills in software to meet up the changing demands of the current IT industry.
- Apply knowledge of management theories and practices to solve business problems.
- Foster Analytical and critical thinking abilities for data-based decision making.

Course Specific Outcome:

- PGDCS&A graduates who will exhibit effective work ethics and be able to adapt to the challenges of a dynamic job environment.
- PGDCS&A equips the students with skills required for designing, developing applications in Information Technology.
- Students will able to learn the latest trends in various subjects of computers & information technology.

Kamla Nehru Mahavidyalaya
Department of Cosmetic Technology
Session 2019-20

Bachelor of Cosmetic Technology

Course Outcomes (U.G.)

I. Bachelor of Cosmetic Technology Semester I & II

1. Cosmetic Chemistry

- Students will be able to understand the chemistry of cosmetic ingredients.
- Students will be able to compare the chemistry of cosmetic ingredients in the cosmetic formulation.
- Students will be able analyse cosmetic ingredients.
- Students will be able to determine the impurities in cosmetic chemicals.
- Students will be able to perform the purification test for cosmetic raw materials which can help them to identify the adulteration in the raw materials.

2. Anatomy & Physiology

- Students will understand the basic anatomy and physiology of skin and its appendages like nail, hair, eye, tooth etc.
- Students will learn different systems of body i.e. Endocrine system, Cardiovascular system, Respiratory system, Digestive system, Excretory system and Nervous system.
- Students will be able to analyse the detail structure of Cell, tissues, Blood and its cells, baby skin and adult skin.
- Students will be able to understand the processes of keratinization and pigmentation.
- Students will be able to determine R.B.C., W.B.C, and D.L.C., Bleeding time, Clotting time and Haemoglobin percentage of human blood.

3. Organic Chemistry

- Students will able to understand relationship between Cosmetics and chemicals.
- Students will able to analyze different types of compounds like acidic, basic, Phenolic, and neutral.
- Students will gain the knowledge about different elements like Sodium, Calcium, Carbon, Nitrogen, Oxygen etc.
- Students will be able to prepare organic preparations by hydrolysis, Acetylation and oxidation.

4. Physical Chemistry

- Student will be able to understand laws of thermo chemistry.
- Student will able to analyze surface tension and viscosity of liquids.
- Students will be able to determine hardness of water, heat of solution, heat of neutralisation.
- Students will be able to explain Faraday's law of electrolysis, E.M.F. of galvanic cell, principles of potentiometric titrations etc.

5. Natural Cosmetic Agents

- Students will be able to understand characteristics of various herbs.
- Students will be able to categorize herbs on the basis of their active constituent and main features.
- Students will be able to determine adulteration of oils, fats, tannins and resins.
- Students will be able to identify various natural agents.

6. Elementary Mathematics

- Students will be able to calculate profit and loss, percentage and logarithm.
- Students will be able to understand Statistics and its calculation.
- Students will be able to solve Trignometry and derivatives.
- Students will learn the application of derivatives.

7. English Communication skills

- Student will learn letter writing, bio data and Job application.
- Student will able to design Advertisement and dialogue writing.
- Students will gain the knowledge about Personality Development Skills.
- Student will able to understand loud reading, speaking, conversation, telephonic conversation, group discussion and interview techniques.

II. Bachelor of Cosmetic Technology Semester III & IV

1. Cosmetic Technology

- Students will be able understand different physical and chemical properties of cosmetic agents.
- Students will be able to explain monophasic and biphasic formulations.
- Students will be able to classify different cosmetics such as Ointments, Creams, Paste, Sticks, and powders.
- Students will be able to formulate basic cosmetic formulations including emulsions, suspensions, powders, after shave preparations, toners etc.

2. Instrumental Methods of Analysis

- Student will be able to understand application of instruments for cosmetic analysis.
- Student will able to analyze different compounds by using different Instrument like pH meter, Conductometer, Colorimeter etc
- Students will gain the knowledge about different Instruments and its operational techniques.
- Student will able to interpret the principles of colorimetric analysis, flame photometry and chromatography.

3. Cosmetic Engineering

- Students will be able to understand flow of fluids, flow of heat fundamental concept of material and energy balance.
- Students will able to draw projections of points, lines and planes.
- Students gain the knowledge about various pumps, transportation of fluids, laws of conservation of energy and conveying.
- Students will be able to understand heat exchangers, humidification and air conditioning.

4. Cosmetic Chemistry

- Student will be able to understand the classification, sources properties of Amino acids, Proteins, lipids, vitamins and enzymes with their cosmetic applications.
- Student will able to interpret clay minerals, synthetic silicates, synthetic surfactants and insoluble metallic soaps.
- Student gain the knowledge about humectants, Polyols, viscosity modifiers, pearl and pearl essence and ion exchange resins.
- Student will able to determine saponification value, iodine value, acid value and qualitative properties of lipids.

5. Drug & Cosmetic Laws

- Students will be able to understand the objectives of acts and rules in pharmaceutical and cosmetic fields.
- Students will be able to compare acts and rules of cosmetics with other products.
- Students will be able to compose basic structure of cosmetic factories according to rules.
- Students will be able to understand the Patenting in India, Pharmacy Act, Factory Act, Contract Act, Sales and Promotion Act, Shop & Establishment Act.

6. Introductory Pharmacology and Toxicology

- Students will be able to understand the routes of administration of drugs, various processes of absorption of drugs.

- Students will be able to describe general mechanism of action of drugs and material safety data sheets (MSDS) of cosmetic materials.
- Students will be able to describe the pharmacology of topical drugs and their different examples.
- Students will be able to learn the pharmacology of Cosmeceuticals, detail knowledge of Autocoids.
- Students will be able to understand the Heavy metals and metal antagonists, and heavy metal poisoning.

III. Bachelor of Cosmetic Technology Semester V & VI

1. Perfumes

- Students will be able to describe different perfumes.
- Students will be able to perform different extraction techniques.
- Students will be able to classify natural perfume and synthetic perfumes.
- Students will be able to compare different extraction techniques.

2. Cosmetic Technology

- Students will be able to understand the cosmetic ingredients with respect to their functions and uses.
- Students will be able to choose the cosmetic ingredients in the cosmetic formulation as per its function.
- Students will be able to analyse and design the formulation by choosing cosmetic ingredients as per their property and functions.
- Students will be able to determine and design the new functional cosmetic products.
- Students will be able to perform the test for cosmetic raw materials as well as finished products.

3. Principles of Cosmeceutics

- Students will be able to understand the Principles of Surface Active Agents, Interfacial Phenomenon, Emulsion and solubility.
- Students will be able to determine the surface tension, Interfacial tension, spreading coefficient etc of different liquids.
- Students will gain knowledge about distribution phenomenon, colloidal dispersion, Rheology, micromeritics and complexation
- Students will be able to evaluate different properties of powders, globule size of emulsion, and suspension stability.

4. Cosmetic Engineering

- Student will be able to understand size reduction theory, size separation, Filtration and methods for quality air.
- Student will be able to calibrate orifice meter, venturimeter and can determine sedimentation parameters, drag coefficient, sieve analysis etc.
- Students will gain the knowledge about theories of Mixing, Distillation, Evaporation Azeotropes and Drying.
- Student will be able to determine boiling point, Rayleigh's equation, mass transfer coefficient, moisture content etc.

5. Beauty Culture

- Students will be able to understand the structure of the skin and how to recognize the types of the skin. They will be able to learn different types of treatments suitable to skin conditions and types.
- Students will able to classify different types of skin blemishes and use various treatments for blackheads, whiteheads, Acne, open pores, freckles and wrinkles.
- Students will be able to illustrate the various muscles of facial expression, Bones of the cranium and face.
- Students will be able to describe various face pack ingredients and their effects.
- Students will be able to understand the different facial massage therapies and explain its process stepwise.

6. Pharmacology and Interactions

- Students will be able to understand the anatomy and physiology of skin, hair, nails, sweat gland and sebaceous gland.
- Students will be able to analyze the various disorders of skin, hair, nails, sweat gland and sebaceous gland.
- Students will be able to determine the side effects and the cause of cosmetic ingredients and products coming in contact with various body parts like skin, hairs and nails.
- Students will be able to understand the disorders and treatments of skin and teeth.
- Students will be able to differentiate between various pigmentary and depigmentary agents.

IV. Bachelor of Cosmetic Technology Semester VII & VIII

1. Perfumes & Colours

- Students will be able to understand the formulation and processing of alcoholic fragrance solutions, emulsified and solid fragrances, solubilized perfumes, Aerosols and its technology.

- Students will learn to formulate different cosmetic preparations by understanding the knowledge behind revision, adaptation and incorporation of perfumes in various skin, oral, eye, nail and hair care formulations.
- Students will be able to understand synthetic substances used to formulate different perfumes.
- Students will be able to understand the different terminologies related to colours, classification of colours, preparation of colour solutions, regulations related to colours, determination of colours and colour matching of marketed products.

2. Cosmetic Technology

- Students will be able to understand the cosmetic formulations with respect to their functions and applications.
- Students will be able to choose the new cosmetic ingredients in the cosmetic formulation as per its functions and design the product.
- Students will be able to analyse and design the innovative formulation or format by choosing cosmetic ingredients as per their property and functions.
- Students will be able to determine and design the new functional and novel cosmetic products with respect to its functions, appearance etc.
- Students will be able to perform the stability test for products with respect to its stability, shelf life etc.

3. Plant Design

- Students will able to understand design considerations, heat exchangers and pressure vessels. Students will learn machine elements, selection of plant location and different factors affecting factory buildings.
- Student will able to draw the design of pressure vessels, heat exchangers, machinery elements, nut and bolts.
- Students will gain the knowledge about Process hazards, reaction vessel, Agitators, storage vessels and driers.
- Student will able to draw design of dryer, reaction vessel, agitator, rivets, shafts and joints.

4. Quality Assurance Techniques

- Student will be able to understand the importance of Quality control in cosmetic preparations and guidelines for hygienic manufacturing of cosmetics.
- Student will be able to understand the significance, role and importance of ISO, Validation in cosmetic manufacturing, Microbial analysis, microbial testing of raw materials and finished products..

- Student will be able to learn the importance of stability testing and how to perform accelerated stability study.
- Student will be able to illustrate the BIS guideline and evaluate the components or active ingredients present in various finished products like Shampoo, hair dyes, depilatories, skin creams, sun screen preparations, tooth paste, tooth powders, lipstick etc.
- Student will be able to understand the testing of packaging component used for cosmetic product.

5. Herbal Cosmetics

- Students will be able to understand role of herbs in cosmetic products.
- Students will be able to formulate cosmetic product with herbal ingredient which gives desired effects.
- Students will be able to evaluate effect of herbal product.
- Students will be able to compare herbal products with synthetic products.

6. Organization & Management of Industries

- Students will be able to explain important aspects which are essential during development of any business.
- Students will be able to understand entrepreneurship and can create new ideas for business.
- Students will be able remember role of small scale industries in economy.
- Students will be able to design structure of establishments.

Master of Cosmetic Technology

Course Outcomes (P.G.)

I. Master of Cosmetic Technology Semester I

1. Formulation & Development –I

- Students will be able to determine physical and chemical properties of ingredients used in cosmetics.
- Students will be able to formulate and develop various cosmetic products like emulsion, suspension, powders, hair care, oral care, coloured cosmetics, soaps, perfumes and men's toilet preparation.
- Students will be able to understand various formulation additives.
- Students will be able to design packaging of cosmetics.

2. Quality Assurance Techniques –I

- Students will be able to evaluate identification test, physicochemical properties and instrumental analysis of raw materials used in cosmetics.
- Students will be able to evaluate finished products as per BIS.
- Students will be able to understand quality management GMP, GLP, Sampling and Inspection of Cosmetics.
- Students will be able to understand Intellectual Property Right Act.

3. Research Methodology

- Students will be able to understand methods of sampling and Research Tools.
- Students will be able to present Research Data and presentation.
- Students will be able to deliver seminar on recent trends in cosmetics.
- Students will be able to learn tabulation and organization of data.

4. Advanced Cosmetic Technology –I

- Students will be able to understand interfacial phenomenon.
- Students will be able to learn theories of dispersion techniques.
- Students will be able to interpret concept of solubilization.
- Students will be able to explain solubilization and its application.

II. Master of Cosmetic Technology Semester II

1. Formulation & Development – II

- Students will be able to formulate different types of cosmetics.

- Students will be able to select the right herbal active for their product.
- Students will be able to perform different extraction techniques for the preparation of herbal extracts.
- Students will be able to list out the different stages through which the product has to go before final production.

2. Advance Cosmetic Technology – II

- Students will be able to understand in detail the theories behind the cosmetic formulation, stabilization of product, equipment used, scale up techniques.
- Students will be able to evaluate the instability of designed formulation
- Students will be able perform the scale up of the product at factory.
- Students will be able to determine & design the new process for cosmetic products
- Students will be able to perform the test for stability, Quality control, shelf life by using different instruments.

3. Statistics and Qualitative Techniques

- Students will be able to understand statistical measures.
- Students will be able to analyse and classify data.
- Students will be able to determine sampling techniques, tabulation of data, and calculation of statistical values.
- Students will learn Frequency distribution, testing of hypothesis, regression and prediction etc.

4. Natural Products

- Students will be able to understand the natural products & natural cosmetic ingredients with respect to their extraction process, functions & uses.
- Students will be able to choose the proper collection & extraction process for herbal cosmetic ingredients in the cosmetic formulation as per its function.
- Students will be able perform the qualitative & quantitative analysis of herbal extracts & products.
- Students will be able to determine & design the new functional herbal cosmetic products
- Students will be able to perform the test for Quality control check for herbal products.

III. Master of Cosmetic Technology Semester III

1. Advance Cosmetic Technology III

- Students will be able to understand the pathways of drug delivery systems, their types and applications.

- Students will learn to formulate and evaluate Microencapsulation, liposomes, niosomes and transferosomes.
- Students will learn to analyse the safety aspects of microencapsulation, Nanotechnology and latest trends in delivery systems.
- Student will be able to describe the scientific and formulation details of Nanoparticles, Microsponges, Microspheres and others.

2. Quality Assurance Techniques II

- Students will be able to understand the Drug & cosmetic Laws with reference to provisions for packaging, labeling, colours, flavours etc.
- Students will be able to evaluate quality assessment of packaging material, containers and closures as per BIS/IP.
- Students will be able to understand various skin testing and hair testing.
- Students will be able to learn performance evaluation of cosmetics products using various instruments.

3. Elective I – Skin Care Cosmetics (SCC)

- Student will be able to understand Phytochemical screening and can determine various chromatographic techniques applied to natural products.
- Student will be able to explain the application and mechanism of action of cleansing, Emollient, skin pigmentation, Anti-pimple and anticellulite, freshners and perfume.
- Student will be able to describe the scrubbing effect of apricot, walnut. cleansing effect of olive oil, aleo-vera. Emollient effect of lanolin, cocoa butter/shea butter. Antibacterial effect of curry leaves, tea tree oil. Perfumery effect of chandan, khus, cinnamon.
- Student will be able to understand the importance of standardisation as per WHO guidelines.

4. Research Designing and Planning (RDP)

- Students will be able to understand data management, analysis and presentation.
- Student will be able to design Research project report.
- Students will be able to prepare the manuscript and assessment.
- Students will be able to analyse the data collected for their project report.

IV. Master of Cosmetic Technology Semester IV

1. Cosmetics Microbiology

- Students will be able to evaluate preservative efficacy and microbial assay of raw materials and finished products.

- Students will be able to determine total microbial count isolation and identification of microorganisms from cosmetic products and raw materials.
- Students will be able to understand microbial contamination and considerations in cosmetic product formulation.
- Students will be able to learn sanitary practices in cosmetic manufacturing, validation of microbial testing methods, cosmetic preservation and its regulation.

2. Production and Marketing Management

- Students will be able to understand the production process in detail.
- Students will be able to analyse the inventory through ABC analysis and study different cost elements in inventory.
- Students will be able to perform market survey for their product research work.
- Students will be able to interpret results for their research work based on their study.

3. Elective II- Colour Cosmetics

- Students will be able to understand the formulation and processing of alcoholic fragrance solutions, emulsified and solid fragrances, solubilized perfumes, Aerosols and its technology.
- Students will learn to formulate different cosmetic preparations by understanding the knowledge behind revision, adaptation and incorporation of perfumes in various skin, oral, eye, nail and hair care formulations.
- Students will be able to understand synthetic substances used to formulate different perfumes.
- Students will be able to understand the different terminologies related to colours, classification of colours, preparation of colour solutions, regulations related to colours, determination of colours and colour matching of marketed products.

4. Cosmetic Validation

- Students will be able to understand the Shelf life, safety, organoleptic characteristics and toxicity profile of the finished products.
- Students will be able to understand the specification creation for raw materials.
- Students will be able to develop prototype, stability studies, pilot batches of products.
- Students will be able to understand the criteria related to Plant selection, IPR and Efficacy studies of cosmetic formulations.

Kamla Nehru Mahavidyalaya

Department of Cosmetic Technology

Session 2019-20

Bachelor of Cosmetic Technology

Programme Outcomes (U.G.)

- Students gain technical, entrepreneurial and communication skills.
- It gives eligibility to students for the vacancies in Sales, Marketing, Research and Development, Production and Quality Control, Beauty experts as well as in Administration and Management of Cosmetic Industries.
- Graduate students of the Cosmetic Technology have high demand in various cosmetic and pharmaceutical companies and sectors in India and abroad.
- Student can apply for all Government competitive exams including MPSC, UPSC, Banking Sector, Railway Department, etc. where graduation is necessary.
- Students can apply for higher education in the fields of M.B.A., G.R.E. etc.

Specific Programme Outcomes

- The course gives extensive training in Cosmetic formulation, Manufacturing, Analysis and Marketing.
- It provides Formulators, Chemists, Heads of research and development at the forefront of cosmetic product development, with concise comprehensive information on the latest raw materials, laboratory procedures, and testing methods available worldwide.
- Further education in Master of Cosmetic Technology Degree and Doctoral Research is an option for becoming Research scientist or for applying in educational field as professor.

- One can also start-up with the own formulation setup / Spa centre /Beauty Salon/ Cosmetic industry/ Perfume industry/ Colour industry/ Extraction industry etc.

Master of Cosmetic Technology

Programme Outcomes (P.G.)

General Outcomes

- The Programme provides in-depth knowledge related to cosmetic products with other related science like Dermatology, Formulation and Development of Cosmetic Products, Principles of Cosmecutics, Herbal Technology and regulatory issues related to Cosmetic Science and Technology.
- After the successful completion of the Master of Cosmetic Technology (MCT), study programme one can have excellent career opportunities in field of Cosmetic Technology, Private and Government sector, colleges and universities.
- Candidates are able to work as Professor, research & Development Executive, Brand Manager (Cosmetic Products/ Raw materials), Quality Control Analyst, Assistant Supervisor (Cosmetic Laboratory), Beauty Advisor, Business Development Manager (Cosmetic) etc.
- Further education in Doctoral Research in Cosmetic Technology is an option for becoming Research scientist or for applying in educational field as professor.

Specific Programme Outcomes

- The course is suitable for those candidates who want to increase their knowledge for accelerating their career by exploring and acquire a critical understanding of Cosmetic Technology.
- One can start R & D Labs, Quality control Labs for the development and testing of Cosmetic Raw materials and finished products.

- One can also start-up with the own formulation setup / Spa centre /Beauty Salon/ Cosmetic industry/ Perfume industry/ Colour industry/ Extraction industry / contract manufacturing industries etc.

Kamla Nehru Mahavidyalaya, Nagpur
Department of Electronics
B.Sc ELECTRONICS
2019-20

- **On completion of the B. Sc. Electronics program the student should possess understanding and knowledge of the following:**

PROGRAM OUTCOME:

- Ability to design and conduct electronics experiments, as well as to analyze and interpret data
- Utilize the basic knowledge of science Electronics and Communication
- To provide opportunity to students to learn the latest trends in Electronics
- To provide opportunities to the students for becoming researchers and developers
- To satisfy the needs of the core Electronics Industry useful for the society in all walks of life.
- To provide opportunities to the students to formulate, analyze and resolve the problems in Electronics Industry
- To prepare students to share the teams working on recent multi-disciplinary projects for entrepreneurship.

COURSE OUTCOME

B. SC. SEMESTER 1
PAPER 1: BASIC CIRCUIT COMPONENTS AND NETWORK ANALYSIS

- To enrich the students with the basic requirement of electronic circuits.
- To describe the theorems useful for circuit operation.
- To explore the use of energy sources for circuit operations.
- To familiarize about the use of transducers in instrumentation systems

PAPER 2: FUNDAMENTALS OF DIGITAL ELECTRONICS

- To enrich the students with the basic requirement of digital electronics.
- To describe the use of Boolean Algebra for circuit operations.
- To elaborate the use of flip flops as memory in data processing system.
- To explore the use of binary circuits in digital system.
- To familiarize about the basic building blocks required for digital system.

B. SC. SEMESTER 2
PAPER 1: SEMICONDUCTOR DEVICES

- To explain about semiconductors used for the fabrication of semiconductor devices.
- To acquire the knowledge of transistor used in many electronic circuits.
- To familiarize about the field effect transistor and its operation.
- To explore the use of power devices required in electronics circuits.
- To familiarize about the applications of diode, transistor and power devices.

PAPER 2: ADVANCED DIGITAL ELECTRONICS

- To enrich the students with the digital ICS used in electronics circuits.
- To enhance the use of Flip-Flops in the construction of counters.
- To familiarize the use of Counters & Registers in data processing system.
- To explore the use of binary memory in digital system.
- To disseminate about the building blocks required for digital system.

B. SC. SEMESTER 3
PAPER 1: ANALOG CIRCUITS

- To illustrate applications of diode as clippers, clamper and rectifier.
- To describe the role of transistor in amplification, signal analysis and two port hybrid circuit for testing amplifier parameters.
- To elaborate the concept of feedback and construction of feedback amplifier and oscillators.
- To explore the use of power amplifier in electronics circuits.
- To familiarize about the applications of diode and transistor.

PAPER 2: LINEAR INTEGRATED CIRCUITS

- To study DC & AC characteristics of operational amplifier
- To elucidate and design linear and nonlinear circuits of OP-AMP.
- To study timer IC and its applications.
- To elaborate the role of filters in electronics circuits.
- To explore the knowledge of linear integrated circuits and its uses.

B. SC. SEMESTER 4
PAPER 1: BASIC COMMUNICATION ELECTRONICS

- To understand functioning of basic processes in communication systems.
- To understand analogue modulation & demodulation techniques.
- To Understand transmission and reception systems.
- To understand propagation of radio waves in communication systems.
- To understand the process of analogue signal communication system.

PAPER 2: ANALOGUE AND DIGITAL CIRCUITS

- To study DAC and ADC used for data conversions in electronics system.
- To elucidate and design regulated DC power supply for operating electronic devices.
- To study PLL IC 565 and its applications.
- To elaborate the role of transducers in Bioelectronics circuits.
- To explore the knowledge of Analogue and Digital circuits and its uses.

B. SC. SEMESTER 5

PAPER 1 MODERN COMMUNICATION SYSTEMS

- To understand the concept optical communication and its operation
- To understand various digital modulation and demodulation techniques.
- To analyze the performance of digital communication system in terms of error rate and spectral efficiency
- To understand the telecommunication traffic, channel and cellular capacity
- To understand various application of cellular technology

PAPER 2: INTRODUCTION TO MICROPROCESSOR

- To understand importance of Microprocessors as a programmable digital system element in computer system.
- To understand architecture and features of 8085 Microprocessor.
- To explore some basic concepts of microprocessors through assembly language programming.
- To grown-up the in-depth understanding of the operation of microprocessors and machine language programming & interfacing techniques.
- To augmented the knowledge of interfacing the peripheral to increase the flexibility of microprocessor

B. SC. SEMESTER 6

PAPER I: PROGRAMMING IN 'C'

- After completion of course, Students are able to
- Develop their programming skills
- Familiar with elements of C language
- Understand operators, Expression and Preprocessors
- Understand different decision making and concept of looping in C
- Understand Array, Structure, Function and Pointers, their declaration and use

PAPER 2: MICROCONTROLLER AND ITS APPLICATIONS

- To understand architecture and features of 8051 Microcontroller.
- To learn Programming of 8051 microcontroller.

- To learn interfacing of 8051 Microcontroller with real world input and output devices.
- To understand the coding and interfacing of 8051 with various IO devices.
- To understand importance of Microcontrollers in atomization and control system

PO 7 Co Of M.Sc Electronics

❖ **On completion of the M. Sc. Electronics program the student should possess understanding and knowledge of the following:**

PROGRAM OUTCOME

- The students will be able to develop aptitude to manifest and wide and extensive knowledge in the field of electronics.
- Ability to think critically for solving various problems and recent trends in integrated circuits and technology.
- The students will be capable of working effectively in diverse conditions as a team.
- The students will be able to develop skills in system design and its mplementation.
- The students will be able to apply knowledge of electronics in academic and corporate sectors.
- The students will be able to develop self-sustainability as well as competitiveness and employability.
- The students will be able to plan and write a research paper or proposal and assignment in electronics.

SPECIFIC PROGRAM OUTCOME

- Detail understanding of engineering programming in common languages, such as Matlab, LabVIEW, embedded C and C^{++}.
- Basic and advance, theory and application of digital signal processing concepts, methods and algorithms with fuzzy logic and neural network.
- Theory and practice of digital electronics logic systems design and operation and system identification.
- Theory and practice of electronics network analysis power systems in dynamical behavior.
- Give an oral scientific presentation, report on a research project and produce a research report

COURSE OUTCOMES

SEMESTER-1

COURSE NAME: FUNDAMENTALS OF SEMICONDUCTOR DEVICES

- Analyze the role of semiconductors in modern day technology
- Distinguish amongst various types of devices based on their phenomenon
- Simplify various circuits involving non-linear devices
- Analyze the importance of optoelectronic devices in the world of Visualization

COURSE NAME: DIGITAL DESIGN AND APPLICATIONS

- Explore the fundamentals of digital electronics, VHDL, CPLD and FPGA
- Design various applications based on digital circuits
- Design various application based on VHDL
- Develop VHDL programming concepts to be used in the designing of various logic circuits

COURSE NAME: ADVANCED MICROPROCESSORS

- Explore the fundamentals of Microprocessors and assembly language Programming
- Apply the concepts of assembly language programming for interfacing Various I/O chips with microprocessor
- Analyze the various types of microprocessors used and their increasing Efficiency over the period of time
- Explore the memory map associated with I/O devices based on assembly Language programming

COURSE NAME: PROGRAMMING IN C

- Explore the fundamentals of C language
- Apply the concepts of control structures, arrays, functions and file handling for effective Programming
- Develop programming skills by writing various C programs
- Develop C programming concepts to be used in the designing of embedded Systems

COURSE NAME: PRACTICAL-1 SEMICONDUCTOR DEVICES, DIGITAL DESIGN APPLICATIONS

- Explore the various semiconductor devices and its standard values
- Understand the functionality of fundamental GATES
- Able to practically design applications digital lCs
- Design various applications based CPLD and FPGA

COURSE NAME: PRACTICAL–2 MICROPROCESSOR, PROGRAMMING IN 'C'

- Understand the flow of Program
- Design various applications based on C programming
- To gain knowledge of debugging a program
- To have hands on experience of microprocessor programming

SEMESTER-2

COURSE NAME: EMBEDDED SYSTEMS AND APPLICATIONS

- Explore the fundamentals of Embedded Systems
- Interface various I/O devices with the microcontroller
- Deal with advanced microcontrollers
- Develop the designing concepts related to Embedded System application

COURSE NAME: BIOMEDICAL INSTRUMENTATION

- Explore the fundamentals of biomedical Systems
- Analyze various bioelectrical signals
- Deal with various biomedical sensors
- Develop the designing concepts related to biomedical system applications

COURSE NAME: COMPUTER ORGANIZATION AND INTERFACING.

- Develop the concepts of memory organization and various memory technologies
- Develop the design concepts of latest processors
- Analyze RISC and CISC processor design concepts

COURSE NAME: VIRTUAL INSTRUMENTATION AND PROGRAMMING IN LABVLEW

- Explore the fundamentals of LabVIEW programming language
- Apply the concepts of front panel design, icon and connector pane for instrument Prototype
- Enhancing programming skills by designing various virtual instruments
- Design various applications based on LabVIEW

COURSE NAME: PRACTICAL-1 EMBEDDED SYSTEMS APPLICATIONS, BIOMEDICAL INSTRUMENTATION

- Develop the skills of interfacing various I/O devices using microcontroller
- Develop the small applications using biomedical sensors
- Ability to write program codes for different microcontrollers
- Design and develop the Embedded systems based projects

COURSE NAME: PRACTICAL-2 COMPUTER LNTERFACING AND LABVLEW

- To be able to interface different I/O cards with computer
- To be able to have hands on experience of computer interfacing
- Develop the embedded instruments by the virtue of LabVIEW interfacing
- To be able to explore LabVIEW software to design different applications as per requirement

SEMESTER – 3

COURSE NAME: NETWORK ANALYSIS AND SYNTHESIS

- Explore the fundamentals of Network Analysis and Synthesis
- Apply various network theorems in the circuit design
- Develop the design concepts of various analog electronic circuits
- Analyze and synthesize various networks

COURSE NAME: FUZZY LOGIC AND ARTIFICIAL NEURAL NETWORKS

- Understand the basics of Fuzzy logic and their applications
- Apply the concepts of Fuzzy Logic for designing various control systems
- Design various applications based on Fuzzy Logic using MATLAB
- Explore the fundamentals of Neural network inside human brain and how
- they correlate with the artificial neural networks

COURSE NAME: DIGITAL SIGNAL PROCESSING

- Explore the fundamentals of Digital Signal Processing
- To be able to operate electro-mechanical devices through programming

COURSE NAME: DIGITAL IMAGE PROCESSING

- Explore the fundamentals of digital image processing
- Deal with image enhancement, filtering and restoration concepts.
- Develop the designing concepts related to DIP
- Design and develop the digital image processing based projects

COURSE NAME: MECHATRONICS

- Distinguish between different types of control systems and their applications in various fields
- Explore the fundamentals of mechatronics and control systems
- Choose the kind of control system necessary to develop a particular system
- Rectify the types of sensors and transducers for desired application

COURSE NAME: PRACTICAL-1 NETWORK ANALYSIS, FUZZY LOGIC AND

ARTIFICIAL NEURAL NETWORK

- Design various artificial neural networks using MATLAB to give intelligence to the machine
- To be able to have hands on experience to understand neural networks
- Able to apply basic fuzzy system modeling methods.

COURSE NAME: PRACTICAL-2 DIGITAL SIGNAL PROCESSING AND MECHATRONICS

- Design and develop the DSP based projects
- To be able to write program code for DSP filters
- To be able to interface electro-mechanical devices with microcontroller.
- Explore the fundamentals of satellite communication
- Develop the designing concepts related to mobile and satellite communication

SEMESTER-4

COURSE NAME: ELECTROMAGNETIC FIELDS AND ANTENNAS

- Explore the fundamentals of Electromagnetic fields and antennas
- Analyze various type of antenna
- Develop the basic concepts of antenna design.
- Deal with various antenna application and measurements

COURSE NAME: DIGITAL COMMUNICATION

- explore the fundamentals of digital communication
- Analyze various digital communication techniques
- Explore the fundamentals of information coding

COURSE NAME: MICROWAVE AND OPTICAL COMMUNICATION

- Explore the fundamentals of Microwave communication.
- Develop the basic concepts related to microwave and optical fiber communication.
- Explore the fundamental of optical fiber communication.

COURSE NAME: COMPUTER COMMUNICATION (ELECTIVE-2)

- Explore the fundamental of computer communication.
- Analyze various computer networking.
- Explore the fundamental of network layer

COURSE NAME: MOBILE AND SATELLITE COMMUNICATION

- Explore the fundamentals of mobile communication

- Analyze various communication techniques
- Deal with DSP processors
- Deal with various digital filter 4gtig, concepts
- Develop the designing concepts related to DSP

COURSE NAME: PC AND PC INTERFACE (FOUNDATION -2)

- Explore the fundamental of pc and pc interface
- Analyze the various types of I/O Buses and ports
- Develop the concept of data acquisition

COURSE NAME: BASIC ELECTRONICS (FOUNDATION L)

- Explore the fundamentals of analogue and digital electronics
- Design various analogue and digital electronic circuits
- Develop electronic circuits from discrete component to Integrated circuits
- Apply these circuits in various products and appliances.

COURSE NAME: PRACTICAL -L ANTENNA, MICROWAVE, MOBILE COMMUNICATION

- To understand the radiation pattern of different antenna
- To design antenna for different types of application.
- To explore functions of GSM module through AT commands.
- To be able to use data connection through GS modules and AT commands

COURSE NAME: PROJECT

- Undertake problem identification, formulation and solution
- Demonstrate a sound technical knowledge of their selected project
- Demonstrate the knowledge skills and attitudes of a professional
- Produce a workable model from the knowledge and skills

Kamla Nehru Mahavidyalaya

Department of Environmental Science

Session 2019-2020

Bachelor of Environmental Science

General Outcomes (U.G.)

- Environmental Science provides a scientific basis for management of earth systems.
- It focuses on the interaction between human activities, resources, and the environment.
- As human population grows and technology advances, pressures on earth's natural systems are becoming increasingly intense and complex.
- Environmental Science is an exciting field where science is used to best serve society.
- The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective.
- The Environmental Studies minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective. Students:
- Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Specific Programme Outcomes (B.Sc. Environmental Science)

- recognize the history, structure, function, interactions, and trends of key environmental systems: climate, earth, life, socio-political;
- assemble a logical chain of reasoning ranging from observation to inference and action, not only to identify and characterize a problem, but also to find solutions:
- design an independent scientific inquiry, from methods to interpretation;
- locate, organize, analyze, integrate, synthesize, and evaluate complex information from multiple and disparate sources;
- apply appropriate analytical and quantitative approaches:
- organize, visualize, and statistically analyze environmental data, and interpret relationships, trends and make predictions about future changes;

Kamla Nehru Mahavidyalaya

Department of Environmental Science

Session 2019-2020

Masters of Environmental Science

General Outcomes (P.G.)

- Environmental Science provides a scientific basis for management of earth systems.
- It focuses on the interaction between human activities, resources, and the environment.
- As human population grows and technology advances, pressures on earth's natural systems are becoming increasingly intense and complex.
- Environmental Science is an exciting field where science is used to best serve society
- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- The Environmental Science minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective. Students:
- Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.
- Appreciate key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Appreciate that one can apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Specific Programme Outcomes (M.Sc. Environmental Science)

- handle uncertain, complex, real-world problems in the lab, field, community, and workplace:
- observe analytically and integrate diverse information from variable sources outside of the classroom;
- think critically, creatively, resourcefully, and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic-mindedness;
- develop spatial literacy, understand the role of maps and 2-3 dimensional spatial systems; effectively process, reason, problem solve and communicate issues within a spacial context;
- utilize advances in environmental sciences and technology to resolve issues and anticipate implications;
- clearly communicate complex analyses, interpretations and significance through variable media (oral presentation, poster, proposal, research article, report), to audiences ranging from scientific to policy, and the general public;
- collaborate in teams, with peers and mentors, and work with others in diverse group settings, developing flexibility and leadership skills.

Kamla Nehru Mahavidyalaya

Department of Environmental Science

Session 2019-2020

Bachelor of Environmental Science

Course Outcome (U.G.)

1. Bachelor Of Environmental Science Semester I & II

SEMESTER I

PAPER –I

Fundamentals of Environmental Science

- Student will able to understand Multidisciplinary nature of Environmental Science . Environmental Education .Classification of Total Environment .
- Students will able to gain knowledge about Chemical Composition of Atmosphere; Division of Atmosphere . Mechanism of Cloud Formation, Classification of Clouds
- Students will able to compare Primary Meteorological Parameters & Secondary Meteorological Parameters
- Students will able to determine the Relative Humidity of Air Using Psychrometer ,Wind Speed and Wind Direction .
- Students will able to measure Light Intensity & solar constant .

PAPER –II

Environmental Ecology

- Students will able to understand basics of Ecology, Modern Branches of Ecology, Environmental Factors .
- Students will able to gain knowledge about ecological relationship, Inter specific and intraspecific relationships , ecological adaptations .

- Student will able to learn Population and Marine Ecology , Community Ecology , Ecological Succession.
- Students will able to compare Primary Productivity in a Water Body by Light & Dark Bottle Method.
- Students will able to study Plant Communities by Quadrate Method .

SEMESTER II

PAPER – III

Introduction to Water and Soil Chemistry

- Students will able to understand Characteristics of water , Water Sampling and Analysis
- Students will able to gain knowledge about Properties of Soil , Issues of Soil Sciences:
- Student will able to learn Physico-Chemical Characteristics of Water Quality
- Students will able to compare Water sampling for ground and surface water and its storage techniques.
- Students will able to determine Physico-Chemical Parameters (Colour, Temperature, Turbidity) for Characterizing and Evaluation of Water Quality.
- Students will able to evaluate Hydrogen Ion Concentration (pH) of Water and Wastewater ,Total Solids, Total Dissolved Solids, Total Suspended Solids by gravimetric method of Water and Wastewater.

PAPER – IV

Introduction to Ecosystem and Biodiversity

- Students will able to understand Ecosystems Biomes Biochemical Cycles .
- Students will able to gain knowledge about Productivity: Biogeochemical cycles Forest Ecology Forestry: Social Forestry
- Student will able to learn Biodiversity: Biodiversity Conservation: ‘Ex-Situ’ Conservation, ‘In-Situ’ Conservation

- Students can able to asses Conductivity of Water and Wastewater ,Chlorides of Water and Wastewater by Argentometric Method.
- Students will able to investigate Alkalinity of Water and Wastewater. Acidity of Water and Wastewater. Total Hardness of Water and Wastewater.

2. Bachelor Of Environmental Science Semester III & IV

Semester III

Paper V

Environmental Chemistry and Instrumentations

- Students will able to understand Aquatic Chemistry Characteristics of Water Surface Water Ocean Water
- Students will able to gain knowledge about Earth's Atmosphere, Green House Effect and Global Warming ,Stratospheric Chemistry .
- Student will able to learn Instrumental Methods Conductivity Measurement Chromatography , Colorimetry , Flame Photometry .
- Students will able to determine Residual Chlorine Ni2+, Co2+ and Cu2+ from given water sample.
- Students will able to analyse Water for its Potability Test

Paper VI

Environmental Microbiology and Water Treatment

- Students will able to understand Basic of Environmental Microbiology, Air Microflora ,Soil Microflora ,Water Microflora .
- Students will able to gain knowledge about Water supply and Distribution Epidemiology, Environmental Sanitation.
- Student will able to learn Water Treatment,Filtration ,Disinfection,Water Softening Processes ,Defluoridation, Reverse Osmosis.

- Students will able to Study of micro organisms by Standard Plate Count Method (SPC Method)
- Students will able to determine Total Coliforms of water by MPN Technique.
- Students will able to determine , Optimum Coagulant Dose, pH and time by Jar Test Apparatus.
- Students will able to evaluate Bacteria from Air. Water Soil.

Semester IV

Paper VII

Soil Pollution and Waste Management

- Students will able to understand Soil Pollution and Pollutants ,Pesticides Pollution Land Protection .
- Students will able to gain knowledge about Treatment and Disposal Solid Waste , Solid Waste Management , Biomedical Waste:
- Student will able to learn about Municipal Solid Waste ,Collection and Handling of Solid Waste , Hazardous Waste ,Hazardous Waste Management
- Students will able to compare Soil sampling methodology , Sampling of soils from different polluted sites , Cation Exchange Capacity of a Provided Soil Sample .
- Students will able to determine Nitrogen, Phosphorus & Potassium of Soil. Total Organic Carbon & Percent Organic matter in the given soil sample.
- Students will able to evaluate soil sample for micronutrients (Fe, Zn, Mn).

Paper VIII

Natural Resources and GIS

- Students will able to understand Energy Resources and Conservation ,Natural Resources ,Renewable (Non Conventional Sources of Energy 3.Non-Renewable (Conventional Source of Energy):

- Students will able to gain knowledge about Land Resources ,Mineral Resources ,Water Resources .
- Student will able to learn Natural Catastrophes and Disaster Management ,Risk Assessment Students will able to compare Remote Sensing and GIS Image processing GIS and its applications
- Students will able to determine for Acidity ,alkalinity ,solids (Total Solids, Total Suspended Solids) of biogas slurry
- Students will able to analyse Vermicompost for fertility.
- Students will able to demonstrate on non conventional energy resource systemi.e. Solar cooker and Solar water heater.

2. Bachelor Of Environmental Science Semester V & VI

Semester V

Paper IX

Principles of Air and Noise Pollution

- Students will able to understand Air Pollution, Air Pollutants , Air Pollution and Meteorology .
- Students will able to gain knowledge about Global Problems Associated with Air Pollution , Prevention and Control of Air Pollution .
- Student will able to learn Genesis of Vehicular Emissions,Vehicular Air Pollution Legislative Measures of Vehicular Pollution .
- Students will able to explain Errors in Environmental Analysis ,Noise Pollution .
- Students will able to determine Suspended Particulate Matter (SPM) & (RSPM) in Ambient Air by Using High Volume Sampler, key parameters like SOx & NOx.
- Students will able to evaluate Noise Pollution by Noise Meter .

Paper-X

Environmental Management

- Students will able to understand Basic Concepts of Environmental Impact Assessment .
- Students will able to gain knowledge about Environmental Impact Statement (EIS) Environmental Issues ,Methods of EIA .
- Student will able to learn concept of EIA . Environmental Audit (EA) ,Assessment of Impacts Environmental Awareness and Sustainable development ,Legislation of EIA
- Students will able to compare Environmental Audit in Polluting Industries .
- Students will able to prepare Environmental Audit Report.
- Students will able to evaluate Air Pollution Index (API).
- Students will able to prepare and inteprete Wind roses
- Students will able to demonstrate an Electrostatic Precipitator ,Cyclone Collector, Gravity Settling Chamber .

Semester VI

Paper-XI

Water Pollution: Monitoring and Management

- Students will able to understand Basic Concepts of Water Pollution Water Pollutants Water Quality Monitoring and Management .
- Students will able to gain knowledge about Marine Pollution Oil Pollution Eutrophication Disposal of Radio-active Waste.
- Student will able to learn Effects of Thermal pollution, Effects of Radioactive Pollution, Mitigation Measures of Thermal Pollution .
- Students will able to compare Sludge Volume Index (SVI) .
- Students will able to determine Chromium in a given Waste Water Sample
- Students will able to demonstrate Atomic Absorption Spectrophotometer (AAS) ,UV-Visible spectrophotometer ,Gas Chromatography

Paper XII

Water Supply and Wastewater Treatment

- Students will able to understand Water Distribution System Environmental Sanitation
- Students will able to gain knowledge about Wastewater Treatment Industrial Pollution and Treatment Options
- Student will able to learn Preliminary Treatment, Primary Treatment, Secondary treatment of water .
- Students will able to compare Biological Wastewater Treatment , Sludge Handling Treatment and Disposal .
- Students will able to determine Zn++ in water ,Cd++ in water ,Sulphate ,Phosphate
- Students will able to evaluate Total Kjeldahl's Nitrogen Biochemical Oxygen Demand (B.O.D) , Chemical Oxygen Demand (C.O.D)

.

Kamla Nehru Mahavidyalaya

Department of Environmental Science

Session 2019-2020

Master of Environmental Science

Course Outcome (P.G.)

Master Of Environmental Science Semester I & II

Semester I

Paper I

Environmental Chemistry

- Students will able to understand Normality, Molarity, Molality, Molar solution
- Students will able to gain knowledge about Quantitative Chemistry Adsorption& Absorption
- Student will able to learn Green Chemistry for Sustainable Future
- Students will able to explain Soil Chemistry Soil Pollution
- Students will able to determine water quality Water sampling and storage techniques.
- Students will able to evaluate pH, conductivity, density, viscosity, turbidity, colour.

Paper-II

Atmospheric Science

- Students will able to understand Segments of Environment, Climatology Global Climate Change .
- Students will able to gain knowledge about Classification of Clouds, Effects of Ozone Depletion .
- Student will able to learn concept of Primary Meteorological Parameters and their Measurement.
- Students will able to compare Wind Data, Wind Roses.
- Students will able to evaluate relative humidity by psychrometer .

Paper-III

Environmental Biology

- Students will able to understand Environmental Factors Ecological Relationship
- Students will able to gain knowledge about Population Ecology Concept of Carrying Capacity
- Student will able to learn Ecological Niche Ecotoxicology:
- Students will able to compare Biotransformation and Bioconcentration
- Students will able to determine Toxic Chemical in the Environment
- Students will able to find Coli form count by MID & MPN technique from water .

Paper IV

Environmental Microbiology and Biotechnology

- Students will able to understand Environmental Aspects of Infectious Diseases (Water Born Diseases)
- Students will able to gain knowledge about Role of Microbes in Sewage (Trickling Filter, Activated sludge Process and Oxidation Pond Process).
- Student will able to learn Microbial Methods Pour plate, Streak plate and Spread plate).MPN and SPC.
- Students will able to compare In-situ and Ex-situ Bioremediation Bio-control Agents-Bio-Pesticides, Bio-Insecticide
- Students will able to determine Phytoplanktons & Zooplanktons in surface water.
- Students will able to evaluate primary productivity by light and dark Bottle method

Semester II

Paper V

Environmental Ecosystem and Biodiversity

- Students will able to understand Introduction to Ecosystem Wildlife Conservation in India
- Students will able to gain knowledge about Biomes and Conservation of Forest
- Student will able to learn Biodiversity at Global, National & Regional Level
- Students will able to explain Wildlife Conservation Project Tiger, Project Elephant and Project Crocodile.
- Students will able to Collect and interprete wild life data with respective common species, endanger Species, rare species .
- Students will able to evaluate Biodiversity Conservation Strategies: '*Ex-situ*' Conservation (Zoos) '*In-situ*' Conservation (National Parks and Sanctuaries) .

Paper-VI

Natural Resources Management

- Students will able to understand Natural Resources ,Renewable (Non Conventional Source of Energy) ,Conservation of Energy .
- Students will able to gain knowledge about Non Renewable (Conventional Source of energy) , Exploitation and Conservation of Mineral resources .
- Student will able to learn concept of Water Resources Land & Forest Resources.
- Students will able to analyse biogas raw materials.
- Students will able to Estimation soil for Organic Carbon, NPK,CEC and SAR.

Paper-VII

Environmental Sampling and Research Methodology

- Students will able to understand Air Sampling , Water Sampling Soil and Solid Waste Sampling
- Students will able to gain knowledge about Research Methodology & Errors in Environmental Analysis
- Student will able to learn Soil and Solid Waste Sampling
- Students will able to Study of calorific value of biomass.
- Students will able to analyse coal for moisture volatile matter and carbon content .

Paper VIII

Analytical Techniques for Environmental Monitoring

- Students will able to understand Chromatography Liquid Chromatography Absorption Spectrophotometry , Polarography in Environmental Chemical Analysis,
- Students will able to gain knowledge about Voltametry with its Application in Environmental Measurements .
- Student will able to learn Ion Selective Electrodes Modern Instrumental Techniques
- Students will able to compare HPLC and GC for pesticide analysis
- Students will able to determine sulphate , phosphate by spectrophotometer.
- Students will able to evaluate nitrate by spectrophotometer

Master Of Environmental Science Semester III & IV

Semester III

Paper IX

Physico- Chemical Treatment of Water & Waste Water

- Students will able to understand Sources of Sanitary Sewage , Wastewater Collection
- Students will able to gain knowledge about Classification of industrial waste water
- Student will able to learn Treatment Flow sheet, Plant Layout, Hydraulic Profile
- Students will able to study Coagulation, Flocculation, Sedimentation, Filtration,
- Students will able to determine impurities of water viz. color , temp., odour and taste of water
  total solids in water (suspended & dissolved).
- Students will able to evaluate chloride in water samples of hardness in raw and treated water

Paper-X

Biological Process in Wastewater Treatment

- Students will able to understand Anaerobic Treatment Anaerobic Digestion and Sludge Treatment
- Students will able to gain knowledge about Aerated lagoon, Trickling Filters, Rotating Biological Contractor,
- Student will able to learn Activated Sludge Process Operation & Maintenance of Wastewater Treatment Plant
- Students will able to explain Zero Liquid Discharge (ZLD) & Common Effluent Treatment Plant (CETP).
- Students will able to determine Sludge Volume Index (SVI) & Sludge Density Index (SDI) of sludge samples
- Students will able to estimate of Nitrogen by Kjeldahl's methods .

Paper-XI

Water Pollution: Monitoring and Management

- Students will able to understand Aeration, Coagulation, Flocculation, Sedimentation, Filtration and Disinfection
- Students will able to gain knowledge about Different Water Treatment Flow Sheets
- Student will able to learn Filter Media and its Characteristics, Water Softening
- Students will able to compare Plain Chlorination, Prechlorination, Post chlorination, Super
- Chlorination, Double Chlorination, Break Point Chlorination,
- Students will able to determine physico-chemical and Bacteriological
- Parameters and their Role in Water Treatment.
- Students will able to demonstrate De-Salinisation of Brackish Waters Defluoridation, Nalgonda Technique

Paper XII

Advanced Water & Waste Water Treatment

- Students will able to understand advanced treatment in water and waste water discharge norms for waste water,
- Students will able to gain knowledge about Advancement in Water Treatment: Dual Media Filtration
- Student will able to learn Osmosis Technology for drinking water, High Rate Solid Contact Clarifier (HRSCC) Membrane Bio Reactor (MBR),
- Students will able to determine Automation in waste water treatment plant and its advantages.
- Students will able to evaluate Reverse osmosis a tool for water sustainability Nano Filtration, Multi Effect evaporators

Semester IV

Paper XIII

Air and Noise Pollution Control Technology

- Students will able to understand Classification of Air Pollutants and their Sources, Acid Rain, Photochemical Smog .
- Students will able to gain knowledge about standards Prescribed for Air Quality in India. Air Pollution Index
- Student will able to learn Air Sampling & Monitoring Electrostatic Precipitator, Fabric Filters, Cyclones Collector, Gravity Settling Chamber
- Students will able to explain Collection of Particulates, High Volume Sampler.
- Students will able to determine Comparative analysis air sampling from residential, commercial, and industrial zone using key parameters like SOx and NOx.
- Students will able to evaluate Base line Study of investigation of water, air, soil and noise quality of the area

Paper-XIV

Environmental Management

- Students will able to understand Nature of Solid Waste , Solid Waste Handling Methods
- Students will able to gain knowledge about Solid Waste Management Composting, Biogas from MSW
- Student will able to learn concept of Mass Burn Technology modern technologies for solid waste treatment
- Students will able to compare Integrated Approach for Minimization of Air, Water and Solid Pollutants
- Students will able to study Bioaccumulation, Mutagenicity, Teratogenicity Carcinogenicity and Genotoxicity.
- Students will able to demonstrate bio medical waste generation and disposal practices in urban area .

Paper-XV

Environmental Impact Assessment and Legislation

- Students will able to understand Environmental Impact Assessment Directly and Indirectly Measurable Impacts EIA Procedure Strategies for Environmental Management Plan .
- Students will able to gain knowledge about Environmental Audit and EMS Environmental Legislation The Air Prevention and Control of Pollution Act 1981
- Student will able to learn Salient Features of Coastal Zone Regulations (CZR)
- Students will able to study EIA legislation for environmental protection ,Green Belt Development.

Paper XVI

Disaster Management

- Students will able to understand difference between disaster and hazard ,Earthquake , Landslides
- Students will able to gain knowledge about Man- Made Disasters, types, nature of man-made disasters,
- Student will able to learn Nuclear disaster Transportation Accidents Forest fires,
- Students will able to evaluate disaster preparedness plans, disaster mitigation , mitigation approaches and strategies

Kamla Nehru Mahavidyalaya, Nagpur

Department of Mathematics

Session 2019-2020

Programme Outcomes of B.Sc.

1. Understand the basic concepts, fundamental principles, and the scientific theories related to scientific phenomena and their relevancies in the day-to-day life.

2. Being able to think creatively to propose novel ideas in explaining facts and figures or providing new solution to the problems.

3. Recognize real-world problem that are related to mathematical analysis, and formulate mathematical models of such problems.

4. Use Mathematical and statistical techniques to solve well-defined problems and present their mathematical work, both in oral and written format, to various audiences.

5. Formulate the analysis of mathematical and statistical problem, precisely define the key terms, and draw clear and reasonable conclusions.

6. Read, understand and construct correct mathematical statistical proofs and Use the library and electronic data-bases to locate information on Mathematical problems.

Kamla Nehru Mahavidyalaya, Nagpur

Department of Mathematics

Session 2019-2020

Course outcomes

B.Sc Ist sem

Paper I: Algebra and Trigonometry

Course	Outcomes
CO:111	Use Matrices to solve system of linear equations.
CO : 112	Find roots of polynomial equation in one variable
CO : 113	Understand the basic concept of complex analysis.
CO :114	Understand the basic concept of Group Theory.

Paper II : Calculus

Course	Outcomes
CO : 121	Discus the concept of Taylor and Maclaurin series and form the Sine and cosine series.
CO : 122	Examine about Leibnitz's theorem.
CO: 123	Students can derive the Euler's theorem on homogeneous function.
CO: 124	Enables to understand Partial derivatives of higher order

B.Sc IInd Sem

Course outcomes

Paper I : Geometry, Differential and Difference Equation

Course	Outcomes
CO : 211	Justify the concept of Exact differential equation.
CO : 212	Allow to discuss about Euler's equidimensional equation .
CO : 213	Students can derive the angle of intersection of two sphere.
CO : 214	Enables to understand differential equation of first order order.

Course outcomes

Paper II : Vector calculus and improper integrals

Course	Outcomes
CO : 221	Understand the concept of line Integral, work done, conservative vector field.
CO : 222	Use double integration to find area.
CO : 223	Solve problems on vector Integration (Surface Integral, Volume Integral).
CO : 224	Evaluate Improper Integrals.

B.Sc.- IIIrd Sem

Course Outcomes

Paper I-Advanced Calculus, Sequence and Series

Course Code	Course Outcomes
CO:311	Learn to investigate limit and continuity of function of two variables. Learn to construct Taylor's theorem for the function of two variables.
CO:312	Learn to analyze the concept of envelopes. Learn to investigate maxima, minima and saddle points of function of two variables.
CO:313	Learn to examine whether the sequence is convergent or divergent using Cauchy criterion
CO:314	Learn to examine whether the series is convergent or divergent using appropriate tests

Course Outcomes

Paper II -Differential Equation and Group Homomorphism

Course Code	Course Outcomes
CO:321	Able to evaluate Bessel's function and Bessel's Integral
CO:322	Learn to evaluate Laplace transform and inverse Laplace transform
CO:323	Able to: apply Laplace transform to solve ordinary linear differential equation, Evaluate Fourier transform, Fourier sin and cosine transform
CO:324	Learn to: explain group, abelian and cyclic group, investigate given set is group, normal subgroup

B.Sc.- IVth Sem

Course Outcomes

Paper I-Partial differential equation and calculus of variation

Course Code	Course Outcomes
CO:411	Solve Pfaffian differential equation and construct partial differential equations by eliminating arbitrary function and arbitrary constants.
CO:412	Learn to solve: Lagrange's equation, Integral surface passing through given curve, Charpit's method, Jacobi's method.
CO:413	Linear partial differential equation of second order and Homogeneous and Non-homogeneous linear partial differential equations with constant coefficients
CO:414	Learn to define functional, investigate continuity and extremum of a functional,

Course Outcomes

Paper II-Mechanics

Course Code	Course Outcomes
CO:421	Able to assess intrinsic and cartesian equation of catenary
CO:422	Learn to examine radial, transverse, tangential and normal components of velocity and acceleration
CO:423	Learn to construct Lagrangian for the given system of particles
CO:424	Learn to explain velocity-dependant potential, dissipation function central orbits and reduce two body problem to one body problem

B.Sc.- Vth Sem

Course Outcomes

Paper I: Analysis

Course	Outcomes
CO : 511	Explain the concept of Fourier series and form the sine and cosine series.
CO :512	Enables to discuss about Riemann-Stieltjes Integral
CO :513	Students can derive the analytic function in various problems
CO :514	Enables to understand Mobius transformation

Course outcomes

Paper II - metric space, Complex integration & algebra

Course	Outcomes
CO:521	Define and recognize the concept of metric space,open sets,closed sets,limit point, interior point
CO:522	Define and illustrate the concept of completeness
CO:523	Define rings,zero division of a ring, integral domain,field and prove theorem
CO:524	Use Cauchy's integral theorem and formula to compute line integrals

B.Sc.- VIth Sem

Course Outcomes

Paper I : Abstract Algebra

Course	Outcomes
CO : 611	Enables to use group and properties
CO : 612	Student can understand the concept of vector space
CO : 613	Find rank, nullity and kernel
CO : 614	By using transformation represent matrix form

Course outcomes

Paper II : Special theory of relativity

Course	Outcomes
CO:621	Define and recognize the Lorentz transformation and Galilean transformation
CO:622	Define the various types of definition related to transformation
CO:623	Define tensor and illustrate the various types of tensor
CO:624	Describe the equivalence and mass energy equation

Kamla Nehru Mahavidyalaya, Nagpur

Department of Mathematics

Session 2019-2020

Specific outcomes of B.Sc

1. In banking sector students can get in to with mathematics.

2. They can prepare for MPSC and UPSC exam.

3. Mathematics graduate can work as finance and investment analyst and advisor And chartered or certified accountant.

4. A career in teaching offers unparalleled job satisfaction.

-

Wanjari Group of Institutions
Amar Sewa Mandal's
Kamla Nehru Mahavidyalaya, Nagpur
Affiliated to RTM Nagpur University, Nagpur, Recognised by State Government
Re-accredited by NAAC with(A+)grade (CGPA 3.53)

Program Outcomes, Program Specific Outcomes and Course Outcomes

DEPARTMENT OF MICROBIOLOGY

SESSION-2019-2020

PROGRAM OUTCOMES (POs)

Name of Program: B. Sc. MICROBIOLOGY :

- Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology.

¬ Students will acquire and demonstrate competency in laboratory safety and in routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

¬ Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing.

¬ Students will demonstrate engagement in the microbiology discipline through involvement in research or internship activities, the microbiology student association club (MSA) and outreach or mentoring activities specific to microbiology.

¬ Students study microscopic living systems and organisms. They can work across a spectrum of private industries or government agencies. Cell biologists focus on the uses, functions, development and lives of cells and their related systems and interaction

PROGRAM SPECIFIC OUTCOME OF B. Sc. MICROBIOLOGY (PSOs)

This course presents the study of Micro organisms. On successful completion of the subject the student should have understood the Role of microorganisms in the diversity.

- A general course emphasizing distribution, morphology and physiology of microorganisms in addition to skills in aseptic procedures, isolation and identification.
- This course also includes sophomore level material covering immunology, virology, epidemiology and DNA technology.
- Recommended for all allied health students. Three hours lecture and four hours lab per week.
- With the individual Research projects, Research orientation will be improved which is reflected in the form of papers and conference presentations.
- Applied papers are advanced, making the students updated in the field. More number of practicals is there in the course making the students well worse with the subject.

Statements of Course Outcomes (COs)

Course: Sem I Paper 1 : History & Microbial physiology

By the end of this course, the students will be able to:

1. Understand the contributions of eminent scientists in the development of microbiology
2. Understand the ultra structure of bacterial cell
3. Compare the differences in bacterial cell with plant cell and animal cell
4. Classify the bacteria on the basis of various parameters.

Course: Sem I Paper 2 : Microbial diversity

By the end of this course, the students will be able to:

1. Compare prokaryotic organism with eukaryotic organism
2. Understand the importance of methane producing bacteria
3. Write the method of reproduction in algae fungi and protozoa
4. Understand and compare the characteristics properties of virus with other microbes
5. Understand various kinds of positive and negative interactions of different microbes

Course: Sem I LAB

By the end of this course, the students will be able to:

1. Understand working and mechanism of different equipments and tools used in microbiology
2. Prepare various nutrients media for cultivating microbes in laboratory
3. Perform the staining technique of various bacteria
4. Design an experiment to isolate specific bacteria in pure form from sample
5. Determine the sensitivity of specific bacteria to given antibiotics

Course: Sem II Paper 1 : Microbial physiology

By the end of this course, the students will be able to:

1. Understand the basic nutritional requirements of bacteria
2. Describe various types of nutrient media for cultivation and isolation of bacteria
3. Explain typical growth curve of bacteria
4. Understand the factors that responsible for bacterial growth
5. Explain mechanism of bacterial cell injury by an anti-microbial agent like anti-biotic.

Course: Sem II Paper 2 : Microbial Techniques

By the end of this course, the students will be able to:

1. Understand and explain basic principles and different kinds of microscope
2. Explain the process of different staining techniques
3. Understand and compare various types of stains and dyes
4. Analyze the determination of specific nutrients by bacteria

Course: LAB Sem 2

By the end of this course, the students will be able to:

1. Enumerate bacterial load in the food sample in quality unit
2. Cultivate bacteria in the lab by using aerobic & anaerobic techniques
3. Demonstrate antimicrobial power of heavy metal ion against any bacteria
4. Demonstrate effect VV radiations of bacterial growth.

Course: Sem III Paper 1 Chemistry of organic Constituents and Enzymology

By the end of this course, the students will be able to:

1. Understand the classification of organic compounds like carbohydrates
2. Understand the chemistry of different kinds of carbohydrates
3. Describe importance of vitamins to human body and their deficiency syndrome
4. Compare DNA and RNA
5. Understand the mechanism of enzyme.

Course: Sem III Paper 2 Industrial Microbiology

By the end of this course, the students will be able to:

1. Understand and describe scope of industrial microbiology
2. Understand and operate fomenters in various industries
3. Explain the process of commercial production and ethanol Vitamin B2 Beer, Wine Penicillin etc.
4. Perform the methods and harvesting and product recovery in industrial fermentations
5. Work out the maintenance of ferment or plant.

Course: LAB Sem III

By the end of this course, the students will be able to:

1. Design practical experiments to identify carbohydrates from given sample

2. Demonstrate enzyme activity by bacteria

3. Understand the techniques to estimate proteins, RNA, DNA from given sample

4. Design an experiment to produce ethanol by fermentation technique

5. Demonstrate application of feast in baking industry

Course: : Sem IV Paper 1 Metabolism

Course outcomes: By the end of this course, the students will be able to:

1. Understand the general strategy of metabolism

2. Understand and explain various metabolic processes operating in living cell

3. Understand the mechanism by which energy is generated in human body

4. Explain and describe the process of protein formation in living cell

5. Explain and describe the process of replication of DNA

Course: Sem IV Paper 2 Metabolism Applied Microbiology

Course outcomes: By the end of this course, the students will be able to:

1. Understand and explain the significance of bacteriological analysis of drinking water

2. Understand and describe various methods applied for treatment of water and waste water

3. Explain the methods for disposal of industrial wastes

4. Understand the role of microbes of soil in various important processes

5. Describe and explain the applications of bacteria and fungi in bio fertilizers

Course: LAB Sem IV

Course outcomes: By the end of this course, the students will be able to:

1. Understand the techniques to isolate microbes from water and waste water(sewage)

2. Understand and demonstrate chlorination of water

3. Demonstrate the technique to find out the alkalinity of water sample

4. Design the experiment to find out quality of raw material

5. Find out microbial load in given drinking water sample.

Course: Sem V Paper 1 Medical Microbiology

Course outcomes: By the end of this course, the students will be able to:

1. Understand and explain the stages of infections diseases

2. Describe various modes by which infections spread in community

3. Describe various methods that can be adopted to control spread of infection in community

4. Understand and explain various hospital borne, air borne and water-borne diseases

5. Understand how to educate the people about taking care of health

6. Understand the role of drugs in disease control.

Course: Sem V Paper 2 Molecular Biology & Bioinstrumentation

Course outcomes: By the end of this course, the students will be able to:

1. Understand and describe various concepts – related with genre and its regulation

2. Understand and explain various processes by which gene transfer occurs amongst microbes

3. Explain the causes of gene mutation and their effect on cell

4. Understand and explain the principles, methodology and application of various bio instruments like spectrophotometer, electrophoresis, chromatography, centrifuge etc

Course: LAB Sem V

Course outcomes: By the end of this course, the students will be able to:

1. Understand the techniques for isolation of DNA and RNA from living cell

2. Understand and describe liver function test by estimating creatinine from patient's serum

3. Analyze proper chromatography technique to find out unknown organic compounds from sample

4. Understand and design the experiment to diagnose pathogenic organism from patient.

Course: Sem VI Paper 1 Immunology

Course outcomes: By the end of this course, the students will be able to:

1. Understand and describe human body's resistance mechanism against disease

2. Understand and write the role of human body's various organs in natural resistance.

3. Understand the properties, structure and importance of antibiotics in immunity

4. Understand various mechanism by which antibiotic destroys antigens

5. Describe and explain the reasons, classes and development of allergy in humans.

Course: Sem VI Paper 2 Biotechnology

Course outcomes: By the end of this course, the students will be able to:

1. Understand the tools and techniques of genetic engineering

2. Understand and describe DNA, fingerprinting and its application in forensic science

3. Understand the methods of production of health related compounds by biotechnology

4. Understand and write application of biotechnology in agriculture

5. Explain and describe the advantages /disadvantages of genetic engineering for humans

6. Understand the production and importance of genetically modified food

Course: LAB Sem VI

Course outcomes: By the end of this course, the students will be able to:

1. Understand and analyze the experiment to diagnose sexually transmitted disease

2. Understand and describe the detection of typhoid

3. Analyze the production of bio-fertilizer

4. Analyze the production of soyasauce

5. Understand and explain various experiments to diagnose diseases.

Program outcomes

Name of Program: M.Sc. Microbiology

Program outcomes

POI Students will be able to gain, communicative, recall and apply spccializcd language and knowledge relevant to microbiology.

PO2 Studcnts will acquire and demonstrate ability in laboratory safety in routinc and specializcd microbiological laboratory skills applicable to microbiological rescarch methods, including observations and analysis.

PO3 Students will develop ability for hypothesis generation and tcsting, development oftheoretical and practical skills in the designing and execution of experiments results and analytical judgmcnt clearly and quickly.

PO4 Students will be abte to work effectively in diverse condition as team to communicate with social community to make life easier and better for society by explaining awareness about hygienic condition, Environmental changes, recycling of waste by using microorganisms.

PO5 Students will able to develop professional and technical skilt in lectureship, quality control, scientist in industries as well as in research laboratories.

PROGRAM SPECIFIC OUTCOME OF M. Sc. MICROBIOLOGY (PSOs)

PSO1 A thorough knowledge of Environmental microbiology, Food & Dairy Microbiology, microbial genetics, Industrial microbiology and many other biotechnologies involved in microbiology industries.

PSO 2 Production of substantial original research of significance and quality sufficient for publication. Ability to present their work through written, oral, and visual presentations, including an original research proposal. Awareness of ethical issues in Microbiology research and careers options.

PSO 3 The programme provides a solid foundation for a career working with project management, business development or venture capital within the microbiology, pharmaceutical, medical technology

Course Outcomes (COs)

SEMESTER-I

PAPER-I Course Name : Microbial Metabolism

COI The students will be able to explain the metabolic pathways - the energy yielding and cnergy-requiring reactions in life.

C02 The students will be able to explain the diversity of metabolic regulation and how this is specifically achieved in different cells.

CO3 The students will be able to describe biochemical processes with specific control sites and key junctions.

CO4 The students will be able to explain structure, function and biosynthesis of biomolecules like lipids, carbohydrates, proteins and nucleic acid.

C05 The students will be able to explain and analyse photosynthetic bacteria from the environment.

C06 The students will be able to compare anoxygenic and oxygenic photosynthesis.

CO7 Thc students will be able to discuss role of Nitrogen and Sulphur metabolism and methanogenesis for useful crop production to the farmers.

PAPER II- Course Name: Enzvmology and Techniques II

COI The students will be able to discuss structure, functions and the mechanisms of action of enzymes.

CO2 The students will explain kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process.

CO3 Students have comprehension in the action of enzymes as biocatalysts and in factors that influence enzymc activity.

CO4 Students will able to explain and calculate the kinetics of enzyme of by using unknown substrate

CO5 Students develop an ability for purification, handling and characterization of proteins.

CO6 The students will be able to perform immobilization ofenzymes for higher production of products.

CO7 Students able to perform glucose biosensor and their application and discuss about Protein engineering.

CO8 The students will get knowlcdge of wide applications ofenzymes and their future potential.

PAPER III Course Name : Advance Techniques in Microbiology

COI Students will casily explain thc basic principles of advance techniques lor identilication and characterization of microorganisms.

CO2 Students develop an ability to find microbial cell structure and their internal components by using SEM,TEM, Staining procedures and microscopy,Fluorescent Microscopy.

CO3 Students describe how to identify DNA, RNA on basis of blotting techniques and electrophoresis techniques.

CO4 Students will able develop practical skill for identification of proteins, DNA, RNA by using agarose electrophoresis.

CO5 Students gain experience in microbiological laboratory practices and skills in the design and implementation of microbiology related research.

PAPER-IV Course Name : Membrane Structure and Signal Transduction

COI The students will be able to explain the biochemical and biophysical properties of membranes constituents contribute to the structure and organisation of membranes.

CO2 The students will bc able to describe Cell compartmentalisation and how proteins are transportcd between organellcs.

CO3 The students will be able to explain the principles and organisation of signal transduction pathway.

CO4 The students will be able to discuss membranes ions and solutes are transported across membrane.

CO5 The students explain how sporulation and mating occurs in yeast by signal transduction pathways.

CO6 Students able to isolatc, charactcrize and identify membrane structure by using differential scanning colorimetry, flouroscence photobleaching recovery,flow cytometry.

Course Name : PRACTICAL-I

COI Students will able to handle instruments, calculate the amount and interpret the result of unknown biological samples such lipids, carbohydrates, proteins, DNA and RNA and also draw conclusions from data. Students will able to calculate kinetics of enzyme analyse and interpret the results.

Course Name : PRACTICAL II

COI Students will able to separate and identify biomolecules amino acids, DNA and proteins by using separation techniques such as electrophoresis and paper chromatography analyse and interpret the results.

CO2 Students will able to calculate, analyse the results of DNA and RNA also draw conclusions from data.

Course Name : SEMINAR

COL Students will able to express thoughts and ideas eflcctively by using appropriate media alsodevelop Skill & personality development for communication and teaching ability.

SEMESTER II

PAPER-I Course Name : Microbial Methods For Environment Management

CO1 Students will discuss about how microbial changes induced by organic and inorganic pollutants.

CO2 The students will explain Biodeterioration, Biomagnification,biotransformation of pesticides, Bioleaching, Biodegradation of plastics.

CO3 Students will easily discuss how to manage pollution from thc environment with the help of microorganisms in waste water management using activated sludge, aerated lagoons, trickling filter

CO4 Students will get share thoughts about global Environmental Problems such Ozone depletion, UV-B, greenhouse effect, acid rain, their impact and biotechnological approaches for managcment. Global warming and climate change and can give information to communities how to prevent from these climatic changes.

PAPER II Course Name : Microbial Metabolites

CO1 Students recognise and use fundamental concepts in the field of plant secondary metabolites, mycotoxins, bioactive compounds and structure and mode of action of secondary metabolites.

CO2 Students collect the information about Biopolymers such as Polypeptides, polynucleotides and polysaccharides also have knowledge about outline and functions of polyamines.

CO3 Students develop critical and analytical attitude on the use ofplant bioactive compounds for formulation of medicines.

CO4 Students able to explain the major action and effects of antimicrobial drugs used to treat various inlectious diseases.

CO5 Students become autonomous in searching scientiflc literature on secondary metabolism and bioactive compounds.

CO6 Students able to identify Pigments as secondary metabolites and their important in plants and m icroorganisrns.

CO7 Students able to know Structure, function and chemistry of vitamins and their deficiency diseases.

PAPER-III Course Name : Mcdical Microbiology and Parasitology

CO1 Students able to explainabout pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

C02 Students able to develop skill about diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases and use of microbiology laboratories in medical field.

CO3 Students able to explain the importance of pathogenic bacteria in human disease with respect to infections of the urinary tract, respiralory tract, gastrointestinal tract and explain the methods of how microorganisms to be control.

CO4 Students will be able to distinguish aspects of the morphology, physiology and genetics ofthe diverse microbial groups

C05 Students will be able to apply experimental methods for the detection and identification of pathogenic agents such as bacteria, fungi, parasites.

CO6 Students will be able to describe and apply specific methods for the study of human parasites and its parasitosis.

CO7 Students will be able to devclop an ability to identify microorganisms by using different laboratory techniques and analyse thc results.

PAPER-IV Course Name : Immunology and Immunodiagnostics

COI Students have to explain concepts in immunology along with overall organization of the immune system and their mechanism.

CO2 Students will discuss the significance of maintaining a state of immune tolerance sufficient to prevent the emergence of autoimmunity.

CO3 Studentsable to explain about tumour Immunology and its immune prophylaxis and immune therapy.

CO4 Students will able to explain the Immunodeficiency disorders and hypersensitivity and their types and control.

CO5 Students will able to discuss leatures of antigen antibody reaction & its uses in diagnostics and various other studies.

Course Name: PRACTICAL

COI Students will able to handle instruments, calculate the amount and interpret the result of unknown biological samples such lipids. carbohydratcs, proteins, DNA and RNA and also draw conclusions from data.

CO2 Students will able to calculate kinetics of enzyme analyse and interpret the results.

Course Name : PRACTICAL-IV

COI Students will able to isolate, identify, and differentiate between different microorganisms by using

CO2 Students will able to aseptically handle body fluids as well as idcntify disease by using serological tests and draw conclusions.

Course Name : SEMINAR

CO1 Students will able to cxpress thoughts and ideas effectively by using appropriate media also develop Skill & personality development or communication and teaching ability.

SEMESTER III

PAPER I Course Name : Molecular Biology and Genetics II

COL Studentswill able to explain the structure, properties and function of genes in living organisms at the molecular level and knowledge about DNA as a genetic material, and replication discuss the molecular mechanisms underlying mutations, detection of mutations , DNA damage and repair mechanisms

CO2 Students able to know the importance strategies of molecular mechanisms involved in transcription and translation

C03 Studcnts also explain the concept of recombination, linkage mapping and elucidate the gene transfbr mechanisms in prokaryotes and eukaryotes

CO4 Students easily explain the concept of gene Regulation and its Expression

CO5 Students have knowledge about genetics of Bacteria and Bacteriophages such as mapping bacteriophage gene by recombination analysis, deletion mapping and complementation and also about Transposons

CO6 Studcnts will able to handle and independently work on lab protocols involving molecular techniques

PAPER-II Course Name : Recombinant DNA Technology and Nanobiotechnology

COI Students will become familiar with the tools and techniques of genetic engineering- DNA manipulation enzymes, genome and analysis and Manipulation tools, gene express ion regulation.

CO2 Students have an ability to explain the steps of PCR and discuss the components and optimization of the process.

CO3 Students able to explain about Restriction mapping: dideoxy and pyrosequencing, DNA fingerprinting expressions, Dnasefootprinting, DMS footprinting,DNA sequencing Mapping, primer

CO4 Students will have practical knowledge about Tissue Culture and stem cell technology to improve food products and their applications.

CO5 Students will discuss about Stem cell technology-embryonal stem cell and multipotent stem cells

CO6 Students able to know the concept of Transgenic plants and plant products.

CO7 Students expertise handling the instruments and techniques in genetic engineering in biological research.

PAPER-III Course Name : Microbial Divcrsity, Evolution and Ecology

COI Students will able to ex lain about Evolution of Earth and early life forms.

C02 Students able to discuss Primitive lile lorms such asRNA world, molecular coding, energy and carbon metabolism, origin of Eukaryotes,endos mbiosis.

C03 Students will able to explains about Methods for determining evolutionary relationships like Evolutionary chronometers, Ribosomal RNA sequencing, signature sequences, phyllogenetic probes, microbial community analysis

C04 Students able to explain General Metabolism and Autotroph in archea

CO5 Students able to explain Microbial Diversity: Bacteria explaining Free living N2 fixing bacteria, purple phototrophic bacteria nitrifying bacteria, sulphur and iron oxidize bacteria. sulphate and sulphur reducing bacteria.

PAPER-IV Course Name : Drug and Disease Management

CO1 Students able to share knowledge about Drug latentiation and Prodrug, carrier-linked prodrugs bio precursors prodrugs.

C02 Students explain about Drug-microbe-Host relationship, mechanism of drug action and drug resistance including MDR.

CO3 Students will ability to know Antiinfective agents Antifungal agents.

C04 Students willable to discuss about structure activity relationships in relation to drug-target interactions

CO5 Students will able to explain Antiprotozoal agent Antimalarials Histamines and Antihistaminic agents Analgesic agents and their mechanisms of action.

Course Name : PRACTICAL-V

COI Students will able to learn all advance molecular biology techniques isolation, identification and characterization of DNA also learn the methods of how to re recombinant DNA b us Genctic cn lneenn tools

CO2 Studcnts will able to handle instruments,prepare chemicals, calculate the amount and interpret the result of DNA, plasmid DNA and RNA and also draw conclusions from data.

Course Name : PRACTICAL VI

COI Students will able to isolate, identify, and differentiate between different microoganism by using microbiological techniques and methods.

CO2 Students will able to aseptically handle body fluids as well as identify disease by using serological tests and draw conclusions.

Course Name : SEMINAR

COI Students will able to express thoughts and ideas effectively by using appropriate media also develop Skill & personality development for communication and teaching ability.

SEMESTER.IV

PAPER-I Course Name : Virology

COI Students will able to explain the architecture of viruses, their Nomenclature and classification of viruses (Regenmortel et.a1.2005, 8th Report of ICTV). Genetic classification and the methods used in their study.

C02 Student will discuss about morphology and structure ofviruses (size and shape/symmetry). Chemical composition of viruses (viral capsid, spikes, envelopes and types ofviral nucleic acids) and Assay of Viruses.

CO3 Students will able to explain about Structural organization; life cycle of Viruses.

CO4 Student able to discuss about Life cycle, pathogenesis and laboratory diagnosis of plants and animal viruses.

CO5 Students will able to handle and expertise in general techniques of Diagnosis of viruses and share knowledge about antiviral drugs.

PAPER II Course Name : Microbial Fermcntation Technology

CO1 Student will able to discuss how microbiology is applied in manufacture of industrial products, learn methods in discovery of new useful microorganisms and acquire knowledge of the design of Fermenters and process controls .

CO2 Students will able to explain how to develop an understanding of fermentation &inoculum media, their formulation and principles & techniques of sterilization.

CO3 Students will able to explain about the different types of fermentation processes & understand the biochemistry of various fermentations and product recovery methods.

CO4 Students have ability to gain knowledge about latest techniques applicable for Improvement of microorganisms bascd on known biochemical pathways and regulatory mechanisms and learn thc methods of immobilization of enzymes and cells.

PAPER III Course Name : Microbial Diversity, Evolution and Ecology

COI Students explains the microbial ecosystem includes Terrestrial environment, deep surface microbiology, Fresh water environment, lake and river Microbiology. Marine Microbiology and hydrothermal vents.

CO2 Students will able to discuss about Diversity, stability and succession.

C03 Students able to discuss the source of genctic variation such as HardyWeinberg genetic drift.

CO4 Studentswill able to explain the concept of microbial Interactions and Ecosystem Management.

PAPER IV Coursc Namc : Vaccincs and Delievery System

COI Students explain the importance of vaccination and their types Active and passive prophylactive measures.

CO2 Students describe the basic principles of vaccination, Students explain how the public arc less tolerant of the risk .

CO4 Students explain subunit vaccines, DNA vaccines and Vaccines additives and adjuvants.

CO5 Students also know about conventional vaccines and advanced vaccines produclion and their effect on microbial model.

CO6 Students also have knowledge about Designing & delivery system Drug designing, Non-automated in vitro drug susceptibility testing, Rapid tests for susceptibility testing, and antibiotic assay in body fluid, Drugs & vaccines delivery system.

Course Name : PRACTICAL-VII

CO1 Students will able to produce transgenic plants by using plant tissue culture techniques.

CO2 Students will able to handle instruments, prepare chemicals, calculate the amount and interpret the result also draw conclusions from data.

Course Name : PROJECT WORK

COI Students will able to develop research ability in microbiology field such as medical, agricultural, food and fermentation, dairy, pharmaceutical, environmental, and genetic engineering for isolation, identification and characterization of different microorganisms also develop an ability to execution of oral and writing skills for paper publication also necessary for effective communication of experimental results, the ability to think critically regarding a respective topic, and the conveyance of scientific results to both scientists and non-scientific community.

Course Name : SEMINAR

COI Students will able to express thoughts and ideas eflectively by using appropriate media also develop Skill & personality development for communication and teaching ability.

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF PHYSICS

Program outcomes for B.Sc. Course With Mathematics

After the graduation in science science faculty (B.Sc.) a student will be able to

1. Examine the basic concept, fundamental principles and the scientific theories related to various scientific phenomena and rate their relevance in the day to day life.

2. Assess skills in handling scientific instruments, planning and performing experiments in recommended laboratories.

3. Inspect the given scientific data critically and systematically and the ability to draw the objective conclusions.

4.Think creatively to propose novel ideas in explaining facts and figures or providing new solutions to the problems.

5.Developed scientific outlook not only with respect to science subjects but also in all aspects related to life.

COURSE OUTCOME FOR B.Sc. PHYSICS

After completing this course students will able to

B.Sc. I year

SEM I - PAPER I (Properties of Matter and Mechanics)

- Understand the elastic behaviour of materials.
- Analyse the bending behaviour of beams
- Understand the concept surface tension and viscosity of fluid
- Understand the basics of rigid body dynamics.
- Compare the Newton's Laws of motion and Laws of Gravitation.

SEM I - PAPER II (Electrostatics, Time varying fields and Electric currents)

- Demonstrate an understanding of core knowledge in electrostatics.
- Understand the properties of dielectric materials and its behaviour in presence of electric field
- Understand the conversion of electric field and magnetic field and vice versa.
- Understand the basic laws of electromagnetism such as Faraday's Law, Lenz law, Biot Savert Law, Ampere's Law and Gauss Law.

SEM II - PAPER I (Oscillations, Kinetic Theory of gases and Thermodynamics)

- Differentiate between linear and angular S.H.M.
- Illustrate Free oscillations and Damped oscillations.
- Demonstration of forced oscillations and resonance.
- Understand the nature of calorimetry by specific heat of solids and law of thermodynamics and entropy
- Analyses of zeroth law of thermodynamics and entropy
- Understanding the low temperature physics

SEM II - PAPER II (Gravitation, Astrophysics, Magnetism and Magnetostatics)

- Explain Kepler's Laws of Planetary motion.
- Describe the Gravitational potential and Gauss's theorem.
- Predict the constituents of universe (Solar system, Stars, Galaxies)
- Evaluate the mass of sun and planets.
- Categorize Ferromagnetic, Antiferromagnetic and Ferrimagnetic materials.
- Examine Meissner effect and Langevin's theory.
- Analyse Magnetic field, Lorentz force equation and magnetic dipole moment.

B.Sc. II year

SEM III - PAPER I (Sound waves, Applies acoustic, Ultrasonic and Power supply)

- Understand Harmonics, Quality of sound, human ear and its response and its audibility to sound.
- Describe characteristics of the transducers and investigate the requirements of good acoustics.
- Inspect ultrasonic waves, their properties, Methods of generation ultrasonic waves and their applications in research.
- Analyse waves and oscillations.
- Design power supply and explain conversion of A.C. to D. C., importance of voltage, current and load regulation.

SEM III - PAPER II (Physical optics and Electromagnetic waves)

- Elaborate the wave nature of light.
- Analyze the intensity variation of light due to, interference and diffraction.
- Assess the application of Michelson and Fabry-Parot Interferometer
- Analyze the polarization and its applications.
- Interpret the Electromagnetic wave, the Maxwell's field equations, and transverse nature of electromagnetic wave.
- Interpret Poynting's theorem and its importance.

SEM IV - PAPER I (Solid state Physics, X-rays and Lasers)

- Understand the concept of reciprocal space lattice and know the significance of Brillouin zones
- Classify the crystal systems and spatial symmetries, Miller indices.
- Understand how crystalline materials are studied using different diffraction techniques.
- Explain the types, properties and production of X-rays with their applications.
- Elaborate fundamental concepts of LASER and their production along with applications.

SEM IV - PAPER II (Solid state electronics and Molecular Physics)

- Understand the basics of diode and working of rectifier circuits and characteristics
- Analyse the characteristics of transistor and transistor biasing circuits
- Justify the fundamentals, fabrication along with their applications in day to day life of LED, Solar Cell and BJT.
- Investigate the basics along with applications of FET, JFET and MOSFET and their special features.

- Understand and elaborate Quantization of vibrational and rotational energies, types of molecules, Diatomic molecules as harmonic and anharmonic oscillator, Rotational-vibrational spectra, Born Oppenheimer approximation.
- Describe the importance and applications of Raman spectroscopy in molecular physics also know the Frank-Condon principle, Elementary ideas of NMR and ESR and their applications in spectroscopy.

B.Sc. III year

SEM V - PAPER I (Atomic Physics, Free electron theory and Statistical Physics)

- Categorize theories of atomic model and classify quantum numbers.
- Predict the momentums and magnetic moments associated with different motion of electron and their interaction with each other.
- Differentiate electrical and thermal conduction of electron.
- Understand basics of Fermi Energy, Fermi temperature band. Different theorems, models and experiments regarding free electron theory.
- Explain the concepts of μ- space, Gamma space, probability distribution, and thermodynamic probability, Principle of a priori probability, Boltzmann′s entropy relation, different states, Maxwell-Boltzmann distribution law, and its application.
- Categorize Bose-Einstein statistics, Fermi-Dirac distribution and its application.

SEM V - PAPER II (Quantum Mechanics, Nanoscience and Nanotechnology)

- Outline the main aspects of the historical development of quantum mechanics and wave properties of matter and able to correlate the classical mechanics with quantum mechanics,.
- Solve Schrodinger equation in one to three dimensions and their physical interpretation.
- Understand the uses of nanoscience and nanotechnology in day to day life and synthesis of nanomaterials.
- Analyse the nanomaterials using different characterization technique.

SEM VI - PAPER I (Relativity, Nuclear Physics and Bio Physics)

- Discuss the concept of Frame of references, Postulates of the special theory of relativity and relativistic variation in, Length, Time, mass, Velocity addition, and Mass energy equivalence.

- Elaborate detectors of radiation, charge accelerators, nuclear reaction along with types of nuclear reactions and their importance in recent technology.
- Understand and able to explain fundamental concepts of decay particles.
- Investigate the terminology Bio physics, and its importance in medical field.

SEM VI - PAPER II (Electronics, Fiber optics, Communication electronics and Digital Electronics)

- Illustrate the fabrication and working principles of Amplifiers and oscillators and their applications.
- Understand the principle and working of Fiber optics, Importance of optical fiber, Propagation of light waves in optical fiber and its importance in communication .
- Classify the Communication types like AM, FM their fundamental theory along with how the broadcasting of television is done by these means.
- Understand the binary arithmetic , logics and Boolean functions.

COURSE OUTCOME FOR M.Sc. PHYSICS

After completing this course students will able to

M.Sc.Part -I, SEMESTER- I
Paper 1 (Core- 1) 1T1, Mathematical Physics:

- Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical applications in physics.
- Learn the fundamentals and applications of Fourier Integral, Fourier transformsetc.
- Perceivethe concept of **tensor** variables and difference from scalar or vector variables. It includes derivation of base vectors, metric **tensors** and strain **tensors** in an arbitrary coordinate system
- Illustrate the concept of Laplace transformation are itsusefulness for solving electrical circuit problems
- It includes matrices which are used in physics related application Matrices are applied in the study of electrical circuits, quantum mechanics, and optics; it is used for solving Kirchhoff's laws of current and voltage.
- Get introduced to Special functions like Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions and their recurrence relations
- Learn different ways of solving second order differential equations and familiarized with singular points.

Semester I Paper 2 (Core 2) 1T2 Complex Analysis and Numerical Methods

- Solve simple problems involving complex algebra such as rationalization.
- Given a function, determine if it is analytic' integrate various functions using calculus of residues.
- Compute pole expansion and product
- Given a function, determine if it is analytic' integrate various functions using calculus of residues.
- Compute pole expansion and product expansion of certain functions. Numerical method to solve a problem gives an easy to use method that gives a quick result ascompared to the analytic methods. Numerical methods are useful to solve the problems where analyticmethods fail.
- Find the roots of a given nonlinear function.
- For a given data, fit a function, interpolate or extrapolate as necessary.
- Solve ordinary differential equations. Compute integrals numerically.

Semester I Paper 3 (Core 3) 1T3 Electronics:

- Understand the basic concepts, mainly characteristic curves and physics of p-n junction of differentsolid state electronics devices:
  a) Special purpose diodes- Schottky, Tunnel and MOS diodes
  b) BJT, JFET, MOSFET
  c) UJT, SCR
  d) Opto-electronic devices: Photodiodes, Solar cells, LED, LCD and Photo transistor
  e) Some processes for manufacturing ICs: diffusion of impurities in Silicon, growth of oxides
- Use the semiconductor devices in linear and digital circuits:
  a) Use of zener diode to make a regulated dc power supply
  b) Making amplifier circuits using BJT, JFET and MOSFETs
  c) Cascading of amplifier stages to increase the gain of the amplifier using RC coupling,transformer coupling and direct coupling
  d) Understand the concept of negative feedback in amplifiers: voltage [series, shunt], current[series, shunt]
  e) Use of positive feedback to understand the working of different oscillator circuits like Phaseshift oscillators, Hartley, Colpitts, and Crystal control oscillator circuits
  f) Cutting the unwanted signal by using clippers and to raise or decrease the signal voltage levelby clampers
  g) How to use the transistor as a switch and understand the universal TTL and ComplimentaryMOS gates
- Understand the digital integrated circuits:
  a) Understand the basic working of different logic gates and laws of Boolean algebra, De Morgantheorem, NOR & NAND logic for simplification of circuits. Understand and design differentcontrolling circuits used in digital electronics

b) Use of transistor as multivibrators
c) Analyze the relationship between analogue and digital circuits.
d) Understand different digital storage devices, memory, and their classification with expansion.
e) Understand and describe 8085 microprocessor
f) Analyze the different parameters of OP-AMP
g) Understand the applications of OP-AMP for positive and negative feedback concept

- Understand the basics of electronics communication and types of communication
  a) Describe different propagation modes of signals
  b) Understand the concept of digital communication
  c) Understand fiber optics communication system and concept of modern communication system
  d) Understand the working of different microwave oscillators, resonators and standing wave detector

Paper 4 (Core 4) 1T4, Electrodynamics-I:

- Familiar with the static properties of electric and magnetic fields
- Understand the concept of electric field and they should be able to solve problems
- Familiar with the definition of electric current and electric current density. They should understand the important information contained in the equation of continuity and they should be able to solve simple problems involving this equation
- Understanding the concept of the magnetic field and be able to calculate this from given current distributions.
- Understand how the Maxwell equations arise as a synthesis of the various individual electromagnetic phenomena and know how Maxwell's equations lead to electromagnetic waves.

SEMESTER- II

Paper 5 (Core 5) 2T1, Quantum Mechanics I:

- The students can gain the knowledge of the time-dependent and time-independent Schrodingerequation for simple potentials like, the harmonic oscillator and hydrogen like atoms.
- Students will understand the central concepts and principles in quantum mechanics, such as theSchrodinger equation, the wave function and its statistical interpretation, the uncertainty principle,
- Students will be able to solve the Schrodinger equation on their own for simple systems in one tothree dimensions. Also they will be able to use these solutions to calculate their time evolution,associated probabilities, expectation values, and uncertainties.
- Students will have mastered the concepts of angular momentum and spin, as well as the rules forquantization
- Identify and relate the Eigen value problems for energy, momentum, angular momentum and centralpotentials and explain the idea of spin.

Paper 6 (Core 6) 2T2 Statistical Physics:

- The students are able explain fundamentals of statistical physics and thermodynamics as logicalconsequences of the postulates. The students able to elaborate the BE, FD and BE statistics.
- Able to explain Fermi function, Fermi energy, ideal Fermi gas at absolute zero and below Fermitemperature, Fermionic condensation and fermions in metals.
- The students can understand and explain the importance of Phase transition of first and second order,Landau theory of phase transition, Ising model, Brownian motion, Langevin theory, Fokker-Planckequation. Weiss theory of ferromagnetism

Paper 7 (Core 7) 2T3 Classical Mechanics:

- The students will be able to understand and describe mechanics of a particle, and the motion of amechanical system using Lagrange-Hamilton formalism.
- Able to describe conservation theorems and symmetry properties, Hamiltonian formalism,conservation laws, Poisson theorems and Hamilton-Jacobi theory.
- Able to describe and understand planar and spatial motion of a rigid body, two body collisions,Rutherford scattering in laboratory and centre-of-mass frames
- The students are able to explain Rigid body dynamics, Euler's angles, Euler's theorem, moment ofinertia tensor, eigen values, Periodic motion, oscillations.

Paper 8 (Core 8), 2T4 Electrodynamics II:

- Examine the phenomena of wave propagation in different media and its interfaces and applications.

- Analyze the nature of electromagnetic wave propagation in guided medium which are used inmicrowave applications.
- Calculate the electromagnetic radiation from localised charges which move arbitrarily in time andspace, taking into account retardation effects.
- Formulate and solve electrodynamic problems in relativistically covariant form in four-dimensional space time

M.Sc.Part -II,
SEMESTER - III
Paper 9 (Core 9) 3T1 Quantum Mechanics II:

- Solve simple problems using perturbation theory
- Solve simple problems of perturbation theory, understand symmetries of wave function.
- Solve simple problems involving time dependent perturbation.
- Solve barrier problem using WKB method
- Understand the physical meaning of scattering coefficients. Difference between bosons and fermions
- know about Klein-Gordon equations, Dirac equations. Solve for Hydrogen atom using Dirac's theory

Paper 10 (Core 10) 3T2 Solid State Physics and Spectroscopy:

- Clear basic concept of crystal classes, lattices, symmetries and to understand the relationship between real and reciprocal lattice.
- Understanding the correlation of crystallography with experimental crystal study by Bragg's conditions for X-ray diffraction.
- Explore with the knowledge of different crystal defect and its influence on basic physical behaviour of crystals.
- Gain basic knowledge of dielectric properties of materials and learn the basic of the dielectric behaviour of various materials.
- Describe the spectra of single and multiple electrons atoms including fine and hyperfine structure of alkaline, Helium like atoms, spin and relativity correction, different type of coupling such as L-S and J-J couplings.
- Analyse the spectra of diatomic molecules such as electronic, rotational, vibrational spectra and a basic introductory idea about the Raman Spectroscopy.
- Explain effect of electric and magnetic field on the atomic spectrum.

Paper 11 (Core Elective E1.1) 3T3 Materials Science I:

- Materials science is a branch of Physics which with properties & characteristics of materialsDevelopments of new materials and their applications. It is an applied branch of Physics and has gottremendous potential for job as researcher and as technician.

(Subject Centric Core Course S1.2) 3T4 Nanoscience and Nanotechnology:

- Nanoscience and Nanotechnology are now become the buzz words all over the world.
- Nanoscience is related to synthesis and characterization of nanomaterials. The use of nanomaterials isgaining impetus in the present century as they possess defined chemical, optical and mechanicalproperties.

SEMESTER IV

Paper 13 (Core 11) 4T1 Nuclear and Particle Physics:

- The core paper Nuclear & Particle Physics deals with the detailed study of the structure and energeticof atom and the nucleus viz. protons and neutrons. In order to study the properties of a material, oneshould be familiar with the properties of atom of that material. Nuclear physics solved thefundamental puzzle of the existence of strong nuclear force. Nuclear and particle Physics includevarious interesting branches such as radioactivity, fission and fusion reactions nuclear reactors,nuclear power plants, particle physics etc. that has huge applications for the benefits of society.

Paper 14 (Core 12) 4T2 Solid State Physics:

- The student will understand the band formation in solids by using different models along with electronbehavior in solid. Also gain knowledge of magnetic properties of materials.
- The student will able to understand and explain interaction of lattice in solids through differenttheories and temperature effect on solids.
- Students Able to elaborate electron in potential wells, degeneracy state, density of states, thermal andelectrical conductivity of metals, and thermoelectric power.
- The students will know Semiconductor properties and carrier concentration, effect of temperature onmobility, electrical conductivity and Hall Effect in conductors and semiconductors.
- Students able to understand and elaborate superconductors, types along with their properties andapplications.

Paper 15 (Core Elective E2.1) 4T3 Materials Science II:

- The students will know the Mechanical response of Materials under applied load such as elasticresponse, stress-strain curve, viscoelasticity, Plastic deformation.
- Students able to understand and explain Corrosion and degradation of materials and corrosioninhibition. Also the Spintronics and Photonics properties of materials.
- The students will understand the synthesis and processing of materials for better applications.
- Students will able to explain the importance of microscopic study of material with differentexperimental techniques.

Semester IV (Subject Centric Core Course S 2.3) 4T4 Communication electronics

- Analyze energy and power spectral density of the signal.
- Describe different types of noise and predicts effect on various analog communication systems.
- Express the basic concepts of analog modulation schemes.
- Evaluate analog modulated waveform in time/frequency domain and also find modulation index
- Analyse different characteristics of receiver
- Analyse various parameters that define antenna technically.
- Design array antenna systems from specifications depending upon type of sources.
- Categorize various shapes and types of antennas such as microwave antennas, smart antennas, VHF & UHF antennas etc.

PROGRAM OUTCOMES OF MASTER OF SCIENCE IN PHYSICS

Learning outcome

The Master of Science in Physics program provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in industry, consultancy, education, research, or public administration.

The work with the Master Thesis gives special expertise within one of the research areas represented at The Department of Physics: Astro and Particle Physics and Modern Field Theory, Biophysics and Medical Physics, Energy and Environmental Physics, Optics and Condensed Matter Physics, and Physics Education and Dissemination.

Knowledge

The candidate

- Has substantial knowledge in physics, basic knowledge in mathematics, and knowledge in supported fields like computer science.
- Has some research experience within a specific field of physics, through a supervised project (the Master Thesis).
- Has advanced knowledge in some areas in physics.
- Is familiar with contemporary research within various fields of physics.

Skills

The candidate

- Has the background and experience required to model, analyse, and solve advanced problems in physics.
- Is able to apply advanced theoretical and/or experimental methods, including the use of numerical methods and simulations.
- Can combine and use knowledge from several disciplines.
- Can critically and independently assess and evaluate research methods and results.
- Has the ability to develop and renew scientific competence -- independently, via courses or through PhD studies in physics or related disciplines.
- Is able to enter new problem areas that require an analytic and innovative approach.
- Can disseminate subject matter and results to both specialists and a broader audience.

General competence

The candidate

- Understands the role of physics in society and has the background to consider ethical problems.
- Knows the historical development of physics, its possibilities and limitations, and understands the value of lifelong learning.
- Is able to gather, assess, and make use of new information.
- Has the ability to successfully carry out advanced tasks and projects, both independently and in collaboration with others, and also across disciplines.
- Has an adequate background for pursuing pedagogic education.
- Has an international perspective on her/his discipline.

PROGRAM OUTCOME

NAME OF PROGRAM: B.Sc. Zoology

KAMLA NEHRU MAHAVIDYALAYA, NAGPUR

DEPARTMENT OF ZOOLOGY

Target Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem solving, Analytical Reasoning, Communication skills, Teamwork, Moral and Ethical Awareness

	SPECIFIC PROGRAM OUTCOME
SPO1	Student will be able to develop aptitude to manifest' wide knowledge in the subject zoology and life sciences.
SPO2	Students will be able to understand about biodiversity ,conservation, based on the knowledge he has acquired from theoritically, practically and field survey studies which will help him to become a scientist, a conservationist, taxonomist, in government owned organisation and non-government organisations.
SPO3	This program will help the student about the diversity of animals and their importance and use as a model for research in various laboratories and in the field of teaching and learning.
SPO4	Students will be able to learn the external and internal organisations of organisms and its functions.
SPO5	Students will gain an insight regarding reproduction and lifecycle of parasitic organisms of vertebrates, and the use of modern medicines to prevent infections.
SPO6	Students will be able to identify and classify the organisms and their larval form ad importance of larvae.
SPO7	Student will gain knowledge and realize the significance of organisms and its relationship with the environment and its impact on human and animal life.
SPO8	Students will gain knowledge and understanding about physiological functions which are under the control of endocrine hormones and working of the body of animals under the nervous control.
SPO9	Student will gain insight regarding the biological rhythm which are governed by external environmental factors and internal factors like biological rhythm and biological clocks and their role in the life, evolution and diversity of organisms on earth.
SPO10	Students will aquire knowledge of enzymes, hormones and their role in mammalian physiology, learn Mendelian principles of genetics, DNA fingerprinting technique and its application.

Name of the Program: B.Sc. I

	Course Outcome
	Course Name
	Life and Diversity- protozoa- Annelida
CO1	Student will be able to classify protozoans on the basis of morphological characters and learn the structure, reproduction, lifecycle and the diseases caused by parasitic protozoans of man.
CO2	The students will gain knowledge and understanding to classify porifera based on general characters and learn the structure reproduction and development, and canal system.
	Students will gain knowledge to classify coelentrate based on external characters, learn about structure, lifecycle and coral reformation
CO3	Students will gain knowledge and understanding of general characters of helminths to classify depending on their general characters. They will also learn the structure, reproductive system and lifecycle and parasitic adaption of Ascaris and Taenia solium
CO4	Students will acquire knowledge of general characters of Annelids and will learn to classify them. Students will learn morphology, digestive and urinogenital system of Leech, significance of trochophore larva and importance of vermiculture.
	Environmental Biology
CO1	Students will be able to learn about the atmosphere, hydrosphere, lithosphere, renewable and non-renewable energy sources.
CO2	Student will be able to learn about the ecosystem, pond ecosystem, food chains, food web and ecological pyramids. They will also learn about the energy flow in the ecosystem their shape and universal model.
CO3	Students will be able to learn about biodiversity and its conservation, causes of reduction of biodiversity. They will learn about the wildlife conservation and about the hotspot of biodiversity in India.
CO4	Students will be able to learn about the sources, effects and control measures of pollution, acid rain, water pollution. They will also learn about the control measures of noise pollution and also about the toxic effect of heavy metals.

Name of the Program: B. Sc. Sem II

	Course Outcome
	Course Name
	Life and Diversity of Animals-No chordates (Arthropoda to Hemichordates)
CO1	Student will be able learn about the Phylum Arthropoda. They will learn about their characters and classification, digestive and reproductive system of insects and will learn about the lifecycle of crustacean larvae.
CO2	The students will gain knowledge and understanding to classify Mollusca based on general characters and learn about the pearl formation and molluscan larvae.
CO3	Students will gain knowledge and understanding of general characters of Echinodermata to classify depending on their general characters. They will also learn the external features, water vascular system and locomotion in Starfish. They will also learn about the echinoderm larva.
CO4	Students will acquire knowledge of general characters of Hemichordate, Balanoglossus, their external features and digestive system and their affinities.
	Cell biology
CO1	Students will be able to learn about the ultrastructure of prokaryotic and eukaryotic cell. Plasma membrane, endoplasmic reticulum and Golgi complex.
CO2	Student will be able to learn about the ultrastructure of mitochondria, glycolysis and Kerb's cycle. They will also learn about the electron transport system and lysosomes.
CO3	Students will be able to learn about the ultrastructure of nucleus, structure of nucleolus. They will learn about the structure and types of chromosomes and giant chromosomes.
CO4	Students will be able to learn about the Lake model of and function of Ribosomes, somatic cell division, meiosis and synaptonemal complex. They will also learn about the cellular ageing, elementary idea of cancer and its causative agents.

Name of the Program: B. Sc. Sem III

	Course Outcome
	Course Name
	Life and Diversity of Protochordates- Amphibia
CO 1	Student will be able learn about the characters and about the classification of protozoa. They will also understand the structure, digestive system, circulatory system of Herd mania and the role of the same.
CO 2	Students will be able to learn about the about prosses o, gamete genesis and formation of types of eggs. They will also understand the prosses of fertilization of eggs and import once in continuity of animal species.
CO 3	Students will gain knowledge and understanding of salient features of Chondrichthyes and Osteichthyes fishes and will be able to learn to identify them on the basis of the differences and gain knowledge of origin of paired fins which help foe locomotion.
CO 4	Students will acquire knowledge of amphibians based on craters various class of animals and dual ways use to live land an in water. Students will learn use of vital stain which are nontoxic to cells in dilute concentration. they help in making ectoderm, mesoderm and endoderm cells end blastula frog they will also understand about migration of cells to three germinal layers.
	Genetics
CO 1	Student will learn about Mendelian principle, interaction of genes, quotative genetics and about the extracellular genome.
CO 2	Student will gain knowledge of the Cytoplasmic Inheritance, the kapa particles, paramecium, drosophila and mice. they will also learn about the linkage and crossing over, concepts of genes and about the disorders in human beings.
CO 3	Students will learn about the sex determination in humans and I drosophila and Bonellia. They will also understand about the chromosol aberration, gene mutation and also about the disorders related to chromosomal numbers.
CO 4	Students will learn about the lethal genes their concepts and consequences. They will also understand about the population genes, their basic concepts and genetic consequences theory introduction, purpose, hereditary diseases and disorders. They will also learn about applied genetics, DNA fingerprinting.

Name of the Program: B.Sc. IV

	Course Outcome
	Course Name
	Life and Diversity of Animals-Chordates (Reptiles, Aves and Mammals)
CO1	Student will be able learn about the classification of Reptiles based on Temporal Vacuities, poison apparatus, biting mechanism. they will also learn about Aves their comparison of Radiate and craniate and about general characters of Mammals.
CO2	The students will gain knowledge and understanding about the modern theories of evolution, Darwin and Neo-Darwin. Adaptation in aquatic, cursorial, and volant. They will be introducing to genetic basics of evolution. They will also learn about the races in man.
CO3	Students will gain knowledge about the comparative account of aortic arches and heart. They will learn about the structure of hen's eggs, development of chicks, development of extra embryonic member.
CO4	Students will acquire knowledge of blastocyst and immolation in mammals, types and function of placenta. They will learn about sources type and ureses of stem cell they also gai knowledge of biology of clock and role of pheromones.
	Molecular biology and Immunology
CO1	Students will be able to learn structure, forms and properties of DNA and RNA. They will gain knowledge about the gene structure in prokaryotes and eukaryotes and also about recombination in bacteria.
CO2	Student will be able to learn about DNA replication, genetic code protein synthesis and gene regulation model. Their properties mechanisms and concepts.
CO3	Students will be able to learn about the concepts of immunity, structures function types of antigen and antibody. Also, about the precipitation and angulation of antigen-antibody reaction.
CO4	Students will gain knowledge about the types of Immune response, complement system their basic concepts. They will also learn about the general accounts of cytokines and their role at the molecular level, autoimmune diseases and their treatment.

PROGRAM MATRIX

Name of the Program: B. Sc. Sem V

	Course Outcome
	Course Name
	General Mammalian Physiology-I
CO1	Student will be able learn about the distribution and chemical nature of enzymes, properties and factors affecting their activity at the molecular level.
CO2	The students will gain knowledge and understanding about the structure and function of digestive gland such as salivary, gastric, intestinal, liver and pancreas; gastrointestinal hormones their role in nutrition and digestion; digestion and absorption of proteins, lipids and carbohydrates, fats soluble in water vitamin soluble sources, deficiencies and diseases.
CO3	Students will gain knowledge about the types, distribution and properties of respiratory pigments, mechanism of respiration, exchange of O2 and Co2 at cellular level and disorders and effects of smoking.
CO4	Students will acquire knowledge composition and functions of blood, blood clotting-intrinsic and extrinsic factors and rh factors and their role in blood transfusion during emergency, cardiac cycle, ECG and blood pressure help in monitoring the heart conditions
	Applied Zoology-Aquaculture and Economic Entomology
CO1	Students will be able to learn about the site selection, construction, restocking and post stocking, management of nursery, raring and stocking ponds. They will technique of breeding of fishes and bundh and Chinese hatcheries, induce breeding by hypothecation, use of new generation drugs in induced breeding, acquire knowledge fish culture, cage culture and integrated fish farming, and fish by-products and fish preservation.
CO2	Student will be able to learn about the technique of culture of prawns and pearl; fabrication and setting up of aquarium and its maintenance, breeding of life bearers and egg layers of aquarium fishes and control of diseases caused by fungi, bacteria, protozoa and helminths and their ill effects of fish health's.
CO3	Students will learn about the chemical control of pests using insecticide like pyrethroids, carbamate and mode of action, merits and demerits; control using predators and parasites which are biological agents their merits and demerits. they will acquire knowledge of cotton spotted bollworm which cause damage to stored grain pests which cause economic losses, the housefly and distally cause nuisance to humans and animals as they are animal pests.

CO4	Students will gain knowledge of lifecycle and rearing of mulberry silkworm, lifecycle and rearing of non-mulberry silkworm, obtain silk fabric by cocoon boiling, realign, revealing, win sling, twisting and weaving; learn about the lifecycle culture movable frame beehive, bee products and economic importance of various types of honey bees reared in apiary, hey will also gain knowledge of lac insects, its lifecycle, lac processing, lac products and its economic importance. .

Name of the Program: BSc VI

	Course Outcome
	Course Name
	General Mammalian Physiology-II
CO1	Student will be able learn about the EM structure and types of neurons, nerve impulse conduction; ultrastructure of straited muscles, properties of muscles and their role in mammalian physiology.
CO2	The students will gain knowledge and understanding about the structure if uriniferous tubules, counter current mechanism of urine formation and exception normal and abnormal constituents of urine.
CO3	Students will gain knowledge about the structure and function of pituitary, thyroid parathyroid, adrenal and pineal gland respectively and their functions in controlling body physiology.
CO4	Students will acquire knowledge of reproduction, oestrous and menstrual cycle, male and female sex hormones causes of infertility in male and female and use of mechanical and hormonal contraceptives, invitro fertilization to overcome sterility in humans and animals.
	Applied zoology
CO1	Students will be able to learn biotechniques, concepts like sterilization, biomolecule separation, SDS-PAGE, agarose gel electrophoresis, principles of colorimetry and spectrophotometry.
CO2	Student will be able to learn about lab technique called biotechnique which includes fixations, dehydration, clearing, embedding and section cutting, difficulties faced during section cutting abuse sand remedies; double staining hemotoxin and eosin routine staining technique, histochemical localizes carbohydrate by periodic acid skiff, protein by merry bromophenol blue and lipid by Sudan black technique.
CO3	Students will learn about the basic concepts go rDNA technology, genetic isolation method by shotgun cloning, isolation of gene using DNA manipulation enzymes like nucleases, ligases and polymerases \, they will acquire knowledge

	of cloning vectors and splicing, insertion of DNA and ligation using blunt ends, cohesive end and cloning vectors and production of insulin and vaccine.
CO4	Students will gain knowledge and understanding of basic concepts, importance, and role of bioinformatics I life sciences, types of data basis, nucleotide sequence databases and elementary idea of protein databases and use of biostatics for tabulation and presentation of dated respectively respect. Sampling error, mean, mode, median, probability, standard errors and standard deviation in analysis of biological data related to research.

PROGRAM OUTCOMES

NAME OF PROGRAM: M. Sc. Zoology

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

No. Of Courses: 28

Targeted Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Communication Skills, Teamwork, Moral and Ethical Awareness

	Program Outcomes
PO1	Students will able to develop aptitude to manifest wide and extensive knowledge in the field of zoology and life science
PO2	They able to understand the importance of conservation and biodiversity rich environment. Based on this knowledge student can achieve the better opportunity in this field as a scientist, conservationist, taxonomist in the related government (ZSI) and non-government institutions
PO3	This programme will help to provide correct information about related condition of the living organisms including human to the pharmacologist to develop accurate drugs. This knowledge will provide job opportunities in the field of research, pharmaceutical industries, laboratories & teaching.
PO4	Students will understandthe detailed structure & function of the cell at molecular level & acquire the knowledge which will help them to work in the field of research, genetic counselling and lab technician.
PO5	Students will gain the knowledge about advance reproductive technique such as cryopreservation,

	test-tube baby, in-vitro fertilization, MOET, ICSI, GIFT&ZIFT so that they can join the respective laboratories in this field for practical training & avail better carrier opportunities.
PO6	The study will help them to discover the new species & understand the evolutionary Significance of the vertebrates. This study will also help them to know the importance of the local animals in the ecosystem.
PO7	By acquiring the knowledge of endocrinology students will able to understand & correlate the hormonal regulation of different systems in the body of different animals so that they can work under the guidance of medical endocrinologist & in pathological laboratories.
PO8	With the basic knowledge of molecular biology & biotechnology the students can join the laboratories which provides practical training or workshops for their carrier opportunities & employability in this field.
P09	Students will be able to identify & classify different types of birds & learn their conservation methods. They will also learn about the radiation and its impact on human & other animals and their biological clock.

Course Outcomes (COs)	
	Course Name:
	Structure and Function of Invertebrates
CO1	Students able to **classify** the animals based on morphological and genetic taxonomic parameters.
CO2	Student will **understand** ultrastructure of protozoan locomotary organs and modes of locomotion in protozoans.
CO3	The students will be able to **classify** the poriferans based on different types of spicules
CO4	This study will help the students **to differentiate** between zooids in the coelenterate colonies, **classify** them accordingly
CO5	The study will help them to discover the new species and **understand** origin of life on earth and the evolutionary **Significance** of the metazoans.

CO6	The students will be able **gain knowledge** the Reproductive systems in Platyhelminthes and Aschelminthes.
CO7	The study of **Significance** of Coelom, Symmetry and Metamerism in Animal classification helps to **classify** the animals based on their structural development.
CO8	By Studying Evolution of nephridia students will be able **gain knowledge** the mechanism of excretion in Annelids
CO9	Study of taxonomic position of Peripatus will help the student to **understand** the evolutuionary **Significance** of phylum arthropoda and its affinities with annelida.
CO10	Study of taxonomic position of Peripatus will help the student to **understand** the evolutuionary **Significance** of phylum arthropoda and its affinities with annelida.
CO11	Study of taxonomic position of Neopilina helps the students to **understand** the connecting link between the annelida and mollusca
CO12	Neuroanatomy in selected group of Molluses will help the student to **understand** the nervous system of mollusca.
CO13	By studying water vascular system in Echinodermata students will be able to **understand** the locomotion and feeding in echinodermata
CO14	Students will be able **gain knowledge** general account and affinities of Ctenophora, Rotifera, Entoprocta and Ectoprocta.
	General Physiology
CO1	Students will **understand** the classification, mechanism of action of enzymes and regulation of enzyme activity.

CO2	The students will able to **understand** the respiratory mechanism of animals at cellular level
CO3	Students will be able to **understand** the chemical nature, biosynthesis and mechanism of action of neurotransmitters.
CO4	**Gain knowledge** and **understand** the colour change mechanism in different groups of animal
CO5	To **understand** the mechanism of bioluminescence in invertebrates and vertebrates
CO6	Able **gain knowledge** the mechanism of thermoregulation in poikilotherms and homeotherms
CO7	To gain the **knowledge** about the process of osmoregulation in pisces and amphibians
CO8	Learn and **understand** the molecular mechanism of peptide and steroid hormonal action and signal transduction
CO9	Learn and able to **understand** the myogenic and neurogenic heart and cardiac cycle.
CO10	Able **gain knowledge** the mechanism of digestion and absorption of carbohydrates, proteins and lipids along GI tract.
CO11	Student will acquire the **knowledge** of physiology of carbohydrate and lipid metabolism.
CO12	To **understand** the physiology of hydromineral metabolism.
CO13	Learn and **understand** the chemistry and function of cerebrospinal fluid

CO14	**To evaluate and** learn the mechanism of reflex action
CO15	Student will able **gain knowledge** the physiology of environmental stress and strain.
	Cell Biology and Genetics
CO1	To **understand** the structure and function of biological membranes
CO2	To **understand** and learn structure and the function of cell organelles.
CO3	Student will able **gain knowledge** the structure and function of cytoskeleton.
CO4	Learn and gain the **knowledge** of cell division and cell cycle.
CO5	Learn and gain the **knowledge** of cell signalling , receptor proteins
CO6	Learn and gain the **knowledge** of signal transduction pathways and its regulation
CO7	Learn and gain the **knowledge** of Cellular communication
CO8	**Gain knowledge** and **understand** the genetics of cancer
CO9	Student will be able **gain knowledge** the mendelian and non-mendelian inheritance

CO10	Able **gain knowledge** the extension of Mendelian principles and Quantitative genetics.
CO11	Learn and gain the **knowledge** of Types, causes and detections of Mutations
CO12	Student will able to **understand** the structural and numerical alterations of chromosomes
CO13	Student will able to **understand** the extra chromosomal inheritance
CO14	Learn and gain the **knowledge** of Microbial genetics
CO15	Learn and gain the **knowledge** of Human genetics
	Advanced Reproductive Biology
CO1	Learn the different methods of asexual and sexual reproduction in protozoans
CO2	Learn the process of regeneration in Hydra, Dugesia and Annelid worms
CO3	Learn the process of metamorphosis and vitellogenesis in insects
CO4	To **understand** mechanism of spermatogenesis and oogenesis
CO5	**Gain knowledge** the mechanism of cytological and molecular events of fertilization.

CO6	To **understand** the process of cleavage, blastulation, gastrulation and embryonic induction.
CO7	**Gain knowledge** and **understand** the male accessory sex glands.
CO8	To **understand** the biochemical composition of semen and abnormality of sperm
CO9	**Gain knowledge** the mechanism of sperm capacitation and decapacitation
CO10	To **understand** the pheromones and sexual behaviour of mammals.
CO11	To able **gain knowledge** the neurohormonal control of fish reproduction and mechanism of vitellogenesis in fishes.
CO12	**Gain knowledge** the mechanism of Morphogenetic gradient and organizer concept
CO13	**Gain knowledge** the mechanism of cryopreservation of gametes, embryo and test tube baby
CO14	**Gain knowledge** the mechanism of In vitro fertilization and its **Significance**
	Structure and function of vertebrates
CO1	Students will be able to **understand** the origin and ancestry of chordate.
CO2	Students will be able to **understand** general organization and affinities of cephalochordate.
CO3	Students will understandstructure, development and metamorphosis of Amoecoetus & characters & affinities of

	Dipnoi
CO4	Students will be able to **understand** organs and mechanism of respiration in pisces and amphibia.
CO5	**Gain knowledge** vertebrate integument and its derivatives.
CO6	The students will be able to **understand** that what are appendicular skeleton in Amphibia, Reptilia, Aves and Mammals.
CO7	The students will be able to **understand** general body organisation and classification in chelonian.
CO8	The students will be able to **understand** the evolution of urinogenital organs in vertebrates.
CO9	To **understand** the origin of birds and adaptations in cetacean.
CO10	To **understand** the complex anatomy of the brain in teleost, frog, lizard, fowl & rat.
CO11	The students will be able to **understand** the evolution of heart an sense organ in vertebrates.
CO12	The students will be able to **understand** the evolution of man.
	Comparative Endocrinology
CO1	To **understand** the hormones and functions in Coelentereta and Helminths.
CO2	To **understand** the neurosecretory system in Annelida & Mollusca
CO3	The students will be able to **understand** about the hormones and functions in Echinodermata.
CO4	To **understand** about the neuroendocrine system in crustacean.
CO5	Students will be able **to explain** the Endocrine control of metamorphosis, reproduction and colour change mechanisms in Crustacean..
CO6	The students will be able to **understand** cephalic neuroendocrine system in insects.
CO7	To **understand** the endocrine control of metamorphosis and

	reproduction in insects.
CO8	Students will be able **to explain** about the pineal organ.
CO9	**Gain knowledge** about the hypothalamo-hypophysial system.
CO10	To **understand** the **To evaluate**pituitary gland, thyroid gland, parathyroid gland and adrenal gland.
CO11	To **understand** the gastro-entero-pancreatic endocrine system.
CO12	**Gain knowledge** the gonadal hormones in vertebrates and their hormonal actions, feedback mechanisms.
	Molecular Biology and Biotechnology
CO1	To **understand** the Cot ½and Rot ½values, organelle genome, DNA structure, forms of DNA.
CO2	To **understand** the molecular mechanisms of replication and its regulation in prokaryotes and eukaryotes.
CO3	**Gain knowledge** the DNA damage and repair – types of DNA damages, excision repair system; mismatch repair, recombination repair, double strand break repair, and transcription coupled repair.
CO4	**Gain knowledge** the mechanism and regulation of prokaryotic and eukaryotic transcription.
CO5	To **understand** the prokaryotic and eukaryotic translation, genetic code, altered code in elongation, termination factors, fidelity of translation, post translational modifications.
CO6	**Gain knowledge** about mobile DNA elements – transposable elements, IS elements, P elements, retroviruses, retrotansposons.
CO7	To **understand** the antisense and ribozyme technology – initiation of splicing, polyadenylation, molecular mechanisms of antisense molecules, miRNA, siRNA, gene silencing.
CO8	To **understand** isolation and sequencing of DNA, gene amplification, PCR, RAPD, RFLP, MaxamGilbert, Sanger's

	dideoxy methods.
CO9	To **understand** the splicing and cloning – cloning vectors for recombinant DNA technology- plasmids, cosmids, phagemids, YACS, gene replacement, restriction enzymes.
CO10	**Understand** the hybridization techniques – Southern- Northern hybridization, microarray.
CO11	**Gain knowledge** the application application of restriction fragment length polymorphism (RFLP) in forensic science, disease prognosis and genetic counseling.
CO12	To **understand** the agricultural biotechnology.
CO13	to **understand** Hybridoma technology and monoclonal antibodies.
	Advanced Developmental Biology
CO1	To **understand** the types ,structure and functions of Foetal membranes & implantation in mammals.
CO2	**Gain knowledge** about the placenta-types, structure, functions of Placenta.
CO3	**Gain knowledge** about metamorphosis in Amphibia and regeneration in vertebrates.
CO4	To **understand** the mechanism and **Significance** of Apoptosis.
CO5	**Gain knowledge** about the ageing- mechanism, concepts and models.
CO6	Students will understandabout the polymorphism in insect.
CO7	To **understand** the multiple ovulation and embryo transfer technology (MOET).
CO8	**Gain knowledge** about the animal cloning.
CO9	**Gain knowledge** about the Immunocontraception. classical contraceptive techniques.
CO10	**Gain knowledge** about the anti-androgen and anti-spermiogenic compounds (LDH-CY and SP-10)
CO11	**Gain knowledge** about the role of mutants and transgenics in

	human welfare.
	Parasitology and Immunology
CO1	To **understand** life cycle, mode of transmission, infection of*Vibrio cholera, Yersinia pestis and Clostridium titani* and treatment of Cholera, Plague and Tetanus.
	To **understand** the life cycle, mode of transmission, infection of Influenza , H1 N1 viruses, Dengue virus and Hepatitis viruses and treatment of Influenza, Dengue and hepatitis.
CO2	**Gain knowledge** about the Trypanosoma and Entomoeba - Life cycle, mode of transmission, infection of *Trypanosoma , Entomoeba, Leishmania* and *Plasmodium* and treatment of diseases caused by these protozoan parasites.
CO3	**Gain knowledge** about the life cycle, mode of transmission, infection of*Wuchereria* and *Trichinella*and treatment of diseases caused by these parasites.
CO4	**Gain knowledge** about the toxin and antitoxins.
CO5	Immune system- innate and adaptive immunity; Antigens and antibodies and its interaction.
CO6	**Gain knowledge** about the cells and organs of immune system.
CO7	**Gain knowledge** Major Histocompatibility Complex (MHC).
CO8	To **understand** complement system and its regulation, biological consequences of complement activation.
CO9	**Gain knowledge** about cytokine and cytokine receptors, Cell mediated cytotoxic responses and leukocyte activation and migration.
CO10	To **understand** types and mechanism of Hypersensitivity reactions and autoimmunity
CO11	To **understand** transplantation immunology
CO12	**Gain knowledge** about the tumour immunology and immunotechniques.
	Biotechniques, Biostatistics, Ethology, Toxicology and

	Bioinformatics
CO1	**Gain knowledge** about the sterilization techniques, media for microbial culture, inoculation methods
CO2	To **understand** the primary culture, cell lines, cell quantification, growth kinetics of cells in culture, cryopreservation of cells
CO3	To **understand** the basic principle of sedimentation and centrifugation along with Radioactive isotopes.
CO4	to **understand** thin layer chromatography , gas chromatography and electrophoretic separation techniques
CO5	To **understand** the Central tendency, Dispersion and Variance.
CO6	To **understand** the probability and probability distribution.
CO7	**Gain knowledge** the types of sampling , standard error (SE), standard deviation (SD) and tests of **Significance** (t- test, z-test, Chi square test).
CO8	To **understand** the neuronal control, genetic and environmental components in development of animal behaviour
CO9	To **understand** the animal ethics- introduction, concept, organizations and their functions
CO10	CO To **understand** the toxicology, environmental toxicology. tran CO slocation of toxicants
CO11	**Gain knowledge** about the toxicity tests, calculation of LC50 and LD 50 and AntidotalThereapy.
CO12	Introduction and scope of bioinformatics.
CO13	**Gain knowledge** about the Biological databases– Basic local alignment search tool (BLAST), and FASTA, Variants of BLAST, PSI-BLAST.
CO14	**Gain knowledge** about the phylogenetic analysis- Tree style, tree building methods.
	Insect morphology and physiology

CO1	To **understand** insects morphology along with other biological attributes which help to **classify** the insects and distinguishing orders, families and species.
CO2	To **understand** the molecular structure, moulting and sclerotization of integument
CO3	To interpret the morphological structure of the head, thorax and abdomen
CO4	To **understand** the structure of antennae, morphology of legs and genitalia structure
CO5	To get the structure of the wing and mechanism of flight
CO6	To **understand** the morphology of mouthparts types and their feeding mechanism
CO7	**To evaluate** the circulatory system which includes organs, mechanism and chemical composition of haemolymph and function of haemocytes.
CO9	**To evaluate** the male and female reproductive system, structure and function of testis, ovary and mechanism of spermatogenesis and vitellogenesis including specialized reproductive mechanism.
	Classification and industrial insects
CO1	To **understand** the classification of insects which provide data on the life history, behaviour and development.
CO2	To **understand** insects from an industrial perspective
CO3	**To evaluate the** modern scheme of insect classification and general characters of various orders
CO4	To **understand** the classification and general characters of Thysanura and collembolan.
CO5	To **understand** classification and characters of Mallophaga and siphunculata
CO6	To **understand** characters and classification of Siphonaptera

CO7	To **understand** the characters and classification of Hemipteratera, Lepidoptera and coleopteran
CO8	**To evaluate** Mulberry silkworm Bombyxmori, life cycle, the structure of silk gland and mechanism silk proteins.
CO9	**To evaluate** Silkworm rearing, cocoon harvesting and seed production.
CO10	**Gain knowledge** about the bacterial and viral diseases in silkworm.
CO11	To **understand** Lac insect-biology, lac cultivation and economic importance.
CO12	To **understand** Eri sericulture includes life cycle, host plant rearing and silk production.
CO13	To **understand** types of honey bee, life cycle, colony formation and apiary products.
	Sense organs, social life and Agriculture pests
CO1&2	To **understand** the Compound eyes Ocelli structure and functions.
CO3&4	**To evaluate** light producing & Sound producing organs
CO5	**To evaluate** Mechanoreceptors
CO6	To interpret Tympanal organs, Johnson's organ, Chemoreceptors- sensillatrichoidea, sensillabasiconica.
CO7	The students will understandabout the pigments and mechanism of colour change, mimicry and camouflage.
CO8	**To evaluate** Immunity in insect
CO9	**To evaluate**Social life, Polymorphism, nest building and social behaviour in Isoptera and ants.
CO10	**To evaluate**Parasitic Hymenoptera its types and **Significance** .
CO11	To **understand** Locust migration and swarming.
CO12	**To evaluate**Pest of major crops: Rice, Cotton and Sugarcane-classification, life history, damage and control.

CO13	**To evaluate** the Pest of vegetables, fruits its classification, life history, damage and control.
CO14	To interpret the classification of Stored grain pests its classification, life history, damage and control measures.
	Pest control measures and Insects vectors
CO1	**To evaluate** inorganic insecticides.
CO2	**To evaluate** Chlorinated Hydrocarbons and organophosphates it's Properties, mode of action and use.
CO3	**To evaluate** Natural organic compound and pyrethroids: Properties, and its mode of action and use.
CO4	**To evaluate the** Historical and theoretical basis of biological control.
CO5	To **understand** Desirable attributes of natural enemies of pests.
CO6	**To evaluate**Parasitoids and predators used in biological control programmes and its life cycle and biological relationship.
CO7	**To evaluate**Insect pathogenic bacteria and used in biological control programmes, biological relationship, mass production and examples.
CO8	To **understand** the use of radiation, chemosterilants, hormones and pheromones in pest control programmes.
CO9	To **understand** Integrated pest managements its principles, modelling, application and examples.
CO10	**To evaluate the** Pest of horse and cattle it's Nature of damage, life cycle and control measures.
CO11	To **understand** life cycle of Mosquitoes, mode of transmission of pathogen and control measures.
CO12	To **understand** life cycle of flies, mode of transmission of pathogen and control measures.
CO13	**To evaluate the** life cycle of lice and fleas causing disease in man, mode of transmission of pathogen and control measures.

	Animal Physiology
	Physiology of Digestion and Excretion
CO1	To **understand** the specialized functions of the organs involved in processing food in the body.
CO2	To **understand** the structure and function of digestive glands, salivary gland and stomach in the digestion and its regulation of secretion.
CO3	To have a comprehensive **knowledge** about structure, function of liver, its role in detoxification and structure, function pancreas and its role in the regulation of glucose level and indigestion.
CO4	To **understand** the ways in which organs work together to digest food and absorb nutrients.
CO5&6	To **understand** the processes of digestion and absorption and role of the intestine.
CO7	To **understand** the neural and chemical regulation of secretion GIT secretion and movement.
CO8	To **understand** the structure, function of kidney and its role in the urine formation.
CO9	To **understand** the mechanism of concentration and dilution of urine in addition to normal and abnormal constituents of urine this will help to **understand** the physiology of kidney in normal and pathological conditions.
CO10	To **understand** the physiology of Regulation of urine and body fluid concentration and volume and its hormonal control.
CO11	To **understand** the physiology of Regulation of water, electrolytes and acid base and renal clearance
CO12	To **understand** physiology of nitrogen excretion and causes of Renal failure, its complication and treatments.
	Physiology of Circulation
CO1	To **understand** the types (Myogenic and Neurogenic)

	anatomy, histology and nerve innervations of the heart, heart valves.
CO2	To **understand** the different types of Pace maker and specialized conducting fibres.
CO3	To **understand** the physiology of Blood pressure and factors affecting blood pressure, Cardiac cycle, Electrocardiogram (ECG).
CO4	To **understand** the Cardiac output, heart sound, Haemodynamics, Cardiac Failure.
CO5	To **understand** the physiology Cellular composition and functions of blood, Blood groups and Blood transfusion Causes and control of hypoglycaemia and hyperglycaemia.
CO6	To **understand** the causes and control of hypolipidimia and hyperlipidemia, Plasma proteins, Haemostasis.
CO7	To **understand** Cascade of biochemical reactions involved in coagulation of blood, transport of O2 & CO2 by blood and composition, formation and functions of lymph.
	Physiology of Brain, Nerve and Muscle
CO1	To **understand** morphological differentiation of mammalian brain, Brain stem, Cerebellum
CO2	To **understand** the physiology of learning, memory and sleep
CO3	To **understand** the types and functional properties of neurons, Ultrastructure of neuron.
CO4	To **understand** the ultrastructure of synapse and molecular mechanism of synaptic transmission, bioelectrical properties of neurons.
CO5	To **understand** the physiology of Biosynthesis, storage and release of various neurotransmitters and neuropeptides.
CO6	To **understand** the Receptor physiology- Mechanoreception, photoreception, phonoreception, chemoreception
CO7	To **understand** Disorders of nervous system: Alzheimer's

	disease, Parkinson's disease.
CO8	To **understand** the Ultrastructure of skeletal muscle, Molecular mechanism of muscle contraction and chemistry and role of ATP in muscle contraction.
CO9	To **understand** the Properties of muscle (twitch, tetanus, summation, tonus, all or none principle fatigue), muscular disorders and Ultrastructure of Neuromuscular Junction.
	Physiology of Respiration and Reproduction
CO1	To **understand** the Physiological anatomy of respiratory system and Mechanism of respiration
CO2	To **understand** the Transport of respiratory gases by blood and Lung volumes and capacities, partial pressure of gases.
CO3	To **understand** the Oxygen dissociation curve, Carbon -dioxide dissociation curve. To **understand** the physiology of Neural and chemical regulation of respiration and Hypoxia, Cyanosis.
CO4	To **understand** the endocrine control of spermatogenesis and oogenesis
CO5	To **understand** the physiology of Leydig cells, sertoli cells and their hormones. To **understand** the structure and functions of Follicular and luteal cells and their hormones.
CO6	To **understand** the physiology of corpus luteum and Placenta.
CO7	To **understand** the physiology of lactation and Role of hormones and pheromones in reproduction.
CO8	To **understand** the Causes of infertility in male and female and In vitro fertilization (IVF) and Test Tube Baby.
	Mammalian Reproductive Physiology
	-Mammalian Reproductive Physiology (MRP)-I Reproductive Process in Male
CO1	**Gain knowledge** and **understand** the detail structure of male reproductive gonad –testes in mammals.
CO2	To **understand** the process and mechanism of development and

	descent of testes.
CO3	To **understand** the process of formation of spermatozoa with respect to its molecular events and regulation of hormones required for this process.
CO4	**Gain knowledge** and **understand** the structure and function of specific cells (Sertoli cells) of the testes and to know the precise regulation of endocrine factors.
CO5	**Gain knowledge** and **understand** the structure and function of specific cells (Leydig cells) of the testes
CO6	**Gain knowledge** and **understand** the detail structure and function of male reproductive organ –Epididymis.
CO7	**Gain knowledge** and **understand** the normal morphological structure of spermatozoa. **To evaluate the** reasons behind their anomalies and **to differentiate** between normal and abnormal spermatozoa.
CO8	**Gain knowledge** and **understand** the mechanism of molecular and biochemical events that take place in the spermatozoa in the process of fertilization.
CO9	**Gain knowledge** and **understand** the detail structure and function of male reproductive accessory organ- Vas deferens.
CO10	**Gain knowledge** and **understand** the detail structure and function of male reproductive accessory organ-Seminal Vesicle and **To evaluate**its hormonal regulation.
CO11	**Gain knowledge** and **understand** the detail structure and function of important male reproductive gland-Prostate
CO12	**Gain knowledge** and **understand** the detail structure and function of another important male reproductive gland-Cowpers and to know the causes of their anomalies.
CO13	**Gain knowledge** and **understand** the detail structure and function of penis and to know the mechanism of its erection
CO14	To **understand** the comparative behavioral pattern of reproduction in males

CO15	To **understand** the different mating systems with respect to neural and hormonal regulation.
CO16	**Gain knowledge** and **understand** the different types, structure and function of Pheromones.
CO17	To **understand** the different probable causes of infertility and to know the possible treatment over it.
CO18	**To evaluate and understand** the different types of diseases in ageing males caused due to imbalance of male hormones.
	Mammalian Reproductive Physiology-II **Reproductive Process in Female**
CO1	**Gain knowledge** and **understand** the process of development of ovary and female genital tract at cellular level.
CO2	To **understand** the detailed process of formation of follicles in the ovary.
CO3	**Gain knowledge** and **understand** the role of hormones in the process of follicle formation.
CO4	To **understand** the detail mechanism of the process of ovulation.
CO5	**Gain knowledge** and **understand** cellular mechanism of the journey of primary, secondary and tertiary follicles to reach their maturity and involvement in the process of ovulation.
CO6	**Gain knowledge** and **understand** the process of formation and differentiation of cells of ovarian follicles.
CO7	**Gain knowledge** the mechanism of biosynthesis of steroidal hormones with respect to 2-gonadotropin and 2- cell concept.
CO8	**To evaluate and understand** the comparative process of estrus cycle with respect to physiological and hormonal changes in the uterus of mammals.
CO9	To **understand** the mechanism of uterine cycle with their respective physiological and hormonal changes.
CO10	**Gain knowledge** and **understand** the processes of cessation of

	menstrual cycle its causes and hormonal regulation.
CO11	**Gain knowledge** and **understand** the detailed mechanism of hormonal regulation of ovulation.
CO12	**Gain knowledge** and **understand** the mechanism of formation of corpus luteum after ovulation.
CO13	**To evaluate the** structure and function of corpus luteum, its maintenance in pregnancy and hormonal regulation.
CO14	**To evaluate and understand** structure and function of oviduct and their cellular and physiological changes.
CO15	**To evaluate and understand** the comparative account of mammalian uterus, types and their abnormalities.
CO16	**Gain knowledge** and **understand** the structure and function of cervix.
CO17	**To evaluate and understand** the structure and function of vagina.
CO18	To **understand** the physiology and cytology of vagina to detect the various stages of oestrous cycle.
CO19	**Gain knowledge** and **understand** the process of puberty, causes of onset of puberty and their related physiological problems.
CO20	**To evaluate the** causes of delayed puberty.
CO21	**To evaluate**in detail the structure and mechanism of biosynthesis of prostaglandins and their major role in reproduction.
CO22	**To evaluate the** developmental process anatomy and growth of mammary glands with respect to hormonal regulation.
CO23	**Gain knowledge** and **understand** the physiological process of lactation and its maintenance with respect to its hormonal control.
CO24	**To evaluate the** factors affecting lactation and **To evaluate the** composition of milk.

	Mammalian Reproductive Physiology-III **Reproductive Endocrinology**
CO1	**Gain knowledge** and **understand** the development, structure and function of hypothalamus.
CO2	To **understand** the mechanism of action of releasing and release inhibiting hormones.
CO3	To **understand** the mechanism of release of neurotransmitters and their physiology of targeting the target organs.
CO4	**Gain knowledge** and **understand** the regulation of feedback mechanism of hormones.
CO5	**Gain knowledge** and **understand** the development, structure and function of adenohypophysis.
CO6	**Gain knowledge** and **understand** the development, structure and function of neurohypophysis.
CO7	**Gain knowledge** and **understand** the structure and function of gonadotrophic hormones their mechanism of secretion.
CO8	**Gain knowledge** and **understand** the development, structure and function of pars intermedia.
CO9	**Gain knowledge** and **understand** the mechanism of release of gonadotropic releasing hormones from hypothalamus targeting hypophysis and ultimately the male gonad – Testes
CO10	**Gain knowledge** and **understand** mechanism of biosynthesis, mode of action, transport and functions of testosterone.
CO11	**Gain knowledge** and **understand** the mechanism of biosynthesis, physiology, mode of action and functions of inhibin in reproduction.
CO12	**Gain knowledge** and **understand** the role of thyroid hormones in reproduction.
CO13	**Gain knowledge** and **understand** the mechanism and mode of action of neurohormones and hypophyseal hormones on female gonad - ovaries

CO14	**Gain knowledge** and **understand** mechanism of biosynthesis, mode of action, transport and functions of oestrogen.
CO15	**To evaluate**in detail the structure and mechanism of biosynthesis, mode of action, transport and function of progesterone.
CO16	**To evaluate and understand** the hormonal relationship between hypothalamus, hypophysis, adrenal gland and gonads.
	Mammalian Reproductive Physiology-IV **Reproductive Toxicology, Embryology and Fertility**
CO1	**To evaluate and understand** the effect of chemical toxicants on testes and testicular toxicity.
CO2	**To evaluate and understand** the effect of various environmental factors on reproductive health.
CO3	To **understand** the induction of ovarian toxicity.
CO4	**To evaluate the** effect of pesticides on pregnancy.
CO5	**Gain knowledge** and **understand** the process of implantation of mammalian blastocyst.
CO6	**To evaluate and understand** the process of development of chorio-allantoic type of placenta.
CO7	**To evaluate and understand** the process of development, structure and function of Foetal membranes.
CO8	**Gain knowledge** and **understand** the mechanism of onset parturition and its hormonal regulation.
CO9	**To evaluate and understand** the different methods of female contraception, mode of action, advantages and disadvantages.
CO10	**To evaluate and understand** the process of surgical sterilization and medical termination of pregnancy, its advantages and disadvantages.
CO11	**To evaluate and understand** the mechanism of mode of action of pregnancy vaccines, its advantages and disadvantages.
CO12	**Gain knowledge** and **understand** the usage, mode of action,

	advantages and disadvantages of advances in female contraception.
CO13	**To evaluate and understand** the methods of male contraception- vasectomy and reversible vas occlusion
CO14	**To evaluate and understand** the use of hormonal contraceptive methods.
CO15	**To evaluate and understand** application of Anti-androgen and anti-spermiogenic compounds (LDH-Cy and Sp-10), Inhibin
CO16	**To evaluate and understand** the effect of antibodies for acrosomal enzymes and sperm surface proteins.
	Fish and Fisheries
	Fish and Fisheries-I **General studies**
CO1	To **understand** the Origin and Evolution of fishes.
CO2	To **understand** the development of jaws and limbs in fishes.
CO3	To **understand** Classification and General characters and affinities of Placoderm and fossil record.
CO4	To **understand** Classification and general characters along with Affinities and specialized characters of Elasmobranchs.
CO5	To interpret Classification and general characters with affinities of Actinopterygiians.
CO6	To **understand** general characters, classification, origin, fossil Dipnoian, distribution and specialized characters and affinities of Dipnoians and blood vascular system of Protopterus.
CO7	To **understand** the respiratory system.
CO8	To **understand** blood supply and mode of respiratory gaseous exchange in teleost.
CO9	To **understand** accessory respiratory organs.
CO10	**To evaluate** mechanism of air breathing, function of accessory respiratory organ.

CO11&12	To **understand** Air Bladder and **gain knowledge** blood supply to air bladder and function of air bladder.
	Fish and Fisheries- II **Applied fisheries**
CO1	To **understand** fresh water fisheries of India, riverine and reservoir fisheries.
CO2	To **understand** Esturine and Marine fisheries of India.
CO3&4	**To evaluate** breeding of Indian Major carps To **understand** neuroendocrine control of carp reproduction.
CO5	To **understand** culture of Exotic fishes.
CO6	To interpret monoculture and monosex culture.
CO7	To **understand** integrated fish farming.
CO8&9	To **understand** Catfish culture and Trout culture
CO10	To **understand** Ornamental fish culture.
CO11	To **understand** Culture of sea weeds and Spirulina.
CO12	To **understand** pearl culture, *Oyster* culture, prawn culture, Frog culture.
	Fish and Fisheries- I **General studies**
CO1	To **understand** Structure of alimentary canal in teleosts.
CO2	**To evaluate** modification of alimentary canal in relation to feeding habits, digestion and absorption of food.
CO3	To **understand** Structure of kidney in teleosts.
CO4	To interpret osmoregulation in fresh water forms, marine forms, Rays and Skates, Diadromous fishes. To **understand** mechanism of spermatogenesis and its hormonal control.
CO5	To **understand** chemoresceptors.
CO6	To **understand** Structure and function of taste buds.
CO7	**To evaluate the** migration in fishes.
CO8	**To evaluate** role of hormones in migration, orientation and

CO9&10	To **understand** Structure of male reproductive system and mechanism of spermatogenesis and its hormonal control
CO11&12	To **understand** female reproductive system and oogenesis, egg development, hormonal control of oogenesis.
CO13	**To evaluate the** structure, hormone and function of pituitary gland and other endocrine gland in fishes.
CO14	**To evaluate** hypothalamo-hypophysial system in fishes.
CO15	To **understand** neurohormones and their functions.
	Fish and Fisheries- II **Fishery technology and fish pathology**
CO1	To **understand** Pond management
CO2	**To evaluate** gear and craft in inland water.
CO3	To **understand** Conservation of fish, Fish legislation and their importance.
CO4	**To evaluate** water pollution and inland fisheries.
CO5	To **understand** Plankton in relation to fish production.
CO6	**To evaluate** Culture of phytoplankton and zooplankton.
CO7	To **understand** Manufacture and maintenance of Aquarium.
CO8	**To evaluate** Hybridization and transgenic fish.
CO9&10	**Gain knowledge** the Fish marketing; Domestic and export marketing.
CO11	To **understand** Sex control and sex reversal under condition and chromosome set manipulation in fish.
CO12	**To evaluate** Gamete preservation.
CO13	**To evaluate** Methods of curing and preservation of fish.
CO14	To **understand** Fish products and by-products.
CO15	To **understand** Fish pathology
CO16	**To evaluate** Fish diseases and its control