

GONDIA EDUCATION SOCIETY'S

MANOHARBHAI PATEL COLLEGE OF ARTS, COMMERCE & SCIENCE

SADAK ARJUNI, GONDIA-441807

(AFFILIATED TO R.T.M.NAGPUR UNIVERSITY)



Cycle-1

**Assessment & Accreditation by
NAAC**

**CRITERION I:
CURRICULAR ASPECTS**

**QnM-1.3.1: Institution integrates
crosscutting issues relevant to Professional
Ethics ,Gender, Human Values ,Environment
and Sustainability into the Curriculum**

Gondia Education Society's



Estd. 2009

MANOHARBHAI PATEL COLLEGE OF ARTS, COMMERCE & SCIENCE

SADAK ARJUNI, Dist. Gondia.(Maharashtra) 441807

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Ref.No. MBPCI/ ³³⁶ 120222023

Date : 28/02/2023

Declaration

The information, reports, true copies of the supporting documents, numerical data, etc. furnished in this file is verified by IQAC and found correct.

Hence this certificate.

Mr. A. M. Patil
IQAC Coordinator
Manoharbai Patel College
Sadak Arjuni



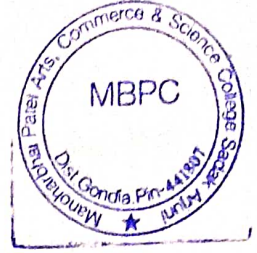
Dr. A. S. Dwivedi
Chairman IQAC and Principal
Manoharbai Patel College
Sadak Arjuni

Cross-cutting
Issues

1st
Year

2016-17

Proposed New syllabus For B. Com
From the Academic session 2016-2017
B.Com. – First Year
Semester-I



1T1: Financial Accounting-I

Unit – I Financial Accounting

Meaning, objectives and principles of Accounting, Accounting concepts & Conventions, Accounting Standards- AS 1 to AS 10. Final accounts of Sole Traders. (Theory & Numerical)

Unit – II Hire Purchase Accounts

Meaning of Hire Purchase Accounts, Features, Merits and Demerits of Hire Purchase System, Distinction between Hire Purchase and Instalment System. (Theory & Numerical Excluding Instalment System and Repossession of Assets)

Unit – III

Final Accounts of Co - Operative Societies: (As per Maharashtra Co-Operative Societies Act 1960)- Introduction, Types of Co-operative societies Preparation of Trading & Profit and Loss A/C and Balance Sheet. (Theory & Numerical)

Unit – IV

Joint Venture Accounts

Meaning, Distinction between Joint venture and Partnership, Methods of joint venture accounting. (Theory & Numerical on Centralized & Decentralized Method)

The Financial year ends on 31st March.

Reference Books :

- S. N. Maheshwari :- Financial Accounting – Vikas Publishing House, New Delhi.
- Gupta R. L. – Advanced Financial Accounting – S. Chand & Sons.
- Kumar, Anil S. – Advanced Financial Accounting – Himalaya Publication House.
- Shukla and Grewal : Advanced Accounts (S. Chand & Ltd. New Delhi).
- Jain and Narang : Advanced Accounts (Kalyani Publishers, Ludhiana).
- Sr. K. Paul : Accountancy, Volume –I and II (New Central Book Agency, Kolkata).
- R. K. Lele and Jawaharlal : Accounting Theory (Himalaya Publishers).
- M. A. Arulnandam :- Advance Accounting – Himalay Publication
- Gulhane, Navghare And Others- Financial Accounting –I, Sheth Publishers Pvt. Ltd. Mumbai.
- Prof. Pradeep Wath, Dr. R. D. Mehta, Dr. Dilip Gotmare :- Financial Accounting– Payal Pakashan.
- Advanced Accounts (volume –I), M. C. Shukla, T.S. Grewal, Revised by S. C. Gupta. S, Chand Publishing.

for JOPAC



1T2: Business Organization

Unit – I

Nature and scope of business: Meaning and definition of business, characteristics, objectives of business, classification of business activities, Industry, Service, Commerce & Trade. Social Responsibility of Business towards different groups.

Unit – II

Forms of Business Units: Meaning, Characteristics, Advantages and Disadvantages of Sole Trader, Partnership, One Person Company, Private Company, Joint Stock Company- Concept, Classification, Service sector business: - meaning, types including BPO and KPO, advantage its role in economy

Unit - III

Organization: Meaning, Definition, Concept and functions of Organization, Principles of Organization, Types of Organization- Line and Staff, Modern types of organizations- Project, Matrix, Formal and Informal Organization, Advantages and Disadvantages.

Unit IV

Recent Trends in Business Organization: Internal constituents of the Business Organization; key managerial personnel (KMP); chairman- qualities of a chairman, powers, responsibilities and duties of a chairman; chief executive officer (CEO), role and responsibilities of the CEO; E-commerce, E-business, E-banking.

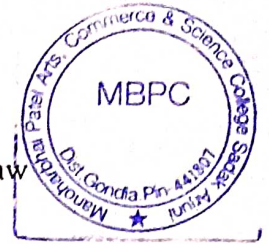
Suggested Books:

1. Jain, Khushpat S : Business Organisation, Mumbai
2. C.P Bose: Business Organisation & Management
3. Sekhri, Arun : Organisation, MUMBAI, Himalaya Publishing House, 2014
4. P.C.Jain: Government and business policy, Galgotia Publishing Com. New Delhi
5. Gulhane, Chopade Choudhary- Business Organization, Sheth Publishers Pvt. Ltd. Mumbai.
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8. Dr. A. Shende, Dr. M Dixit & Dr. D. Mohture, Business Organization, Anuradha Prakashan Nagpur.

1T3: Company Law

Level of Knowledge: - Basic Conceptual Knowledge.

Objective: To make aware the students with basic concept of company law
[The Company Act 2013 with Amendments up to June 2016]



UNIT - I

- (i) Background of New Company Act 2013.
- (ii) **Corporate Personality** – Company, Meaning of Company, Characteristics of a Company, Lifting of Corporate Veil
- (iii) Kinds of Company- Private Company, Public Company, Company limited by Share, Company Limited by guarantee, Unlimited Company, Association not for profit, Government Company, Foreign Company, Holding and Subsidiary and associate company with features of all kinds of company.
- (iv) Promotion and incorporation of company- stages in formation and incorporation of company, registration and commencement of business, Certificate of Incorporation

UNIT – II

- (i) Memorandum of Association- Meaning, Definition, Importance and Content of Memorandum of Association.
- (ii) Articles of Association – Meaning, Definition, Importance and content of Articles of association.
- (iii) Private Placement and Prospectus: Meaning and definition of private placement and prospectus, public offer, types of prospectus- Deemed prospectus, Shelf prospectus, Red Herring Prospectus, Abridge prospectus.
- (iv) Misrepresentation in prospectus, Consequences of misrepresentation and remedies for misrepresentation in prospectus.

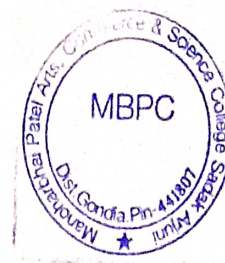
UNIT- III

- (i) Share and share capital- Meaning and nature of capital and share capital, kinds of share- equity, preference, sweat equity, bonus, employee stock option scheme, and Right issue.
- (ii) Debt Capital (Borrowing and Debenture)- Meaning and nature of debt and debt capital, Types of different types of borrowing
- (iii) Difference between- Share and debenture, owned capital and debt capital.
- (iv) Depositories and dematerialization of securities- meaning and nature of depositories, procedure of dematerialization of securities.

UNIT – IV

- (i) Membership in a company – Meaning of shareholder and member, distinction between shareholder and member, kinds of member.
- (ii) Procedure to become member and shareholder of a company, Concept of Transfer and Transmission of Securities (Share and Debenture)
- (iii) Directors – Meaning, Appointment, Power and Duties, Managing Director and Whole Time Director – Appointment and Qualification.

1T4: Business Economics – I



Unit I: Nature and Scope of Business Economics

Business Economics-Meaning, scope and objectives of business economics. Nature and types of business decisions. Role and social responsibility of business & business economist. Micro and Macro Economics- Definition, scope, merits and demerits.

Unit II: Theory of Consumption

Law of Demand, Demand determinants, Changes in demand, Indifference Curve Concept- Definition, properties, importance of indifference curves. Elasticity of Demand- Concept, definition, kinds, measurement of elasticity of demand, Factors influencing elasticity of demand, Importance of elasticity of demand. Demand Forecasting- Meaning, need, importance, methods of demand forecasting.

Unit III: Theory of Production

Concept of Production Function- Concept, definition, Types of Products, Total Production, Average Production, Marginal Production. Law of Variable Proportions- Assumptions, significance & limitations. Isoquant Curves- Definition, general properties of Isoquant curves, Expansion Path. Law of Returns to Scale, Internal and External Economies and Diseconomies of Scale, Ridge Lines. Theories of Population - Malthusian Theory of Population, Optimum Theory of Population, Demographic Transition Theory of Population and Criticisms. Law of Supply.

Unit IV- Theory of Cost and Revenue

Law of Supply & Criticisms, Factors influencing supply. Concept of Cost in the Short & Long Run- Accounting Cost, Economic Cost, Opportunity Cost, Fixed Cost, Variable Cost, Direct and Indirect Costs, Real Cost, Explicit & Implicit Costs, Money Cost, Total Cost, Average Cost, Marginal Cost, Selling Costs. Revenues - Total Revenue, Average Revenue, Marginal Revenue and their Relationship.

Books Recommended:

1. Business Economics ,V.G. Mankar, Himalaya Publication House.
2. Business Economics, H.L.Ahuja, S.Chand Publishing
3. Business Economics, Dr. A. shende, Dr. D. Mohture, Dr. Dixit, Dr. R. Gan, Anuradha Prakashan Nagpur
4. Micro Economics, P.N.Chopra, Kalyani Publishers.
5. Micro Economics, D.D.Chaturvedi, Galgotia Publishing Company.
6. Principles of Economics, D.M.Mithani, Himalaya Publishing House.
7. Advance Micro Economic Theory, M.Maria John Kennedy, Himalaya Publishing House.
8. Business Economics, Rashi Arora, Sheth Publishers, Mumbai
9. Business Economics, Dr. Samudra, Sai Jyoti Prakashan

201617

B.Com. - First Year
Semester-II
211: Statistics and Business Mathematics



Unit - I Statistics & Measures of Central Tendency

Meaning, Scope, Importance, Functions and Limitations of Statistics. Collection of data, Tabulation and Classification, Frequency distribution, Mean, Median, Mode, Geometric Mean and Harmonic Mean (Theory & Numericals)

Unit - II

Dispersion- Meaning and significance of dispersion, Methods of measuring dispersion, Mean Deviation, Standard Deviation, Quartile Deviation, co-efficient of variation (Theory & Numericals)

Unit - III

Skewness-Absolute Measures of Skewness, Relative Measures of Skewness, Karl Pearson's Coefficient of Skewness, Bowley's Coefficient of Skewness. (Numericals)

Unit - IV

Business Mathematics:- Ratio Proportion, Percentages, Simple & Compound Interest, Profit/ Loss. (Numericals)

Reference Books:

- Fundamentals of statistics : D. V. Elhance & Veena Elhance
- Statistics : V. K. Kapoor - S. Chand & Sons
- Statistics : B. New Gupta - Sahitya Bhavan Agra
- Fundamentals of statistics and Computer, Dr. M. Datalkar & Mrs. Sindhu Ghate, Sai Jyoti Prakashan, Nagpur
- Business Statistics A Self Study Text Book, Dr. P. C. Tulsian & Bharat Jhunjhunwala, S. Chand Publishing
- Fundamental of Statistics : S. C. Gupta - Himalaya Publishing House
- Business Mathematics & Statistics : NEWK Nag & S.C. Chanda - Kalyani Publishers
- Gulhane, Chopade - Statistics and business mathematics, Sheth Publishers Pvt. Ltd. Mumbai
- Business Mathematics and Statistics- Dr. M. Datalkar & Mrs. S. Ghate, Sai Jyoti Publication, Nagpur.
- Problem in statistics : Y. R. Mahajan - Pimplapure Publisher Nagpur

2T2: Business Management



Unit I

Introduction: Meaning, Definition, concept and types of management. Principles of business Management. Scope and significance of business management. Process of business management. Function of business Management. Management as a science or art.

Unit II

Planning: - Meaning, Nature and Characteristics, Importance, Types & Components of Planning. **Decision Making:** Meaning, characteristics & importance of decision making. Traditional and Modern techniques of Decision-Making.

Unit – III

Delegation of Authority:— Meaning, Elements, Advantages, & Obstacle of Delegation of Authority. Centralization and decentralization of authority and its merits and demerits.

Co-ordination & Controlling: Meaning, Concept and principles of Coordination, Internal & External Coordination. Meaning, concept and elements of control.

Unit IV

Recent trends in management:

Management of Change Management of Crisis, Total Quality Management, Stress Management, International Management.

Suggested Books:

1. Bajaj: Management Processing and Organization, Excel Publications.
2. Tripathy and Reddy – Principles of Management – Tata McGraw Hill.
3. A. Pardhasaradhy & R. Satya Raju: Management Text and Cases, Prentice Hall of India. Gulhane, Chopade Choudhary- Business Management, Sheth Publishers Pvt. Ltd. Mumbai
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2T3 : Secretarial Practice



Level of Knowledge: - Book Conceptual Knowledge.

Objective: To make aware the student with various function, duties and responsibilities of company secretary and Secretarial Practice

[The Company Act 2013 with Amendments up to June 2016]

UNIT – I

- (i) Procedure for Incorporation of Companies, Conversion of Companies – Private Limited to Public Limited and Public Limited to Private Limited
- (ii) Procedure for Alteration of Memorandum of Association and Article of Association
- (i) Company Secretary – Meaning, Qualification and Functions/ Role
- (ii) Directors – Procedure for Appointment of Directors and Director's Identification Number (DIN)- allotment and surrender

UNIT- II

- (i) Types and characteristics of company meeting, statutory, board, general and extra ordinary meeting, and meetings of committee of director.
- (ii) Agenda, Notice and provision regarding quorum of Board meeting, Annual General Meeting and Extra ordinary General Meeting
- (iii) Voting and resolution- Meaning of poll, postal ballot and E-Voting, Meaning of ordinary and Special Resolution.
- (iv) Circular Resolution, Explanatory statement, Ordinary and special Business to be transacted in meetings.

UNIT – III

- (i) Report Writing - Essential and content of Board Report and Annual Report.
- (ii) Concept of secretarial audit, Secretarial standards, corporate social responsibility and corporate governance, National Financial Reporting Authority.
- (iii) E-Governance and E-Filing- Meaning, features and procedure of E-Governance and E-Filing, MCA-21

UNIT – IV

- (i) Key managerial personnel- Appointment and function of managing director, whole time director and manager.
- (ii) Procedure for appointment of Additional Directors, Alternate Directors, Nominee Directors.
- (iii) Managerial Remuneration - Remuneration of managing director, whole time director or manager.
- (iv) Provisions regarding resignation, removal of directors, Casual vacancy.



Unit I: Market Structure

Meaning, Definition, Classification of Market Structures. Firm & Industry- Meaning, Difference between Industry and Firm. Pricing of Products-Types, Cost-based pricing, Customer-based pricing, Competitor-based pricing.

Unit II: Perfect & Imperfect Competition Markets

Definition, Features, Price-output determination under Perfect Competition Market. Monopoly - Definition, Features, Types, Price determination under Monopoly. Concept of Price Discrimination. Monopolistic Competition- Meaning, Features, Price determination under Monopolistic Competition.

Unit III: Theories of Distribution

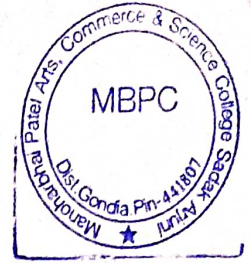
Theory of Distribution -Modern Theory of Distribution. Theories of Rent- Ricardian theory of Rent, Modern theory of Rent, Concept of Quasi Rent. Theory of Wages- Marginal Productivity theory of Wages with Criticisms, Nominal & Real wages. Theories of Interest-Loanable Funds Theory of Interest, Liquidity Preference Theory of Interest, Criticisms, Concept of Gross Interest & Net Interest. Theories of Profit- Dynamic Theory of Profit, Innovation Theory of Profit, Criticisms of the Theories, Gross Profit & Net Profit.

Unit IV- Business Cycles & National Income

Business Cycles-Concept, Features, Types, Phases of Business Cycles. National Income - Meaning, Concepts, Methods of Measuring National Income, Difficulties in National Income Accounting.

Books Recommended:

1. Business Economics , V.G. Mankar, Himalaya Publication House
2. Modern Economics, H.L.Ahuja, S.Chand & Co Ltd.
3. Micro Economics P.N.Chopra, Kalyani Publishers.
4. Micro Economics, D.D.Chaturvedi, Galgotia Publishing Company.
5. Modern Economic Theory, K.K.Dewett, S.Chand & Co Ltd.
6. Business economics, Dr. Arvind Shende, Dr. R. Ingole, Dr. P. Kothiwale, Anuradha Prakashan, Nagpur
7. Managerial Economics,D.N.Dwivedi, Vikas Publishing House Pvt Ltd.
8. Managerial Economics-Theory & Applications, D.M.Mithani, Himalaya Publishing House.
9. Business Economics by Ms. V. Karkare, Mrs. S Ghate, Anuradha Prakashan Nagpur.
1. Business Economics, Rashi Arora, Sheth Publishers, Mumbai



**Proposed New syllabus For B. Com
From the Academic session 2020--21
B.Com. – First Year Semester-I
1T1: Financial Accounting-I**

Unit – I Financial Accounting

Meaning, objectives and principles of Accounting, Accounting concepts & Conventions, Accounting Standards- AS 1 to AS 10. Final accounts of Sole Traders.
(Theory & Numerical)

Unit – II Branch Accounting (Excluding Foreign Branch)

Meaning of Branch, Objective of Branch Accounting, Maintenance of Accounting Records, Transactions relating to Branch, Accounting procedure of Branch.
(Theory & Numerical)

Unit – III Final Accounts of Co - Operative Societies: (As per Maharashtra Co-Operative Societies Act 1960)-

Introduction, Types of Co-operative societies Preparation of Trading & Profit and Loss A/c and Balance Sheet. (Theory & Numerical)

Unit – IV-Joint Venture Accounts

Meaning, Distinction between Joint venture and Partnership, Methods of joint venture accounting. (Theory & Numerical on Centralized & Decentralized Method)

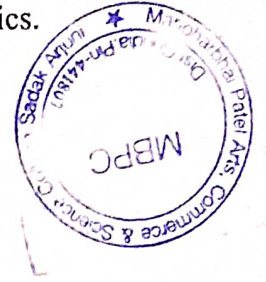
The Financial year ends on 31st March.

Reference Books :

1. S. N. Maheshwar :- Financial Accounting – Vikas Publishing House, New Delhi
2. Gupta R. L. – Advanced Financial Accounting – S. Chand & Sons
3. Kumar, Anil S. – Advanced Financial Accounting – Himalaya Publication House
4. Shukla and Grewal : Advanced Accounts (S. Chand & Ltd. New Delhi)
5. Jain and Narang : Advanced Accounts (Kalyani Publishers, Ludhiana)
6. Sr. K. Paul : Accountancy, Volume –I and II (New Central Book Agency, Kolkata)
7. R. K..Lele and Jawaharlal : Accounting Theory (Himalaya Publishers)
8. M. A. Arulnandam :- Advance Accounting – Himalay Publication
9. Dr. Vijay Bagde, Dr. Pramod Fating, Dr. Prashant Gulhane: Financial Accounting-I; Sir Sahitya Kendra, Nagpur.
10. Prof. PradeepWath, Dr. R. D. Mehta, Dr. DilipGotmare :- Financial Accounting–Payal Prakashan

1T4 B.COM. PART-I BUSINESS ECONOMICS – I (SEMESTER I)

19-20



Unit I Nature and Scope of Business Economics

- Business Economics – Meaning, Scope and Objectives of Business Economics.
- Nature and Types of Business Decisions.
- Social Responsibility of Business.
- Meaning, Scope, Merits and Demerits of Micro and Macro Economics.

Unit II- Theory of Consumption

- Law of Demand, Demand Determinants, Changes in Demand.
- Indifference Curve Concepts – Definition, Properties and its importance.
- Elasticity of Demand – Concept, Types, Measurement, Factors influencing Elasticity of Demand. and Importance
- Demand Forecasting – Meaning, Importance and methods of Demand Forecasting.

Unit III – Theory of Production

- Concept of Production Function – Meaning, Cobb-Douglas Production Function.
- Law of Variable Proportion.- Assumptions, Significance and Limitations
- Law of Returns to Scale.
- Internal and External Economies and Diseconomies of Scale.

Unit IV – Theory of Cost and Revenue

- Law of Supply and factors influencing supply.
- Concept of Cost in Short Run – Accounting Cost, Economic Cost, Opportunity Cost, Fixed Cost, Variable Cost, Direct and Indirect Costs, Real Cost, Explicit and Implicit Costs, Money Cost, Total Cost, Marginal Cost, Average Costs. Total, Marginal and Average Cost in the Long Run.
- Revenues – Total Revenue, Average Revenue, Marginal Revenue and their Relationship.

Books recommended:

- 1) Business Economics, V.G. Mankar, Himalaya Publication House,.
- 2) Business Economics, H.L. Ahuja, S.Chand Publishing.
- 3) Business Economics, Dr.A. Shende, Dr. D.Mohture, Dr.Dixit, Dr. R.Gan, Anuradha Prakashan.
- 4) Micro Economics, Dr. P. N. Chopra, Kalyani Publishers,
- 5) Micro Economics, D.D. Chaturvedi, Galgotia Publishing Co.
- 6) Principles of Economics, D.M. Mithani, Himalya Publishing House
- 7) Advance Micro Economic Theory, M. Maria John Kennedy, Himalaya Publishing House.
- 8) Business Economics Rashi Arora Sheth Publishers Mumbai

19-20

Unit I Market Structure

Meaning, Classification of Market Structure. Firm and Industry-Meaning and objectives, Difference between Industry and Firm. Pricing of Products-Cost based pricing, Customer-based pricing, Competitor-based pricing.

Unit II Perfect & Imperfect Competition Markets

Features and Price-output determination under Perfect Competition Market.

Features and Price-output determination under Monopoly Market.

Price Discrimination – Meaning and types.

Features and price-output determination under Monopolistic Competition.



Unit III: Theories of Distribution

Theory of Distribution- Modern Theory of Distribution.

Theories of Rent- Ricardian Theory of Rent, Modern theory of Rent, Concept of Quasi Rent.

Theory of Wages- Marginal Productivity Theory of Wages with Criticisms.

Theories of Interest- Loanable Funds Theory of Interest, Liquidity Preference Theory of Interest, Criticisms,. Theories of Profit- Dynamic Theory of Profit, Innovation Theory of Profit, Criticism of Theories, Concept of Gross Interest and Net Interest

Unit IV –Business Cycles and National Income

Business Cycles- Concept, Features, Phases of Business Cycles, Causes and Remedies of Business Cycles.

National Income – Meaning, Concepts, Methods of Measuring National Income, Difficulties in National Income Accounting.

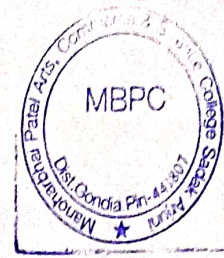
Books recommended:

- 1) Business Economics, V.G. Mankar, Himalaya Publication House,.
- 2) Modern Economics, H.L. Ahuja, S.Chand Publishing.
- 3) Micro Economics, Dr. P. N. Chopra, Kalyani Publishers,
- 4) Micro Economics, D.D. Chaturvedi, Galgotia Publishing Co.
- 5) Modern Economics Theory, D.D. Dewett, S Chand & Co Ltd
- 6) Managerial Economics, D.N. Dwivedi , Vikas Publishing House Pvt Ltd.
- 7) Managerial Economics- Theory & Applications, D.M. Mithani, Himalya Publishing House

Cross-cutting
Issues

IInd Year

**B. Com. Second Year
Semester- III
3T1 – : Financial Accounting – II**



Unit – I

Consignment Accounts.

Meaning, Needs, Advantages and Formalities in consignment, Difference between a consignment and a sale, Performa invoice, Account Sales, Accounting Procedure of Consignment, Valuation of Consignment Stock. (Theory & Numerical)

Unit – II

Branch Accounts (Excluding Foreign Branch)

Meaning of Branch, Objectives of Branch Accounting, Maintenance of Accounting Records , Transactions relating to Branch. Accounting Procedure of Branch(Theory & Numerical))

Unit – III

Flotation of Joint Stock Companies and their Capital Structure.

Types of Shares, Methods of issue of shares, Accounting for Issue, Forfeiture of shares & reissue of forfeited shares(Theory & Numerical)

Unit – IV

Final Accounts of Joint Stock Companies

Introduction, Statutory provisions regarding preparation of companies final accounts. Provision for interest on debentures, Proposed Dividends, Interim Dividend (Theory & Numerical)

The financial year ends on 31st March.

Reference Books:

- Corporate Accounting:-Maheshwari S N, VikasPublishing house Pvt. Ltd.
- Advanced Financial Accounting, Gupta R. L. ,S. Chand Publishing
- Advanced Accounts Shukla and Grewal : (S. Chand & Ltd. New Delhi)
- Advanced Accounts , Jain and Narang : (Kalyani Publishers, Ludhiana)
- Accountancy, Volume –I and II ,Sr. K. Paul : (New Central Book Agency,Kolkata)
- Accounting Theory, R. K..Lele and Jawaharlal : (Himalaya Publishers)
- Accounting Theory, Dr. L. S. Porwal : (Tata McGraw Hill)
- Corporate Accounting Dr. S. N. Maheshwari : (Viakas Publishing House Pvt. Lit. New Heldi)
- Advanced Financial Accounting ,Dr. Ashok Sehgal& Dr. Deepak Sehgal : (Taxmann, New Delhi)
- Advanced Financial Accounting Dr. R. D. Mehta, Prof. P. Wath & Dr. D. C. Gotmare ,Payal Prakashan, Nagpur.

For 2014

3T2 : Business Communication & Management



Unit – I: Introduction

Meaning, Definition and concept of Communication, Objectives of Communication, Functions of communication Written Communication, Oral Communication, Visual Communication, Audio Visual Communication, interpersonal communication, supervisory communication, grapevine communication, barrier in communication

Unit – II: Business communication

Business communication: concept, objective, elements, purpose, importance, salient feature, principles of effective business communication.

customer care communication In business

Types of business communication-company manual, house journal, placement broacher, leaflets, E MAIL . Public Relations Management- Role of public relations officer in business, group discussion,

Unit-III: Technology and business communication

Concept of Management Information System, Role of Computer in communication, Barriers of computerized Communication –Use of internet, website and electronic media in business communication. **Social media as a mean of communication.**

Unit-IV:

MS-office aided communication: MS Word and its application in business communication , Role of MS-Excel and MS-Power point in communication skill, MS-excel and financial presentation, MS-power point and business communication, Use of MS-power point in business meeting as a tools of effective communication.

Suggested Books:

1. A guide to business correspondence- Kapoor A- S Chand & Co
- 2.. Urmila Rai & S.M. Rai, Business Communication, Himalya Publishers,
3. Lesikar I Flatley, Basic Business Communication, Tata McGraw Hill.
4. Microsoft office-2000/2007- Gini courter, annelte Marquis BPB
5. Business Communication, Dr. Arvind Shende, Dr. Asha Tiwari, Anuradha Prakashan, Nagpur.
5. Business Communication , Pooja Khanna, S. Chand Publishing.
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3T3– III: Business Law



Level of Knowledge: Basic Conceptual Knowledge

Objective: To make students aware about various Laws relating to Business
[with amendments up to June 2016 in respective Acts]

Unit-I (i) Business law : Meaning, evolution and significance

- (ii) Law relating to Contract – (Indian Contract Act-1872): important definitions, nature and kinds of contract, essentials of a valid contract, offer and acceptance, consideration, capacities of parties to contract, free consent.
- (iii) Void Agreement, Contingent Contract, Quasi Contract
- (iv) Contract of Indemnity and Guarantee, Law of Agency.

Unit-II

- (i) Law relating to Sale of Goods- (Sale of Goods Act- 1930): contract of sale of goods, Essentials of a contract of sale, concept of goods, sale distinguished from agreement to sell, difference between conditions and warranties; transfer of ownership and delivery of goods, unpaid seller - his rights against the goods and the buyer.
- (ii) Law relating to Partnership- (the Indian partnership act 1932): concept of partnership and partnership firm, types of partner, types of partnership.
- (iii) Registration of partnership firm, effect of non registration, partnership deed, duties and liabilities of partners including those of newly admitted partners, dissolution of partnership firms.

Unit-III

- (i) Law relating to Negotiable Instruments -(Negotiable Instrument Act-1881): Meaning and Definition of Negotiable instruments, Promissory Notes, Bills of Exchange and its Types, Cheques and Its types, Crossing of Cheques.
- (ii) Endorsements: Meaning and Types, Holder and Holder in due course and its rights, Discharge of Negotiable Instruments.
- (iii) Parties to a Negotiable Instrument - duties, rights, and liabilities
- (iv) Prevention of Money Laundering Act-2002: Objectives, Important Definitions and Salient Features.

Unit-IV

- (i) Law relating to Consumer protection in India - (Consumer Protection Act-1986): Definition of Consumer, Importance of Consumer, Problems faced by Consumers, Consumer Protection- Need & Importance, Rights & Responsibilities of Consumer



(ii) Definitions: Complaints, Services, Defects & Deficiency, Relief available to consumer, Procedure to file complaints, ways and means of consumer protection, consumer dispute redresser agencies and procedure followed by redresser agencies.

(iv) Law Relating to Information Technology- (Information Technology Act-2000): Objectives, scope and Important Terms, Digital Signature & Electronic Records, Certifying Authority, Digital Signature Certificates, offense and Penalties.

(iv) Cyber Law: Meaning, Important Definitions, Features, Need and Importance of cyber Law in India

Reference Books:

- Gulshan, S S and Kapoor, G K: Business Law Including Company Law, New Age International (P) Ltd., Publishers
- M.C. Kuchhal and Vivek Kuchhal : Business Law, Vikas Publishing House, New Delhi
- V.S. Datey: Business and Corporate Laws, Taxman, New Delhi
- N.D. Kapoor: Mercantile Law, Sultan Chand & Sons, Educational Publishers, New Delhi.
- Dr. V. K. Jain: Mercantile Law, Seth Publications, Nagpur.
- Business Law R.S. N. Pillai & V. Bhagavathi, S. Chand Publishing.
- Sen & Mitra: Cinnercuak Kawn, The World Press Pvt. Ltd., Kolkata.
- C.K. Kapoor: Lectures on Business and Corporate Laws, Vidya Sadan, Delhi.
- K.R. Bulchandani, Business Law Himalaya P. House, Mumbai-2006.
- Business Law, Dr. Arvind shende, Dr. Vijay Uggade, Anuradh Prakashan, Nagpur.

3T4 MONETARY ECONOMICS-I



Unit I: Money

Evolution, Meaning, Definition, Nature and Functions of Money. Quantity Theory of Money and Criticisms. Paper Currency & Methods of Note Issue- Fixed Fiduciary Method, Proportionate Reserve Method, Minimum Reserve Method.

Unit II: Inflation & Deflation

Inflation- Meaning, Nature, Causes, Effects, Impact of Inflation. Deflation - Meaning, Nature, Causes, Effects, Impact of Deflation. Role of Monetary Policy and Fiscal Policy in controlling Inflation & Deflation.

Unit III: Money Market & Policies

Money Market- Concept of Money Market, Objectives, Importance of Money Market, Instruments of Money Market. Monetary Policy and Fiscal Policy Concept-Meaning, Objectives, Need, Importance, Impact, Recent Changes/Trends.

Unit IV: Public Finance

Concept, Meaning, Importance of Public Finance, Principles of Public Finance, Theory of Maximum Social Advantages & Criticisms. Taxation – Definition, Characteristics & Cannons. Types of Taxation- Proportional, Progressive and Regressive Taxation System. Direct and Indirect Taxes- Merits & Demerits.

Books Recommended:

1. Monetary Economics, RR Paul, Kalyani Publishers.
2. Money, Banking, Trade & Public Finance, M.V.Vaish, New Age International Pvt.Ltd.
3. Money, Banking and International Trade, K.P.M. Sundaram, Sultan Chand, New Delhi.
4. Public Finance, Tyagi, Jai Prakash Nath Publishers.
5. Money and Financial System P.K. Deshmukh, Phadke Prakashan.
6. Monetary Economics, Rashi Arora, Sheth Publishers, Mumbai
7. Modern Macroeconomics (Theory & Policy), B.N.Ghosh, Ane Books Pvt Ltd, 2nd Edition, 2012.
8. Macro Economics, D.D.Chaturvedi, Galgotia Publishing Company, 1999.



B.Com. – Second Year
Semester-IV
4T1-: Financial Accounting – III

Unit – I

Final Accounts of Banking Companies

Meaning of Banking Companies, Functions of Banking, Restrictions for a Banking Company, Provision of the Banking Companies Regulation Act 1949, Preparation of Annual accounts as per Banking Companies Regulation Act 1949 as per amendment by RBI.
(Theory & Numericals)

Unit – II

Final Accounts of General Insurance Companies

Introduction, Types of General Insurance, Important Terms- Reserve for unexpired Risk, Reinsurance Claims, Reinsurance Premium, Commission, Bonus in Reduction of Premium and preparation of final accounts
(Theory & Numericals)

Unit – III

Valuation of Goodwill

Meaning, Characteristics of Goodwill, Factors influencing the value of goodwill, Need for Valuation of goodwill , Valuation of goodwill as per -Average Profit Method, Weighted Average Profit Method, Super Profit Method, Capitalization Method. (Theory & Numericals)

Unit – IV

Liquidation of Company.

Meaning, Types of Liquidation, Steps in Voluntary Liquidation, Functions of Liquidator, Liquidators remuneration/Commission. Preparation of Liquidator's Final Statement of Account only. (Theory & Numericals)

The Financial year ends on 31st March.

Books Recommended

- Gupta R. L. – Advanced Financial Accounting – S. Chand & Sons
- Kumar, Anil S. – Advanced Financial Accounting – Himalaya Publication House
- Shukla and Grewal : Advanced Accounts (S. Chand & Ltd. New Delhi)
- Jain and Narang : Advanced Accounts (Kalyani Publishers, Ludhiana)
- Sr. K. Paul : Accountancy, Volume –I and II (New Central Book Agency, Kolkata)
- R. K. Lele and Jawaharlal : Accounting Theory (Himalaya Publishers)
- Dr. L. S. Porwal : Accounting Theory (Tata McGraw Hill)

b)	Unit -II	Problem 04 Marks
c)	Unit-III	Problem 04Marks
d)	Unit-IV	Problem 04 Marks



4T2- : Skill Development

Unit I: Introduction:

Basic of personality, Human growth and behavior, Motivation and morality, Meaning of Skill, types; soft and hard skill, need for developing skill, human skill and behavior, Motivation and morality, skill development and employment

Unit II: Communication skills and Personality Development:

Intra-personal communication and Body Language, Inter-personal Communication and Relationships, Leadership Skills, Team Building and public speaking, Communication in English, Presentation Skills, and Quality required for good public speaker,

Unit III: Techniques in Personality development

Self confidence, Mnemonics, Goal setting, Time Management and effective planning, Stress Management, Meditation and concentration techniques, Self Motivation Self acceptance and Self growth

Unit IV : Entrepreneurial skill development

Skill development of rural industrial sectors - small scale - handloom - agro based industries, rural artisans - handicrafts and sericulture. Meaning of entrepreneurship, types skill required for entrepreneurship

Suggested Books:

1. Personality Development –Transform yourself by Rajiv K Mishra.
2. Personality Development and Communication Skills – II by Dr.C.B.Gupta
3. Business Communication and Personality Development: Lessons for Paradigm Change in Personality by Biswajit Das and Ipseeta Satpathy.
4. Entrepreneurship development.



4T3-: Income Tax

Unit I: Introduction of Income Tax

- i) Basic Concepts of Income Tax, Meaning & Definition of Assesses, Assessment Year, Previous Year, Gross Total Income, Types of Assesses, Income Exempt from tax, Capital & Revenue Expenditure. Agricultural Income.

Residential Status

- ii) Residential Status and its effects on Tax incidence: Residential status of Individual, HUF, Firm & Association of Person, Company, Basic Conditions & Additional Conditions.(Theory)

Unit II: Income from Salary

- i) Definition of Salary, Allowances, Types of Allowances, Taxable Allowances, Tax Free Allowances, Partly Taxable Allowances,
- ii) Perquisites, Types of Perquisites, Taxable Perquisites, Tax Free Perquisites,
- iii) Types of Provident Fund, Tax treatment of P.F, E.P.F., Superannuation Fund and Computation of Salary Income/Taxable Salary and tax liability. (Theory & Numericals)

Unit II Income from House Property

- i) Meaning of Annual Value, Fully exempted income of house property, deemed owner.
- ii) Deduction from income from house property, unreleased rent, computation of income from house property. (Theory & Numericals)

- Unit IV :
- i) Income Tax Slab Rates, Rebates, Income which do not form part of total Income
 - ii) Deduction under section 80C, 80CCC, 80CCD, 80D, 80DDB, 80E, 80G, 80GG, 80U

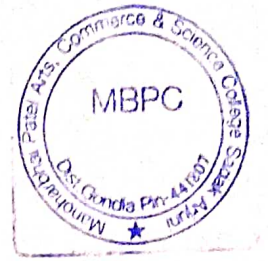
iii) Income from Other Sources

Income specifically included under the head of other sources, specified income, casual income, deduction allowed from the income of other sources, computation of income from other sources. (Theory & Numericals)

Books Recommended :

Ahuja G. K. and Ravi Gupta :- Systematic Approach to Income and Central Sales tax, Bharat law house, New Delhi.

- Singhania V. K. :- Direct taxes :- Law and Practice, Taxman's publication, Delhi.



4T4:- MONETARY ECONOMICS-II

Unit I: Commercial Banking

Evolution, Meaning, Functions of Commercial Banks. Role commercial banks in a developing economy. Process of Credit Creation by Commercial Banks & its Limitations, Investment Policy of Commercial Banks. Non-Performing Assets- Meaning, Criteria and Causes.

Unit II: E-Banking & Core Banking

Meaning, Features, Advantages & Disadvantages of ATM (Automated Teller Machines.)
Meaning, Features, Merits and Demerits of Credit cards, Plastic cards, Smart cards, e-purse, Laser cards. EFT (Electron Fund Transfer), ECS (Electronics clearing system).

Unit III: Banks and Customers Relationship and Services

Introduction, Meaning of Customer. Bank & Customer Relationship- Debtor & creditor, Trustee and Beneficiary, Agent and Principal, Bailor and Bailee. Opening, operating and closing of various bank accounts. Demat Account -Advantages, Opening and Operation of Demat Account. Methods of Calculating Interest Rates on deposits and on loans.

Unit : IV Central Bank

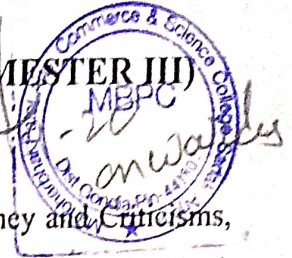
Meaning, Objectives, Functions, Role of Central Bank. Credit Control- Meaning, Objectives, Methods : Quantitative- Bank Rate, Open Market Operations, Cash Reserve Ratio(CRR), Statutory Liquidity Ratio(SLR), Repo Rate. Qualitative – Varying margin requirement, Regulation of consumer's credit, Issuing directives, Publicity measure, Moral suasion, Credit rationing and limitations.

Books Recommended:

1. Monetary Economics, RR Paul, Kalyani Publishers.
2. Money, Banking and International Trade, K.P.M. Sundaram , Sultan Chand, New Delhi.
3. Macroeconomics, Mankiw, N. Gregory, Macmillan Worth Publishers New York, Hampshire U.K.

Syllabus changed

3 T 4 B.COM. PART-II MONETARY ECONOMICS – I (SEMESTER III)



Unit I – Money

Evolution, Meaning, Definition and Functions of Money. Quantity Theory of Money and Criticisms, Paper Currency and Methods of Note Issue – Fixed Fiduciary Method, Proportionate Reserve Method, Minimum Reserve Method.

Unit II: Inflation & Deflation

Inflation- Meaning, Nature, Causes, Effects, Impact and Remedies of Inflation.

Deflation- Meaning, Nature, Causes, Effects, Impact and Remedies of Deflation.

Unit III: Money Market & Policies

Money Market- Concept of Money Market, Objectives, Importance of Money Market, Instruments of Money Market, Monetary Policy and Fiscal Policy Concept, Meaning, Objectives, Need, Importance, Impact, Recent Changes/Trends.

Unit IV: Public Finance

Concept, Meaning, Importance of Public Finance, Principles of Public Finance, Theory of Maximum Social Advantages & Criticism. Taxation- Definition, characteristics & Canons. Types of Taxation- Proportional, Progressive and Regressive Taxation System.. Direct and Indirect Taxes- Merits and Demerits.

Books Recommended:

- 1.Monetary Economics, RR Paul, Kalyani Publishers.
- 2.Money,Banking,Trade & Public Finance, M.V.Vaish, New Age International Pvt.Ltd.
- 3.Money, Banking and International Trade, K.P.M. Sundaram , Sultan Chand,New Delhi.
- 4.Public Finance, Tyagi , Jai Prakash Nath Publishers.
- 5.Money and Financial System P.K. Deshmukh, Phadke Prakashan.
- 6.Monetary Economics, Rashi Arora, Sheth Publishers, Mumbai
- 7.Modern Macroeconomics(Theory & Policy),B.N.Ghosh, Ane Books Pvt Ltd, 2ndEdition, 2012.
- 8.Macro Economics, D.D.Chaturvedi, Galgotia Publishing Company,1999.

Syllabus changed

4TH B.COM. PART -II MONETARY ECONOMICS - II (SEMESTER-IV)



Unit I: Commercial Banking:

Evolution, Meaning, Functions of Commercial Banks, Role of Commercial Banking in a developing economy. Process of Credit Creation by Commercial Banks and its Limitation, Investment Policy of Commercial Banks. Non Performing Assets- Meaning, Criteria and Causes.

Unit II: Banking and Core Banking:

Meaning, Features, Advantages and Disadvantages of ATM(Automated Teller Machines).

Meaning, Features, Merits and Demerits of Credit Cards, Plastic Cards, Smart Cards, e-Purse, Laser cards, EFT(Electron Fund Transfer), ECS(Electronics Clearing System).

Unit III: Banks and Customers Relationship and Services:

Introduction, Meaning of Customer, Bank and Customer Relationship- Debtor and Creditor, Trustee and Beneficiary, Agent and Principal, Bailor and Bailee. Opening, Operating and closing of various bank account. Demat Account-Advantages, Opening and Operation of Demat Account. Methods of Calculating Interest Rates on Deposits and on loans.

Unit IV: Central Bank:

Meaning, Objectives, Functions, Role of Central Bank. Credit Control-Meaning, Objectives, Methods: Quantitative-Bank Rate, Open Market Operations, Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate. Qualitative- Varying Margin requirement, Regulation of Consumer's Credit, Issuing Directives, Publicity Measures, Moral Suasion, Credit Rationing and Limitations.

Books Recommended:

1. Monetary Economics, RR Paul, Kalyani Publishers.
2. Money, Banking and International Trade, K.P.M. Sundaram , Sultan Chand, New Delhi.
3. Macroeconomics, Mankiw, N. Gregory, Macmillan Worth Publishers New York, Hampshire U.K. 81
4. Financial Institutions and Markets , Agrawal & Gupta, Kalyani Publishers.
5. Modern Banking ,Vaish, M.C, Oxford & IBH Publishing Co., New Delhi
6. Money and Financial System P.K. Deshmukh, Phadke Prakashan.
7. Monetary Economics, Rashi Arora, Sheth Publishers, Mumbai

Cross-cutting Issues

- Q.2. (a) UNIT - I 8 Marks
(b) UNIT - I 8 Marks
OR
(c) UNIT - I 8 Marks
(d) UNIT - I 8 Marks
- Q.3. (a) UNIT - I 8 Marks
(b) UNIT - I 8 Marks
OR
(c) UNIT - I 8 Marks
(d) UNIT - I 8 Marks
- Q.4. (a) UNIT - I 8 Marks
(b) UNIT - I 8 Marks
OR
(c) UNIT - I 8 Marks
(d) UNIT - I 8 Marks
- Q.5. Answer in Brief
(a) UNIT - I 4 Marks
(b) UNIT - II 4 Marks
(c) UNIT - III 4 Marks
(d) UNIT - IV 4 Marks

OR
IIIrd year
IVth & 6th Sem

B.Com. - Third Year Semester-V

5T1- : Financial Accounting - IV



Unit - I

Amalgamation and Absorption of Companies

Introduction, Meaning, Characteristics, Objectives, Methods of purchase Consideration, Accounting Procedure of Amalgamation and Absorption.

(Theory & Numericals)

Unit - II

Reconstruction of Companies.

(Internal and External Reconstruction of Companies)

Meaning, Characteristics, Objectives, Difference between Reconstruction and Reorganization, Accounting Procedure of Reorganization and Reconstruction.

(Theory & Numericals)

for 2019



Unit – III

Accounts of Public Utility Companies (Electricity, Gas and Water Supply Companies) According to Double Accounting System-

Meaning, Main features of Double Accounting system, Objective of Double Accounting System, Difference between Double Accounting System and Single Accounting System, Merits, Demerits of Double Accounting System, Preparation of Final Accounts.
(Theory & Numericals)

Unit – IV

Valuation of Shares

Meaning, Need of Valuation of Shares, Factors affecting the value of shares, Methods of valuation of shares, Net Assets Method/Intrinsic Value Method, Yield Method.
(Theory & Numericals)

The Financial year ends on 31st March.

Books Recommended

- Gupta R. L. – Advanced Financial Accounting – S. Chand & Sons
- Kumar, Anil S. – Advanced Financial Accounting – Himalaya Publication House
- Shukla and Grewal : Advanced Accounts (S. Chand & Ltd. New Delhi)
- Jain and Narang : Advanced Accounts (Kalyani Publishers, Ludhiana)
- Sr. K. Paul : Accountancy, Volume – I and II (New Central Book Agency, Kolkata)
- R. K. Lele and Jawaharlal : Accounting Theory (Himalaya Publishers)
- Dr. L. S. Porwal : Accounting Theory (Tata McGraw Hill)
- Robert Anthony, D. F. Hawkins & K. A. Merchant : Accounting Text & Cases (Tata McGraw Hill)
- Dr. S. N. Maheshwari : Corporate Accounting (Viakas Publishing House Pvt. Lit. New Delhi)
- Dr. Ashok Sehgal & Dr. Deepak Sehgal : Advanced Accounting (Taxmann, New Delhi)

Question Paper Pattern Semester - V

5T1-Financial Accounting – IV

- N.B. – 1) All questions are compulsory.
2) All questions carry equal marks.

Time :- 3 hours

Marks-80

Q. No. 1 – Unit I

- | | | |
|------------|----|----------|
| a) Theory | | 08 Marks |
| b) Problem | | 08 Marks |
| | OR | |
| c) Problem | | 16 Marks |



Q. No. 2 – Unit II

- | | |
|------------|----------|
| a) Theory | 08 Marks |
| b) Problem | 08 Marks |
| OR | |
| c) Problem | 16 Marks |

Q. No. 3 – Unit III

- | | |
|------------|----------|
| a) Theory | 08 Marks |
| b) Problem | 08 Marks |
| OR | |
| c) Problem | 16 Marks |

Q. No. 4 – Unit I

- | | |
|------------|----------|
| a) Theory | 08 Marks |
| b) Problem | 08 Marks |
| OR | |
| c) Problem | 16 Marks |

Q. No. 5

- | | | |
|----|----------|------------------|
| a) | Unit- I | Problem 04 Marks |
| b) | Unit –II | Problem 04 Marks |
| c) | Unit-III | Problem 04Marks |
| d) | Unit-IV | Problem 04 Marks |

5T2– :Cost Accounting

Unit – I

Cost Accounting :-

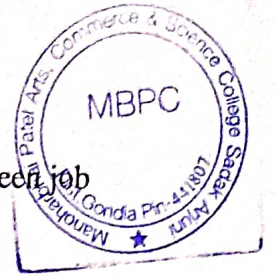
Meaning, Importance, Element of Cost, Cost-Absorption, Allocation of Overheads and Methods of costing, Difference between Cost Accounting and Financial Accounting. Simple Problems on Cost Sheet, Tender and Quotations. (Theory & Numericals)

Unit – II

Reconciliation of Profit /Loss shown by Cost and Financial Accounts:

Need for reconciliation of profit, reason for the difference between cost accounts and financial accounts, objectives of reconciliation statement, methods of preparation of reconciliation statement. (Theory & Numericals)

Unit – III



Process Cost Accounting :

Methods of costing, advantages and limitations of process costing, difference between job costing and process costing, Normal loss, Abnormal loss and Abnormal effectives, (Theory & Numericals)

Unit –IV

Contract Costing:

Features of contract costing, Types of contracts, Elements of contract cost, Nature of contract-completed contract, incomplete contract (Theory & Numericals)

- Books Recommended -

- S. N Maheshwari : Cost Accounting Theory and problems –Shri Mahavir Book Depot, New Delhi
- V.K. Saxena : Cost Accounting Text Book- Sultan Chand and Sons New Delhi
- M.C. Shukls – T.S. – Grewal, M.P. Gupta – Cost Accounting – S. Chand , New Delhi
- R. S. N. Pallai, V Bhagavathi – Cost Accounting – S. Chand, New Delhi
- S. M. Shukla :- Cost Accounts (Hindi)
- Nigam R. S. – Advanced Cost Accounting , S. Chand & Company
- Jain S. P. – Advanced Cost Accounting – Kalyani Publication
- Gawada, J Made – Advanced Cost Accounting – Himalaya Publication House

**Question Paper Pattern
Semester –V
5T2-Cost Accounting
Compulsory Paper- II**

- N.B. – 1) All questions are compulsory.
2) All questions carry equal marks.

Time :- 3 hours

Marks-80

Q. No. 1 – Unit I

a) Theory

08 Marks

5T3-MANAGEMENT PROCESS



Objective: To equip the students with the knowledge of Management Process and inspire them to acquire required quality to face the managerial challenges.

Unit I:-

Management and Administration: - Management concept, levels of management, importance & functions of various levels of management. Administration- meaning, concept and functions of administration. Differences between Management and Administration.

Unit II:-

Managerial Development & Group Dynamics: - Need for developing managerial skills, skills required of a manager, classification of managerial skill, methods of developing skills of managers, group dynamics ,meaning & significance, types of groups, group formation development, group composition.

Unit III:-

Managerial Style: - Meaning and types of managerial styles X and Y Theory of Macgregor, factors' influencing managerial style, organization conflict- traditional and modern approaches to conflict, Management as a profession, significance of professional manager in current scenario,

Unit IV:-

Motivation: Definition, Meaning and concept of motivation, kinds of motivation and its importance, Theories of motivation- Maslow's theory of need hierarchy, Herzberg's theory of motivation, relationship between motivation & productivity.

Referecne:

1. Sherlekar"Management Value Oriented Holistic Approach" Himalaya Publishing.
2. Stephen Robbins : Organizational Behaviour, Prentice Hall of India.
3. Terry George: Principles of Management.
4. R.S.Dewedi "Human Relation and organizational behaviour.
5. Shejwalkar and Ghanekar : Principal and Practices of Management
6. Sharma, : Organisational behaviour
7. Saxena, Principal and Practices of Management

5T4: Indian Economy – I



Unit I:

Indian Economy & Planning

Economic Planning- Characteristics, Rationale, Features, Objectives of Economic Planning. Strategy of India's Development Plans. Objectives and Evaluation of 11th Plan. Objectives of 12th Plan. Resources allocation and financing of five years plans. Regional Planning in India- Aspects of regional planning, Conceptualization, Magnitude & Challenges. Achievements and shortcomings of India's Economics Planning. NITI Aayog-Aims, Objectives & Structure. From Economic Planning to NITI Aayog- Differences in the two Approaches.

Unit II:

Indian Economy & Policy

Concept of Economic Growth & Economic Development. Characteristics of underdeveloped/ developing countries. Broad features of Indian economy. Natural resources- Land, soil, water, forest, mineral. Infrastructure - Sources of Energy in India. Power, Coal, Oil and Gas, Atomic, Non-conventional Sources, India's Energy Strategy. Transport System in India- Railways, Road, Water & Air Transport.

Unit III-

Population & Unemployment

India's Population: Size and Growth Trends, Causes of Population Explosion, Consequences on Economic Development, Remedies, Population Policy. Employment and Unemployment- Trends, Structure of Employment in India. Nature & Estimates of Unemployment. Urban & Rural Unemployment- Causes, Effect, Government Policy for Removing Unemployment.

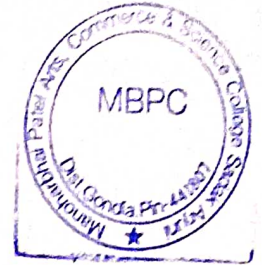
Unit IV:

India's Public Finance

Public Expenditure-Classification, Role of Public Expenditure in India, Causes of increase in Public Expenditure. Public Revenue-Sources of Public Revenue in India. Public Debt- Meaning, Concept, Classification, Role, Problem and Remedies. India's Fiscal Deficit-Causes, Recent Policy Measures towards Controlling Fiscal Deficit.

Books Recommended:

1. Indian Economy, Datt & Sundharam, S Chand
2. The Indian Economy: Problems and Prospects, D .R.Gadgil.
3. Globalization And Indian Economy, R.Chaddha, Sumit Enterprises.
4. Indian Economy : Problems of Development and Planning, A.N.Agrawal, New Age International.
5. Indian Economy, Misra & Puri, Himalaya Publishing House Pvt. Ltd.
6. Government of India- Five Year Plans.
7. Government of India- Economy Survey.
8. Reserve Bank of India- Annual Reports on Currency and Finance.
9. Indian Economics, Rashi Arora, Mumbai



5T5.1 : Marketing Management

Unit – I

Introduction: Meaning and Concept of Marketing and Marketing Management. Traditional and Modern concept of Marketing, Functions and importance of Marketing Management, Market segmentation: - evaluation, criteria's, advantages and disadvantages of market segmentation, types

Unit-II

Market and pricing policies: Meaning, concept and characteristics of Consumer Market, Industrial Market and Service Market, their difference, government and reseller market, online market: - issues and challenges **Pricing policies:** - meaning, types and factors governing them.

Unit – III

Product Planning and Distribution: Product Planning – New Product Development – Product Life Cycle – Branding and Packaging , Distribution Channels for Consumer Product, Industrial Product and Service Product, Function of Distribution of Channels, Factors Affecting Distribution of Channels.

Unit – IV

Consumer behavior and Promotion:

Consumer behavior: - Meaning, concept and factors affecting consumer behavior, Customer Satisfaction, measurement of Customer Satisfaction, After Sales Services and its role in modern business, **Promotion:** techniques of promotion, Personal Selling; Advertising, Direct Marketing. E-marketing

Suggested Books:

1. Marketing Management, Philip Kotler and Kevin Lane Keller: Prentice Hall of India / Pearson Education, New Delhi.
2. Marketing Management, V. J. Ramaswami and S. Namakumari:, Macmillan Business Books, Delhi.
3. Principles of Marketing Management, Dr. Arvind Shende, Dr. Dilip Vairagade, Anuradha Prakashan, Nagpur.
4. Services Marketing; S M Jha; Himalaya Publishing House.
5. Industrial Marketing Practices in India- S.L. Gupta, Sanjeev Bahadur and Hitesh Gupta Excel Books, New Delhi.
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5T6.2 : Auditing

UNIT- I: Basic of Auditing

(i) **Audit, Auditing and Auditor:** Meaning, definition, object and scope of Audit and auditing, basic principles governing an audit, Advantage and Disadvantages of Audit, Difference between Internal Audit and External Audit, **Types of Audit:** Meaning, Objective and Importance of Continuous Audit, Annual Audit, Periodical Audit, Internal Audit.

(ii) **Internal Control and Internal Audit System:** Meaning, definition, advantages and disadvantages of Internal Control, Internal Check, Internal Audit, EDP Audit: Meaning of EDP audit, Control in EDP (Electronic Data Processing) Environment- General EDP Control, Application Control

UNIT- II: Audit Working and Procedure.

i) **Audit Planning, Evidence Audit programme:** Meaning and Definition, Objective, Advantages and Disadvantages of Audit Programme, Formulation of audit programme, precaution to be taken for preparation of audit programme.

ii) **Audit Documentation and Evidence:** Meaning, definition, content, advantages of audit note book, audit working paper, essential of good audit working paper, Ownership and custody of audit working paper, Audit evidence, Method of obtaining audit evidence

UNIT-III

(i) **Standard on Auditing:** Standard Auditing Policies- Introduction of auditing standard issued by ICAI (From AAS-1 to AAS -30 and AAS-34)

ii) Vouching & Verification

Vouching: Meaning and definition of vouching, objective, importance and limitation of vouching, Vouching procedure and precaution to be taken for vouching of - Cash book, purchase book, sales book.

iii) **Verification of Assets and Liabilities:** Meaning, object, importance and limitation of Verification. Audit of Fixed Assets, Current Assets, General principle regarding verification of assets, Audit of Liabilities, General principle of regarding verification of liabilities.

UNIT- IV: Company Audit & Audit Report

(i) **Company Auditor:** Legal provision related with appointment of auditor under Companies Act 2013, Qualification and disqualification of auditor, Right, Power, and liabilities of company auditor, civil and criminal liabilities of company auditor, Legal provision related with remuneration, removal of company auditor.

(ii) **Company Audit :** Meaning, definition, feature, objective, advantages and criticism of Financial audit, Management audit, Special audit, Cost Audit, Difference between Financial audit and cost audit, Management audit and financial audit.

iii) **Audit report and Certificate:** Meaning, definition, content, scope and significance of audit report

Reference Books:

- Aruna Jha: Students Guide to Auditing and Assurance, Taxman Publication, New Delhi
- S.D. Sharma: Auditing Principle and Practice, Taxman Publication , New Delhi
- Dr. Arvind shende, Dr. Dilip Vairagade; Auditing-Anuradha Prakashan, Nagpur.
- L. N. Chopde, D.H. Choudhari, Dr. Baban Taywade: Auditing – Sheth Publishers
- Dr. K. R. Dixit: Auditing – Vishwa Publishers & Distributors, Nagpur
- B. N. Tandon, S. Sudharsanam, S. Sundharabahu: Practical Auditing – S. Chand & Company Ltd.
- S. K. Mehta: Auditing , Diamond Publication Pune



Semester-VI
GT2-Management Accounting

Unit_I

Management Accounting :-

Meaning, Scope, Importance, and Limitations of Management Accounting. Difference between Cost Accounting and Management Accounting, Role of Management Accounting. Break -Even Point Analysis (Theory & Numericals)

Unit – II

Business Budget & Budgetary Control:

Meaning, Characteristics, Objectives, Advantages, Limitations. Classification & Types of Budgets. Problems on Cash Budget and Flexible Budget Only (Theory & Numericals)

Unit – III

Ratio Analysis:

Meaning, Importance and Limitations of Ratio Analysis, Classification of Ratio, Computation of Profitability Ratio, Financial Ratio with special reference to Current Ratio, Acid Test/ Liquid Ratio, Inventory Turnover Ratio Debtors and Creditors Turnover Ratio, Fixed Assets Turnover Ratio, Debt-Equity Ratio, Working Capital Ratio, Earnings per Share Ratio. (Theory & Numericals)

Unit – IV

Fund Flow Analysis:

Meaning, Sources of fund, Uses of fund, Distinguish between fund flow statement and Balance Sheet. Preparation of Statement showing Changes in Working Capital, Profit from operation, Fund flow Statement (Theory & Numericals)

Books Recommended –

- S. N Maheshwari : Cost Accounting Theory and problems –Shri Mahavir Book Depot, New Delhi
- V.K. Saxena : Cost Accounting Text Book- Sultan Chand and Sons New Delhi
- M.C. Shukls – T.S. – Grewal, M.P. Gupta – Cost Accounting – S. Chand , New Delhi
- R. S. N. Pallai, V Bhagavathi – Cost Accounting – S. Chand, New Delhi
- S. M. Shukla :- Cost Accounts (Hindi)
- Nigam R. S. – Advanced Cost Accounting , S. Chand & Company
- Jain S. P. – Advanced Cost Accounting – Kalyani Publication
- Gawada, J Made – Advanced Cost Accounting – Himalaya Publication House
- Pillai R. S. N. – Management Accounting – S. Chand & Co. Pvt. Ltd.
- Agrawal N. K. – Managements Accounting – Galgotia Publication
- Singh, Jagwant - Managements Accountings – KitabMahal
- Rathnam P. V. - Managements Accountings – KitabMahal
- Sharma R. K. - Managements Accountings – Kalyani Publication

Question Paper Pattern
Semester –VI



Semester VI
6T3-Advanced Statistics

Unit I

Correlation- Types of correlation, Karl Pearson's coefficient of correlation in Bivariate frequency table, probable error, interpretation of 'r', Rank Correlation Method.

Unit II

Regression Analysis- Lines of Regression/Regressions Equation, Coefficient of regression for a Bivariate frequency table.

Unit III

Index Number- Uses of I N, Types of I No. Methods of Index Number. Test of consistency of Index No.- unit test Time Reversed Test, Factor cost of living Index No.

Unit IV

. Time series Analysis-Introduction components of a Time series- a) Trend b) Short Term Variation c) Irregular variation d) Measurement of Trend- (Simple Problems)
Graphic Methods, Methods of Seminar, Methods of Curve by the square
Methods of Movig Average



Elective Group- II
GT5.1- Human Resource Management

UNIT-I

Introduction

Human Resource Management, Definition, Objectives, Functions, Scope, Importance.
Quality of a ideal Human Resource Managers

UNIT-II

Recruitment selection and training

Recruitment: - meaning, source; selection process and importance, placement and induction, career planning v/s manpower planning
Training: - meaning, method, training and development,

UNIT-V

Labour welfare and Collective bargaining

Labour welfare: - Safety and Health Measures Workers Participation in Management - Objectives for Wage Incentive - Fringe Benefits

Collective Bargaining - Features - Pre-requisite of Collective Bargaining - Agreement at different levels, Successful Participation of workers in Management.

UNIT-IV

Human resource planning and accounting

Human Resource Planning - Human Capital Investment - Expenditure vs. Productivity
Meaning and Definition of Human Resource Accounting, Importance; Human Resource Accounting - Measurement of Human Value addition into Money Value

Suggested Books:

1. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons.
2. Personnel & Human Resource Management - P. Subba Rao - Himalaya Publishing House.
3. Human Resource and Personnel Management - K. Aswathappa - Tata Mc Graw Hill Publishing Co. Ltd.

Human Resource Management, Dr. Arvind shende, Dr. Dilip Vairagade, Dr. Devendra. Mohture, Anuradha Prakashan, Nagpur.

4. Personnel Management & Human Resources - C.S. Venkata Rathnam & B.K. Srivastava. TMPL.

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Foundation Group II

6T6.2- Industrial Law

Level of Knowledge: Basic Conceptual Knowledge

Objective: To make students aware about Various Laws relating to Industries [with amendments up to June 2016 in respective Acts]

Unit -I

- (i) **Indian Factories Act-1948:** Important Definitions, Object & Scope, Provision regarding workers Health, Provision regarding Safety of Workers,
- (ii) **Rules regarding Labour Welfare,** Provision regarding Adults, women workers and Young Workers.
- (iii) **Industrial Dispute Act-1947:** Concept, Objectives and Significance, Authorities for settlement of Industrial Dispute-their work procedure & Powers,
- (iv) Concept and Distinction between Strike, Lockouts, Layoff & Retrenchments

Unit-II

- (i) **Law relating to Wages:** Object, Scope and Application of Minimum Wages Act-1948 and Payment of Wages Act 1936
- (ii) Law Relating to Bonus and Gratuity: Object, Scope and Application of Payment of Bonus Act 1965 and Payment of Gratuity Act 1972
- (iii) Law Relating to Employee State Insurance and Provident Fund: Object, Scope and Application of The Employee's State Insurance Act 1948 and Employee's Provident Fund & Miscellaneous Provision Act 1952
- (iv) **Law Relating to Workmen Compensation and Maternity Benefits:** Object, Scope and Application of Workmen Compensation Act-1923 and Maternity Benefits Act 1961

Unit-III

- (i) **Child Labour (Prohibition and Regulation) Act 1986:** Object Scope and Application
- (ii) Trade Union Act 1926: Object Scope and Application. Registration of Trade Union.
- (iii) International Labour Organization (ILO): Background and Importance of ILO and its impact on Indian Labor Laws
- (iv) Contract Labour Act: Object Scope and Application

Unit-IV

- (i) Meaning and Nature of Industrial Estate, Software Technology Park, SEZ, Co-operative Industrial Estate
- (ii) Intellectual Property Rights Law In India: Object and Scope of Patent, Copyrights, Trademark and Industrial Design
- III) Procedure for registration of Trademarks and Copyrights.
- (IV) Environment Protection Act 1986: Objective and Scope, Location of Industries, Processes & Operation, offense and Penalties

Reference Books:

Syllabus
changed
19-20 onwards



From the Academic session 2019--20

Third Year Semester-VI

6T3-Advanced Statistics

Unit I

Correlation- Types of correlation, Karl Pearson's coefficient of correlation in Bivariate frequency table, probable error, interpretation of 'r', Rank Correlation Method.

Unit II

Regression Analysis- Lines of Regression/Regressions Equation, Coefficient of regression for a Bivariate frequency table.

Unit III

Index Number- Uses of Index Number & its, Types and Important.

Unweighted Index Number (Simple Aggregative, Simple Average of Price Relative)

Weighted Index Number (Weighted Aggregative I. N, Laspeyre's, Paasche, Dorbish & Bowley's, Fisher's Ideal, and Marshall & Edgeworth Method.) Weighted Average of Price relatives

Test on consistency of Index No.- Time Reversal Test, Factor Reversal Test, Cost of living Index No.

Unit IV

Time series Analysis-Introduction components of a Time series-

a) Trend b) Short Term Variation c) Irregular variation d) Measurement of Trend- (Simple Problems) Graphic Methods, Methods of Seminar, Methods of Curve by the square Methods of Moving Average

Books Recommended:

1. Ajay Goel, Alka Goal: Mathematics & Statistics (Taxmann)
2. Elhance D.N : Fundamentals of Statistics
3. Asthana B.N. Applied Statistics in India
4. Gupta S.P: Statistical Method
5. Gupta S.G. & Kapoor V.K.: Fundamentals of Applied Statistics
6. Dr. P. Fating, Dr. V. Bagde, M. Gulhane: "Advanced Statistics" – Sir Sahitya Kendra.



**Question Paper Pattern
Third Year Semester-VI
6T3-Advanced Statistics**

- N.B. – 1) All questions are compulsory.
2) All questions carry equal marks.

Q. No. 1 – Unit I

- a) Theory 08 Marks
b) Problem 08 Marks

OR

- c) Problem 16 Marks

Q. No. 2 – Unit II

- a) Theory 08 Marks
b) Problem 08 Marks

OR

- c) Problem 16 Marks

Q. No. 3 – Unit III

- a) Theory 08 Marks
b) Problem 08 Marks

OR

- c) Problem 16 Marks

Q. No. 4 – Unit IV

- a) Theory 08 Marks
b) Problem 08 Marks

OR

- c) Problem 16 Marks

- Q. No. 5 a) Unit-I Problem 04 Marks
b) Unit –II Problem 04 Marks
c) Unit-III Problem 04 Marks
d) Unit-IV Problem 04 Marks

6T3 B.COM. PART-III – INDIAN ECONOMY–II (SEMESTER VI)



Unit I – Indian Agriculture:

Role of Agriculture in Indian Economy. Cooperative Farming and Marketing. Green Revolution, Impact and constraints. Causes and Remedies to Low Agricultural Productivity. Agriculture Marketing – Problems and Remedies. Sources of Agriculture Finance. NABARD (National Bank for Agriculture and Rural Development). Problems and Remedies to Vidarbha's Agricultural Distress..

Unit II: Indian Industry:

MSME (Micro Small & Medium Enterprise),- Role, Performance, Problems and Remedies. Role of Public Sector Industries. Privatization of Public Sector Industries: Meaning, Methods of Privatization Policy in India. Arguments in favor and against privatization. Industrial Sickness in India-Definition, Causes, Effects and Remedial measures. Problems and Remedies to Vidarbha's Industrialization.

Unit III: Indian Service Sector and International Trade:

Growth & Importance of Service Sector in India. Major Government's reforms in Service sector. Challenges and Opportunity in India's Service Sector, Composition and Direction of India's Exports and Imports, India's Balance of Payment position.

Unit IV Contribution of Indian Economic Thinkers:

- 1) **Mahatma Gandhi:** Basic principles of Gandhian Economic Thoughts on -Labour Capital Theory of Trusteeship, Swadeshi model of Economic Development and Its relevance in the present Economic scenario.
- 2) **Pandit Dindyal Upadhyaya:** Concept of integral Humanism, meaning, Objectives, Benefits. Contribution in Integral Humanism and Indian Economic Policy.(एकत्म मानववाद आधारित भारतीय अर्थनीती).
- 3) **Dr. B. R. Ambedkar-** Land Reforms, Indian Currency Problems, Nationalization of Industries, Economic upliftment of Indian Women, Creation of Institutional mechanism for Economic Development in India..
- 4) **Dr. Ram Manohar Lohiya-** Individual Freedom, Planning, Gender Difference, Solution to Food Scarcity, Decentralization for Economic Development of India..

Cross-cutting Issues



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

Syllabus for Bachelor of Science /B.Sc (IT)/BCA Part-I

Compulsory English

(To be implemented from the session 2020-2021 and onwards)

Semester I

Theory - Full Marks : 60

Internal Assessment - Full Marks :15

Prescribed Textbook :

Empowering Minds by Board of Editors (Raghav Publishers & Distributors)

Unit I - Prose

1. My Struggle for an Education - Booker T. Washington
2. Florence Nightingale - Lytton Strachey

Unit II - Prose

3. The Birth of Khadi - Mahatma Gandhi
4. Go, Kiss the World! - Subroto Bagchi

Unit III - Poetry

1. Ulysses - Alfred Tennyson
2. Yussouf - James Russell Lowell
3. If - Rudyard Kipling

Unit IV - Comprehension & Grammar

1. Comprehension of Unseen Passage
2. Prepositions
3. Subject-verb agreement
4. Summarizing

Recommended books for Unit IV :

1. Macmillan Foundation English (Macmillan) by R.K.Dwivedi & A.Kumar
2. Oxford Practice Grammar by John Eastwood (Oxford University Press)
3. English for Practical Purposes (Macmillan) by Z.N. Patil, B.S.Valke, Ashok Thorat, Zeenat Merchant
4. Learners' English Grammar and Composition (S.Chand) by N.D.V.Prasada Rao

for JQMC



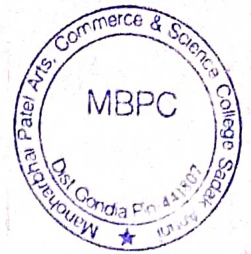
Distribution of Marks

	LAQ	SAQ	VSAQ	Total
Unit I (Prose)	06	08 (04+04)	02	16
Unit II (Prose)	06	08 (04+04)	02	16
Unit III (Poetry)	--	08 (04+04)	--	08
Unit IV (Grammar & Composition)	--	--	20	20

(Internal Assessment: Two assignments based on the Items given in the Prescribed Text Book)

Pattern of the Question paper

- Q.1. (A) One out of Two LAQs to be answered in about 120 words from Unit I 06
(B) One out of Two LAQs to be answered in about 120 words from Unit II 06
- Q. 2. (A) Two SAQs with internal choice to be answered in about 75 words each from Unit I.
04 + 04 = 08
(B) Two SAQs with internal choice to be answered in about 75 words each from Unit II.
04 + 04 = 08
- Q.3. (A) Two SAQs with internal choice to be answered in about 75 words each from Unit III.
04 + 04 = 08
(B) 4 VSAQs out of 6 from Unit I & Unit II (3 questions each from both Units)
(carrying 01 mark each) 4 x 1 = 04
- Q.4. (A) Comprehension of Unseen Passage (4 Questions of 2 marks each) 4 x 2 = 08
(B) Prepositions (Four blanks to be filled in a given passage – 1 mark each) 4 x 1 = 04
- Q. 5. (A) Subject- Verb Agreement 4 x 1 = 04
(B) Summarizing 1 x 4 = 04



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
Syllabus for Bachelor of Science/B.Sc (IT)/BCA Part-I
Compulsory English
(To be implemented from the session 2020-2021 and onwards)

SEMESTER II

Theory - Full Marks :60

Internal Assessment – Full Marks :15

Prescribed Textbook :

Empowering Minds by Board of Editors (Raghav Publishers & Distributors)

Unit I - Prose

1. Grassroots Innovation and Social Enterprise: Changing Lives
2. The Two Gentlemen of Verona

Unit II - Prose

3. The Verger
4. Synthesis of Science and Spirituality

Unit III - Poetry

1. Richard Cory
2. Allow Sanity A Little Space
3. Refugee Blues

Unit IV – Writing Skills

1. Paragraph Writing
2. Application and C.V. Writing
3. Phrasal Verbs

Recommended books for Unit IV :

1. Macmillan Foundation English (Macmillan) by R.K.Dwivedi & A.Kumar
2. Oxford Practice Grammar (Oxford India) by John Eastwood
3. Learners' English Grammar and Composition (S.Chand) by N.D.V.Prasada Rao
4. English for Practical Purposes (Macmillan) by Z.N. Patil, B.S.Valke, Ashok Thorat, Zeenat Merchant



Distribution of Marks

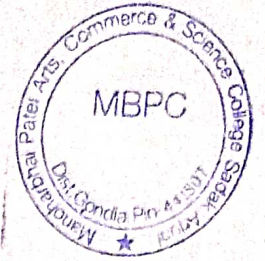
	LAQ	SAQ	VSAQ	Total
Unit I (Prose)	06	08 (04+04)	02	16
Unit II (Prose)	06	08 (04+04)	02	16
Unit III (Poetry)	--	08 (04+04)	--	08
Unit IV (Writing Skills)	--	--	20	20

(Internal Assessment: Two assignments based on the Items given in the Prescribed Text Book)

Pattern of the Question paper

- Q.1. (A) One out of Two LAQs to be answered in about 120 words from Unit I 06
(B) One out of Two LAQs to be answered in about 120 words from Unit II 06
- Q.2. (A) Two SAQs with internal choice to be answered in about 75 words each from Unit I.
04+04 = 08
(B) Two SAQs with internal choice to be answered in about 75 words each from Unit II.
04+04 = 08
- Q.3. (A) Two SAQs with internal choice to be answered in about 75 words each from Unit III.
04+04 = 08
(B) 4 VSAQs out of 6 from Unit I & Unit II (3 questions each from both Units)
(carrying 01 mark each) $4 \times 1 = 04$
- Q.4. (A) Write an application and prepare a C.V. for the given post 08
(B) Make sentences using the given phrasal verbs (Any 4 out of 6) $4 \times 1 = 04$
- Q.5. (A) Write 2 Short Paragraph of about 100 words each on any 2 of the given 3 topics/
statements $2 \times 4 = 08$

Cross-cutting Issues



R.T.M Nagpur University, Nagpur

Syllabus

B.Com

Semester I

1T5- Compulsory English

Prescribed Text : Epiphanies by Board of Editors (Publisher: Orient BlackSwan)

Unit 1: Prose

1. Sreelakshmi Suresh
2. Why a Startup Needs to Find its Customers First- *Pranav Jain*
3. Devender Pal Singh

Unit 2: Prose

1. The Model Millionaire- *Oscar Wilde*
2. The Monkey's Paw -*W.W.Jacobs*
3. The Lumber Room-*Saki*

Unit 3: Poetry

1. Invictus-William Earnest Henley
2. The Builders- *Henry Wadsworth Longfellow*
3. Stay Calm- *Grenville Kleiser*

Unit 4: Writing Skills

1. Emails
2. Speeches
3. Views and Opinions

Unit 5: Language Study

1. Nouns
2. Pronouns
3. Verbs
4. Adjectives
5. Adverbs
6. Prefixes
7. Suffixes
8. Root Words

for IQAC



B.Com

Question Paper Pattern

1T5-Compulsory English

Semester I

N.B: SAQ – Short Answer Questions to be answered in about 75-100 words
VSAQ- Very Short Answer Question to be answered in two or three sentences
PRQ- Personal Response Question to be answered in about 75- 100words

	Total 80 Marks
Q.1. (A) Three VSAQ out of Five based on Prose (Unit 1) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit1)	(05)
(C).One PRQ out of Two based on Prose (Unit1)	(05)
Q.2. (A) Three VSAQ out of Five based on Prose (Unit 2) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit 2)	(05)
(C).One PRQ out of Two based on Prose (Unit 2)	(05)
Q.3. (A) Three VSAQ out of Five based on prescribed Poems (Unit 3) (3x 2) -	(06)
(B) One SAQ out of Two based on prescribed Poems (Unit 3)	(05)
(C).One PRQ out of Two based on prescribed Poems (Unit 3)	(05)
Q.4. (A).ONE Business Email	(05)
(B)One Speech (150 Words)	(05)
(C) One View and Opinion (150 Words)	(06)
Q.5.(A)i) Synonyms (3 Words)/Antonyms (3Words)	(06)
ii)Textual Match the following based on Unit-I & II(- 4 Items	(02)
(B) Nouns/Pronouns/ Verbs/ Adjectives/Adverbs	(06)
(C) Root word/Suffixes/Prefixes	(02)



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Semester II

2T5- Compulsory English

Prescribed Text : Epiphanies by Board of Editors (Publisher: Orient BlackSwan)

Unit 1: Prose

1. Stephen Hawking
2. How to be a Healthy User of Social Media-Peggy Kern
3. Jadav Payeng

Unit 2: Prose

1. Luck-Mark Twain
2. How I Became a Public Speaker-George Bernard Shaw
3. My Lord, the Baby-Rabindranth Tagore

Unit 3: Poetry

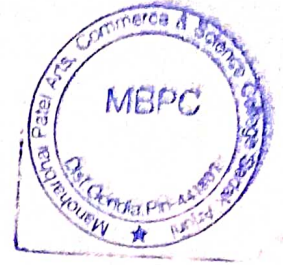
1. Success is Counted Sweetest-Emily Dickinson
2. The World is Too Much with Us-William Wordsworth
3. No Man is an Island-John Donne

Unit 4: Writing Skills

1. Weave Your Idea/Story
2. Interviews
3. Narrating an Experience

Unit 5: Language Study

1. Articles
2. Prepositions
3. Conjunctions
4. Interjections



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Question Paper Pattern
1T5-Compulsory English
Semester II

N.B: SAQ – Short Answer Questions to be answered in about 75-100 words
VSAQ- Very Short Answer Question to be answered in two or three sentences
PRQ- Personal Response Question to be answered in about 75- 100words

	Total 80 Marks
Q.1. (A) Three VSAQ out of Five based on Prose (Unit 1) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit1)	(05)
(C).One PRQ out of Two based on Prose (Unit1)	(05)
Q.2. (A) Three VSAQ out of Five based on Prose (Unit 2) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit 2)	(05)
(C).One PRQ out of Two based on Prose (Unit 2)	(05)
Q.3. (A) Three VSAQ out of Five based on prescribed Poems (Unit 3) (3x 2) -	(06)
(B) One SAQ out of Two based on prescribed Poems (Unit 3)	(05)
(C).One PRQ out of Two based on prescribed Poems (Unit 3)	(05)
Q.4.(A). Weave Your Idea/Story	(05)
(B) Framing Interview Questions (5x1)	(05)
(C) Narrating an Experience	(06)
Q.5.(A) i)Synonyms(03 Words) & Antonyms(03 Words)	(06)
ii)Textual Match the Columns based on Unit I & II(4 items)	(02)
(B)Articles(03) and Prepositions(03)-Fill in the Blanks	(06)
(C) Conjunctions(01) and Interjections(01)	(02)



INTERNAL ASSESSMENT : 20 MARKS

The Internal Assessment would be done on the basis of the assignments submitted by the student and his/her performance, attendance and conduct during the Semester. The concerned teacher shall provide, in advance, a list of topics/assessment items/Question Bank (to the students) based on the Units prescribed for the Theory Examination. Students shall finalize **2 topics/items** from 2 different units with the approval of the concerned teacher and submit the same within the prescribed deadline as **Assignments**.

Students may be given freedom to submit a creative writing assignment on human values/world peace/environmental issues inspired by or related to the lessons/poems prescribed in the syllabus and give a **Power Point Presentation/Oral** of the same.

2 Assignments – 5+5= 10 Marks

Power Point Presentation/Oral Presentation– 5 Marks

Attendance - 5 Marks TOTAL – 20 MARKS



B.Com
Semester III
3T5- Compulsory English

Prescribed Text: Igniting Minds by Board of Editors (Publisher: Orient BlackSwan)

Unit 1: Prose

1. The Chicago Speeches-*Swami Vivekananda*
2. What Teenagers Need to Know about Cyber Security- *Sanjay Goel*
3. Values in Life-*Rudyard Kipling*

Unit 2: Prose

1. Work Brings Solace-*A.P.J. Abdul Kalam*
2. Too Dear! - *Leo Tolstoy*
3. The Pleasures of Ignorance-*Robert Lynd*

Unit 3: Poetry

1. The Tiger and the Deer-*Sri Aurobindo*
2. A Dream within a Dream- *Edgar Allan Poe*
3. Leisure-*W.H. Davies*

Unit 4: Writing Skills

1. Application Letters
2. Etiquette and Manners
3. Writing Blogs

Unit 5: Language Study

1. Types of Sentences(Affirmative, Assertive, Negative, Exclamatory, Interrogative)
2. Tenses



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Question Paper Pattern
3T5-Compulsory English
Semester III

N.B: SAQ – Short Answer Questions to be answered in about 75-100 words
VSAQ- Very Short Answer Question to be answered in two or three sentences
PRQ- Personal Response Question to be answered in about 75- 100words

	Total 80 Marks
Q.1. (A) Three VSAQ out of Five based on Prose (Unit 1) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit1)	(05)
(C).One PRQ out of Two based on Prose (Unit1)	(05)
Q.2. (A) Three VSAQ out of Five based on Prose (Unit 2) (3x 2) -	(06)
(B) One SAQ out of Two based on Prose (Unit 2)	(05)
(C).One PRQ out of Two based on Prose (Unit 2)	(05)
Q.3. (A) Three VSAQ out of Five based on prescribed Poems (Unit 3) (3x 2) -	(06)
(B) One SAQ out of Two based on prescribed Poems (Unit 3)	(05)
(C).One PRQ out of Two based on prescribed Poems (Unit 3)	(05)
Q.4 .(A).One Application Letter	(05)
(B)Etiquette & Manners	(05)
(C)Writing Blog (150 Word)	(06)
Q.5.(A)i)Idioms and Phrases-Make sentences(03), One Word Substitute(03)	(06)
ii)True and False based on Unit II & III (4 items)	(02)
(B)Types of Sentences (Affirmative, Negative, Interrogative, Exclamatory, Assertive (04)	
(C) Tenses	(04)



INTERNAL ASSESSMENT : 20 MARKS

The Internal Assessment would be done on the basis of the assignments submitted by the student and his/her performance, attendance and conduct during the Semester. The concerned teacher shall provide, in advance, a list of topics/assessment items/Question Bank (to the students) based on the Units prescribed for the Theory Examination. Students shall finalize **2 topics/items** from 2 different units with the approval of the concerned teacher and submit the same within the prescribed deadline as Assignments.

Students may be given freedom to submit a creative writing assignment on human values/world peace/environmental issues inspired by or related to the lessons/poems prescribed in the syllabus and give a **Power Point Presentation /Oral Presentation** of the same.

2 Assignments – 5+5 = 10 Marks

Power Point Presentation/Oral Presentation– 5 Marks

Attendance – 5 Marks TOTAL – 20 MARKS



B.Com
Semester IV
4T5- Compulsory English

Prescribed Text: Igniting Minds by Board of Editors (Publisher: Orient BlackSwan)

Unit 1: Prose

1. Gifts-*Ralph Waldo Emerson*
2. India, What Can it Teach Us?-*Max Muller*
3. Why We Travel-*Pico Iyer*

Unit 2: Prose

1. The Doll's House- *Katherine Mansfield*
2. The Globe of Gold-*Bankim Chandra Chattopadhyay*
3. The Beggar-*Anton Chekhov*

Unit 3: Poetry

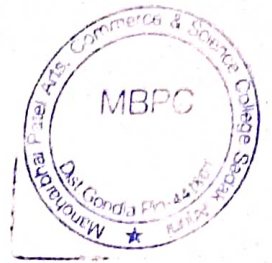
1. The Ballad of Father Gilligan-*William Butler Yeast*
2. God's Grandeur-*Gerard Manley Hopkins*
3. The Soul's Prayer- *Sarojini Naidu*

Unit 4: Writing Skills

1. Comprehension
2. Summary Writing
3. Writing Dialogue
4. Group Discussion

Unit 5: Language Study

1. Voice
2. Direct/Indirect Narration



B.Com

Question Paper Pattern

4T5-Compulsory English

Semester IV

N.B: SAQ – Short Answer Questions to be answered in about 75-100 words
VSAQ- Very Short Answer Question to be answered in two or three sentences
PRQ- Personal Response Question to be answered in about 75- 100words

Total 80 Marks

- | | |
|--|------|
| Q.1. (A) Three VSAQ out of Five based on Prose (Unit 1) (3x 2) - | (06) |
| (B) One SAQ out of Two based on Prose (Unit1) | (05) |
| (C).One PRQ out of Two based on Prose (Unit1) | (05) |
| Q.2. (A) Three VSAQ out of Five based on Prose (Unit 2) (3x 2) - | (06) |
| B) One SAQ out of Two based on Prose (Unit 2) | (05) |
| (C).One PRQ out of Two based on Prose (Unit 2) | (05) |
| Q.3. (A) Three VSAQ out of Five based on prescribed Poems (Unit 3) (3x 2) - | (06) |
| (B) One SAQ out of Two based on prescribed Poems (Unit 3) | (05) |
| (C).One PRQ out of Two based on prescribed Poems (Unit 3) | (05) |
| Q.4 .(A).One passage for Comprehension | (05) |
| (B)Summary Writing of the above passage in 4(A) | (05) |
| (C) Dialogue Writing or Group Discussion | |
| (At least 3 Dialogues to be exchanged) (3x2) | (06) |
| Q.5.(A)i)Idioms and Phrases-Make Sentences(03) One Word Substitute(03 Words) | (06) |
| ii)True and False(Textual based on Unit II & III) -4 Items | (02) |
| (B) Voice | (04) |
| (C) Direct/Indirect Narration | (04) |



INTERNAL ASSESSMENT : 20 MARKS

The Internal Assessment would be done on the basis of the assignments submitted by the student and his/her performance, attendance and conduct during the Semester. The concerned teacher shall provide, in advance, a list of topics/assessment items/Question Bank (to the students) based on the Units prescribed for the Theory Examination. Students shall finalize **2 topics/items** from 2 different units with the approval of the concerned teacher and submit the same within the prescribed deadline as **Assignments**.

Students may be given freedom to submit a creative writing assignment on human values/world peace/environmental issues inspired by or related to the lessons/poems prescribed in the syllabus and give a **Power Point Presentation/Oral Presentation** of the same.

2 Assignments – 5+5 = 10 Marks

Power Point Presentation/Oral Presentation– 5 Marks

Attendance - 5 Marks TOTAL – 20 MARKS

Cross-cutting Issues



1T6.2 - विषय : मराठी
सत्र पहिले २०१६

प्रश्न क्र.	घटक क्र.	अभ्यासक्रम	गुण	शेरा
१	१	समकालीन राष्ट्रीय, सामाजिक समस्यावर आधारित (चार पर्यायांपैकी एका विषयावर, शब्द मर्यादा-४००)	२०	
२	२	गद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग एक १. लोकशाहीचे भवितव्य (डॉ. बाबासाहेब आंबेडकर) २. नौका (प. भा. भावे) ३. अस्पृश्यांचा आधारवड (शिवाजी सावंत) ४. बेगड (योगीराज वाघमारे) ५. उमा (वि. स. जोग)	३५	
३	३	पद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग एक १. ज्ञानेश्वरांच्या विराण्या (संत ज्ञानेश्वर) २. मन (बहिणाबाई चौधरी) ३. गणपतवाणी (बा. सी. मर्डेकर) ४. गिरणीची लावणी (नारायण सुर्वे) ५. माउली भुकेले बेट (सुधाकर गायधनी)	३५	
४	४	व्यावहारिक मराठी १. पत्रलेखन २. इतिवृत्त लेखन	१०	

for JQAC

2T8.2-विषय : मराठी

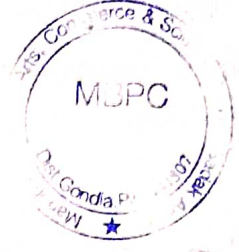
सत्र दुसरे



प्रश्न क्र.	घटक क्र.	अभ्यासक्रम	गुण	शेरा
१	१	आत्मवृत्तपर, वर्णनपर, विषयांवर आधारित निबंध (चार पर्यायांपैकी एका विषयावर शब्द मर्यादा-४००)	२०	
२	२	गद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग एक १ जेट युगातील मराठी माणूस (शंतनू किर्लोस्कर) २ विडल तो आला आला (पु. ल. देशपांडे) ३ नवसमाजनिर्मितीचे प्रणेते: महात्मा ज्योतीबा फुले (गंगाधर पानतावणे) ४ भरती (वसंत वऱ्हाडपांडे) ५ महालूट (संदानंद देशमुख)	३५	
३	३	पद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग एक १ तुकारामांचे अभंग (संत तुकाराम) २ प्रेमाचा गुलकंद (केशव कुमार) ३ पृथ्वीचे प्रेमगीत (कुसुमाग्रज्) ४ स्वप्न (ग्रेस) ५ दोन कामागारांच्या गोष्टी (लोकनाथ यशवंत)	३५	
४	४	व्यावहारिक मराठी ३. मुलाखत तंत्र ४. म्हणी व वाक्प्रचार	१०	

3T6.2-विषय : मराठी

सत्र तिसरे



प्रश्न क्र.	घटक क्र.	अभ्यासक्रम	गुण	शेरा
१	१	पर्यावरण, आधुनिकज्ञानविज्ञान आणि प्रसार माध्यमे ह्या विषयांवर आधारित निबंध (चार पैकी एक ; शब्द मर्यादा-४००)	२०	
२	२	गद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग दोन १ दुखःक्रांत लेंकी येणें (म्हाडंभट) २ माझे दत्तक वडील (चि. वि. जोशी) ३ सांगावा (शंकरराव खरात) ४ शेवटची माती (आनंद यादव) ५ जनसामान्यांच्या प्रबोधनाचं गतिचक्र (बा. ह. कल्याणकर)	३५	
३	३	पद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग दोन १ संतवाणी (चोखामेळा, सेना न्हावी, नरहरी सोनार) २ लटपट लटपट तुझे चालणें (होनाजी बाळा) ३ माझी कन्या (बी.) ४ आभाळाची आम्ही लेकरे (वसंत बापट) ५ इथेच (यशवंत मनोहर) ६ जहर खाऊ नका (ज्ञानेश वाकुडकर)	३५	
४	४	व्यावहारिक मराठी १ प्रसारमाध्यमांसाठी वृत्तलेखन २ कल्पना विस्तार	१०	

Students may be given freedom to submit a creative writing assignment on human values/world peace/environmental issues inspired by or related to the lessons/poems prescribed in the syllabus.

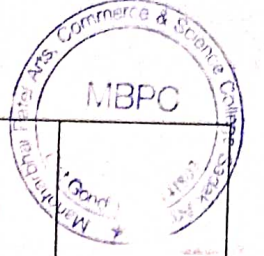
2 Assignments – 6+6 = 12 Marks
 Performance & Conduct – 4 Marks
 Attendance - 4 Marks
 TOTAL – 20 MARKS

Theory Examination – 80 Marks
 Internal Assessment – 20 Marks
 Total: 100 Marks



4T6.2-विषय : मराठी
 सत्र चौथे

प्रश्न क्र.	घटक क्र.	अभ्यासक्रम	गुण	शेरा
१	१	साहित्यविषयक निबंध (चार पैकी एक; शब्द मर्यादा- ४००)	२०	
२	२	गद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग दोन १ इंद्रायणीच्या वाळवंटात (श्री. म . माटे) २ मित्र (ना. सी. फडके) ३ माणसांत विरलेला माणूस (दुर्गा भागवत) ४ रामा मैलकुली (व्यंकटेश माडगुळकर) ५ प्रेम (मारोती चित्तमपल्ली) ६ विज्ञान युगात भारत (जयंत नारळीकर)	३५	
३	३	पद्य विभाग : पाठ्य पुस्तक : भाषा दर्शन भाग दोन १ दोन भारुडे (संत एकनाथ) २ विद्यार्थ्यांप्रत (केशवसुत) ३ आई (यशवंत)	३५	



		४ विचार झाला पाहिजे (वसंत आबाजी इहाके) ५ आता आम्ही (वैभव सोनारकर)		
४	४	व्यावहारिक मराठी १ स्मरणिका संपादन २. वाक्प्रचार	१०	

4T6.2-विषय : मराठी

प्रश्न पत्रिकेचे स्वरूप

सत्र : चौथे

वेळ:३ तास)

(एकूण गुण-80

प्रश्न:१ साहित्य विषयक निबंध (चार पर्यायांपैकी एका विषयावर)

शब्दमर्यादा- ४०० शब्द

(16 गुण)

प्रश्न: २ गद्य विभागावर आधारित दीर्घोत्तरी दोन प्रश्नांपैकी एक सोडवा (16 गुण)

प्रश्न: ३ पद्य विभागावर आधारित दीर्घोत्तरी दोन प्रश्नांपैकी एक सोडवा (16 गुण)

प्रश्न: ४ दोन गद्य विभागावर व दोन पद्य विभागावर आधारित चार लघु प्रश्नांच्या दोन गटांपैकी एक

गट सोडवा

(16 गुण)

प्रश्न: ५ एक लघु प्रश्न गद्य विभागावर, एक लघु प्रश्न पद्य विभागावर आणि दोन लघु प्रश्न व्यावहारिक मराठीवर आधारित अशा चार लघु प्रश्नांची उत्तरे लिहा (16 गुण)

एकूण गुण विभागणी

१. गद्य विभाग 28 गुण

२. पद्य विभाग 28 गुण

Cross-cutting Issues



राष्ट्रसंत तुकडोजी महाराज नागपूर विद्यापीठ, नागपूर

Syllabus for Bachelor of Science / B.Sc.(IT)/ BCA - Part - I

मराठी

(To be implemented from the session 2020-21 and onwards)

विज्ञान स्नातक भाग १, सत्र १ व सत्र २

अनुक्रमणिका

सत्र पहिले

पाठ्यपुस्तक — साहित्यसेतू

गद्य विभाग

- १ उमाई नमस्कारे — म्हाईभट
- २ सार्वजनिक सत्यधर्म — महात्मा जोतीराव फुले
- ३ वाचन — गोपाळ गणेश आगरकर
- ४ भारतीय संविधानाची विज्ञाननिष्ठा — यशवंत मनोहर
- ५ ही श्रीची ईच्छा — श्रीनिवास ठाणेदार

पद्य विभाग

- १ संतवाणी — ज्ञानेश्वर, नामदेव, चोखामेळा, तुकाराम
- २ या भारतात बंधुभाव नित्य वसू दे — राष्ट्रसंत तुकडोजी महाराज
- ३ झपूझा — केशवसूत
- ४ माझ्या मना बन दगड — विंदा करंदीकर
- ५ पाऊस — ग्रेस

व्यावहारिक मराठी

- १ प्रसारमाध्यमांसाठी लेखन — डॉ. संजय भक्ते
- २ शुध्दलेखन

for JQAC

(डॉ. वसुधारा ठाकरे)

प्रथम सत्र (Semester -I)

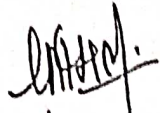


	गुण.
विभाग एक गद्य (पहिल्या भागातील पाच पाठ)	२०
विभाग दोन पद्य (पहिल्या भागातील पाच कविता)	२०
विभाग तीन निबंध — खालील दोनपैकी एका विषयावर १) विज्ञानावर २) सामाजिक समस्या	१०
विभाग चार व्यावहारिक मराठी अ) प्रसारमाध्यमांसाठी लेखन ब) शुध्दलेखन	०५ ०५

सूचना :-

अभ्यासक्रमात नेमलेल्या साहित्यसेतू पुस्तकातील सर्व पाठ व सर्व कविता अभ्यासक्रमात समाविष्ट राहतील. प्रश्नपत्रिका ६० गुणांची राहिल. १५ गुण अंतर्गत मूल्यांकनावर (Internal Assessment) राहतील.

अंतर्गत मूल्यांकनासाठी अभ्यासक्रमातील कोणत्याही घटकांवरील लेखन विद्यार्थ्यांकडून गृहपाठरूपाने सादर करता येईल. अथवा विद्यार्थ्यांच्या सर्जनशील जाणीवा विकसित करण्यासाठी अभ्यासक्रमातील पाठ आणि कवितेवरील आपले स्वतंत्र विचार लिखित स्वरूपात मागण्यात येतील. याशिवाय आणखी नव्या संकल्पना अंतर्गत मूल्यांकनासाठी विद्यार्थ्यांकडून साकार करण्याचे स्वातंत्र्य विषय शिक्षकाला असेल.


डॉ. प्रकाश पाटील

प्रश्नपत्रिकेचे स्वरूप व गुण विभागणी :-



वेळ : ३ तास

गुण : ६०

प्रश्न १ ला निबंध (खालील दोनपैकी एका विषयावर २०० शब्दांत)

१) विज्ञानावर

२) सामाजिक समस्या "

(विभाग तीन)

१०

प्रश्न २ रा दीर्घोत्तरी प्रश्न (१०० शब्दांत)

(सहा पैकी चार—पहिल्या भागातील पाच पाठातून)

(विभाग एक)

२०

प्रश्न ३ रा दीर्घोत्तरी प्रश्न (१०० शब्दांत)

(सहा पैकी चार — पहिल्या भागातील पाच कवितांतून)

(विभाग दोन)

२०


प्रश्न ४ था अ) प्रसारमाध्यमांसाठी लेखन

ब) शुध्दलेखन

(विभाग चार)

०५

०५


डॉ. प्रकाश भाटनगर

राष्ट्रसंत तुकडोजी महाराज नागपूर विद्यापीठ, नागपूर
Syllabus for Bachelor of Science / B.Sc.(IT)/ BCA -Part - I



मराठी

(To be implemented from the session 2020-21 and onwards)

विज्ञान स्नातक भाग १, सत्र १ व सत्र २

अनुक्रमणिका

सत्र दुसरे

पाठ्यपुस्तक — साहित्यसेतू

गद्य विभाग

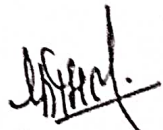
- १ अखेरचे कीर्तन — संत गाडगेबाबा
- २ एक राष्ट्र एक जनता — डॉ. वि. भि. कोलते
- ३ अपंगशाहीचे पंतप्रधान — मधुकर केचे
- ४ भरती — वसंत वराडपांडे
- ५ वैज्ञानिक दृष्टिकोण म्हणजे काय? — डॉ. जयंत नारळीकर

पद्य विभाग

- १ भंगु दे काठीण्य माझे — बा.सी.मर्ढेकर
- २ उषःकाल होता होता — सुरेश भट
- ३ खापराचे दिवे — विठ्ठल वाघ
- ४ आपल्याला नव्हती — अनुराधा पाटील
- ५ तू मदरबोर्ड माझ्या संगणकाचा — अरूण काळे

व्यावहारिक मराठी

- १ अनुवादप्रक्रिया — डॉ. नंदकुमार मोरे
- २ म्हणी व त्यांचा अर्थ


डॉ. आनंद ठाकरे

द्वितीय सत्र (Semester -I)

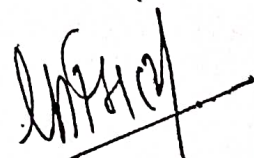


विभाग एक गद्य (दुसऱ्या भागातील पाच पाठ)	गुण २०
विभाग दोन पद्य (दुसऱ्या भागातील पाच कविता)	२०
विभाग तीन निबंध — खालील दोन पैकी एका विषयावर १) पर्यावरणावर २) कल्पकतेवर	१०
विभाग चार व्यावहारिक मराठी अ) अनुवादप्रक्रिया ब) म्हणींचा अर्थ सांगून वाक्यात उपयोग करा	०५ ०५

सूचना :-

अभ्यासक्रमात नेमलेल्या साहित्यसेतू पुस्तकातील सर्व पाठ व सर्व कविता अभ्यासक्रमात समाविष्ट राहतील. प्रश्नपत्रिका ६० गुणांची राहिल. १५ गुण अंतर्गत मूल्यांकनावर (Internal Assessment) राहतील.

अंतर्गत मूल्यांकनासाठी अभ्यासक्रमातील कोणत्याही घटकांवरील लेखन विद्यार्थ्यांकडून गृहपाठरूपाने सादर करता येईल. अथवा विद्यार्थ्यांच्या सर्जनशील जाणीवा विकसित करण्यासाठी अभ्यासक्रमातील पाठ आणि कवितेवरील आपले स्वतंत्र विचार लिखित स्वरूपात मागण्यात येतील. याशिवाय आणखी नव्या संकल्पना अंतर्गत मूल्यांकनासाठी विद्यार्थ्यांकडून साकार करण्याचे स्वातंत्र्य विषय शिक्षकाला असेल.


(डॉ. कोमल ठाकरे)

प्रश्नपत्रिकेचे स्वरूप व गुण विभागणी :-

वेळ : ३ तास

गुण : ६०



प्रश्न १ला निबंध (खालील दोन पैकी एका विषयावर २०० शब्दांत)

१) पर्यावरणावर

२) कल्पकतेवर

(विभाग तीन)

१०

प्रश्न २ रा दीर्घोत्तरी प्रश्न (१०० शब्दांत)

(सहा पैकी चार — दुसऱ्या भागातील पाच पाठातून)

(विभाग एक)

२०

प्रश्न ३ रा दीर्घोत्तरी प्रश्न (१०० शब्दांत)

(सहा पैकी चार — दुसऱ्या भागातील पाच कवितांतून)

(विभाग दोन)

२०

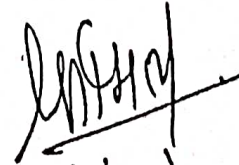
प्रश्न ४ था अ) अनुवादप्रक्रिया

०५

ब) म्हणींचा अर्थ सांगून वाक्यात उपयोग करा

०५

(विभाग चार)


(डॉ. कोप्रब ठाकरे)



RTM NAGPUR UNIVERSITY NAGPUR

SEMESTER PATTERN SYLLABUS

(Implemented from session 2017-18)

SUBJECT CHEMISTRY

B.Sc. -I, Semester - I

CH - 101: Paper- I (Inorganic Chemistry)

Unit-I

(7.5 Hrs)

(A) Atomic structure-Idea of de-Broglie matter Waves, Heisenberg's uncertainty principle. Schrodinger wave equation, significance of Ψ and Ψ^2 , Quantum numbers, shapes of s, p, and d orbitals, Aufbau principle, Pauli's exclusion principle and Hund's rule of maximum multiplicity. Electronic Configuration of elements and ions ($Z = 1$ to 30)

(B) Periodic Properties: Atomic and ionic radii, ionization energy, electron affinity and electronegativity- Definition, trends in periodic table. Factors affecting ionization potential. Pauling's and Muliken's scale of electronegativity. Effective nuclear charge and Slater's rule with some numericals.

Unit-II

(7.5 Hrs)

(A) Covalent Bond: Valence Bond Theory, Formation of Hydrogen molecule with Potential energy diagram Limitations of VBT, directional characteristics of covalent bond, overlap criterion and bond strength. Bond energy, bond length, Bond order and Bond angle. Various types of hybridization involving s, p, d orbitals and shape of inorganic molecules.

(B) Ionic solids: Ionic structures with respect to NaCl and CsCl, Lattice energy and Born- Haber cycle with numericals. Solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajans rule.

Unit - III

(7.5 Hrs)

(A) s- block elements- Electronic configuration, Comparative study with respect to atomic and ionic radii, Ionization potential, reducing properties. Diagonal Relationships (Li-Mg). Hydrogen bonding .Classification and effect of Hydrogen bonding on viscosity, solubility, M.pt. and B.pt.

(B) Chemistry of Noble Gases: Chemical properties of the noble gases, Preparation, chemical properties, structures, bonding and applications of Xenon fluorides (XeF_2 , XeF_4 , XeF_6). Structure and bonding in XeOF_2 and XeOF_4

Unit- IV

(7.5 Hrs)

(A) p-block elements - Introduction to p-block elements. Comparative study of groups 15, 16 and 17 with respect to their Atomic and ionic radii, Ionization potential, electron affinity, electronegativity, redox properties and oxidation state. Diagonal relationship (B-Si).

(B) Hydrides: Comparative study with respect to structure of NH_3 , PH_3 , AsH_3 and SbH_3 .

Oxides: Structure of P_2O_3 , P_2O_5

Oxyacids of Phosphorous: Structure of H_3PO_3 and H_3PO_4

Peroxyacids of sulphur: Preparation and structure of Caro's and Marshall's acids.

Hydrides of boron: Structure and bonding of diborane, structure of borazine.

for JQAC

CH – 102: Paper- II (Physical Chemistry)



UNIT-I: Thermodynamics

(7.5 Hrs)

(A) Definitions of some common thermodynamic terms: system, surrounding etc. Types of systems (closed, open & isolated). Homogeneous and Heterogeneous systems, extensive and intensive properties, thermodynamic processes (isothermal, adiabatic, isobaric, isochoric, cyclic, reversible & irreversible). State & path functions and their differentiation, concept of heat & work.

(B) Statements of first law of thermodynamics, definition of internal energy & enthalpy. Heat capacity, heat capacity at constant volume and at constant pressure & their relationship. Joule-Thomson experiment, Joule-Thomson coefficient & inversion temperature, calculations of w , q , ΔE & ΔH in isothermal & adiabatic expansion of ideal gases for reversible process.

(C) **Thermo chemistry:** Standard states, Standard enthalpy of formation. Hess's law of constant heat of summation & its applications. Heat of reaction, relation between heat of reaction at constant volume and constant pressure. Average bond energy, bond dissociation energy and its calculations from thermo chemical data. Numerical problems.

Unit-II Gaseous State.

(7.5 Hrs)

A) Postulates of kinetic theory of gases, derivation of kinetic gas equation, deduction of various gas laws from kinetic gas equation (Boyle's, Charle's, Avogadro's, Graham's, Dalton's law and ideal gas equation). Qualitative discussion of the Maxwell- Boltzmann distribution of molecular velocities. Effect of temperature on molecular velocities. Different types of molecular velocities (most probable, R.M.S. and average and expressions for them), their inter relationships. Definitions of collision diameter, collision number and Mean free path.

(B) Ideal gas and real gases, Difference between an ideal and real gases. Deviations from ideal behavior. Explanation of the terms – Compressibility factors and Boyle temperature. Causes of deviation from ideal behaviors. Vander Wall's equation of state, explanation of behavior of real gases by Van der Waal's equation. Andrew's experiment on critical phenomenon of isotherms of CO₂. Continuity of states. The isotherms of Van der Waal's equation, Relationship between critical constants and Van der Wall's constants. Reduced equation of state and law of corresponding states. Numerical problems

Unit- III Liquid State

(7.5 Hrs)

A) Intermolecular forces, structure of liquids (a qualitative description), structural differences between solids, liquids and gases, liquid crystals, Difference between liquid crystals, solids and liquids. Classification, structure of Nematic and Cholesteric phases. Thermography and seven segment cell.



B) Properties of liquid:

- i) Surface tension: Explanation, measurement of surface tension, Capillary rise method and drop number method, Parachor value and its application.
- ii) Viscosity: Explanation, coefficient of viscosity, Effect of temperature on Viscosity, relative viscosity, specific viscosity, intrinsic viscosity and reduced viscosity. Method of determination of viscosity (Ostwald viscometer method).
- iii) Refractive index: Definition. Method for determination of refractive index (Abbe's Refractometer). specific refraction, molar refractions. Numerical problems.

Unit- IV Surface Chemistry and Catalysis:

(7.5 Hrs)

A) Adsorption- Introduction, Factors affecting adsorption of Gases by Solids, Difference between physical and chemical adsorptions. Adsorption Isotherms: Freundlich Adsorption Isotherm, Langmuir Adsorption Isotherm, B.E.T. Equation (no derivation), Application of B.E.T. Equation in Determination of Surface Area of Adsorbent, Application of Adsorption.

B) Catalysis: - Introduction, Positive and negative catalysis. General characteristics of catalyst. Promoters & Inhibitors. Action of catalytic promoters and Inhibitors. Homogeneous & Heterogeneous Catalysis, Enzyme catalysis, auto catalysis. Kinetics of Enzyme Catalyzed Reactions- Machaelis-Menten Equation. Numerical problems.

CH-103: Laboratory Course

Practical- I (Inorganic Chemistry): Semi micro Qualitative Analysis

Qualitative analysis of inorganic salt mixture containing two acidic radicals of different group and two basic radicals of same groups. (At least six mixtures to be analyzed)

Practical- II (Physical Chemistry)

- 1) To determine the heat of solution of potassium nitrate calorimetrically.
- 2) To determine the heat of ionization of acetic acid calorimetrically
- 3) Determination of viscosity of unknown liquid by Ostwald viscometer.
- 4) To determine the percentage composition of given binary mixture (Ethanol-water) by viscosity method.
- 5) Determination of surface tension of a given liquid by drop number method (Stalagmometer method)
- 6) To compare cleansing power of two samples of detergent.
- 7) To determine refractive index, specific and molar refraction of given liquids by Abbe's refractometer.
- 8) To study the adsorption of oxalic acid on activated charcoal and verify the Freundlich adsorption isotherm.

(At least six experiments to be performed)



B.Sc. –I, Semester - II
CH – 201: Paper- I (Organic Chemistry)

Unit - I

(7.5 Hrs)

A) Structure and Bonding: Hybridization in case of Methane, Ethane, Ethylene and Acetylene. Bond lengths, bond angles and bond energies. Elementary ideas of Inductive effect, Electromeric effect. Resonance effect, Hyperconjugation (definition and examples). Hydrogen bonding in organic compounds (with reference to alcohol) and its consequences.

B) Mechanism of Organic Reactions: Homolytic & heterolytic bond fission with examples. Electrophiles & nucleophiles - definition and example both neutral and charged. Types of organic reactions - addition, substitution, elimination, rearrangement. Reactive intermediates – Definition: carbocations, carbanions, free radicals, carbenes, formation, geometry (orbital structure), stability.

Unit - II

(7.5Hrs)

Stereochemistry of Organic Compounds: Concept of isomerism. Types of isomerism with suitable examples. Optical isomerism-elements of symmetry, molecular chirality, enantiomers, stereogenic centre (lactic acid as example). **Optical activity, chiral and achiral molecules with two stereogenic centres (Tartaric acid) diastereo-isomers, meso-compound. Resolution of enantiomers biological and chemical methods. Inversion, retention and racemisation. Asymmetric synthesis. Relative and absolute configuration, sequence rules- D & L and R & S system of nomenclature.**

Geometrical isomerism: E & Z system of nomenclature, geometric isomerism in maleic acid, fumaric acid and 2-butene.

Conformational isomerism: Conformational analysis of ethane and n-butane.

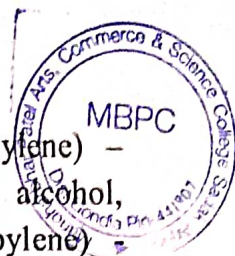
Newman's projection and sawhorse formulae. Difference between configuration and conformation.

Unit - III

(7.5 Hrs)

A) Alkanes: IUPAC nomenclature of branched and unbranched alkanes. Alkyl group, methods of formation (Ethane) - **Wurtz reaction, Kolbe's reaction, decarboxylation of carboxylic acid. Physical properties and chemical reactions of alkanes: halogenation, nitration, sulphonation, isomerization, cyclization, aromatization, pyrolysis, cracking and oxidation. L. P. G., Octane number. Mechanism of free radical chlorination of methane.**

Cycloalkanes: Nomenclature. Baeyer's strain theory and its limitations. Ring strain in small rings cyclopropane and cyclobutane. Theory of strainless rings. Conformational analysis of cyclohexane, axial and equatorial bonds.



B) Alkenes: Nomenclature of alkenes, methods of formation (ethylene & propylene) – dehydrogenation of alkane, dehydrohalogenation of alkyl halides, dehydration of alcohol, dehalogenation of dihalides. Chemical reactions of alkenes (ethylene and propylene) hydroboration, oxidation KMnO_4 , HIO_4 , Epoxidation, Ozonolysis, Hydroxylation, Polymerization, Substitution in allylic position of alkenes. Markownikoff's Rule and peroxide effect. Ionic Mechanism of addition of Br_2 to ethene and HBr to propene Free radical mechanism of addition of HBr to propene.

Unit - IV

(7.5 Hrs)

A) Dienes: Nomenclature and classification of dienes. Methods of formation of 1, 3 - butadiene. Chemical reactions of butadiene - 1, 2 and 1, 4 additions, Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in Alkynes. Methods of formation of acetylene from - calcium carbide, dehydrohalogenation of dihalides .Chemical reaction - hydroboration, oxidation ,metal ammonia reduction & polymerization. Oxyacetylene flame. Acidity of alkynes.

B) Aromatic compounds and Aromaticity: Nomenclature of Benzene derivatives. Structure of benzene - Molecular formula and Kekule structure, Resonance structure, MO picture. Huckel rule – aromaticity, aromatic ions (cyclopentadienyl anion and cycloheptatrienyl cation). Aromatic electrophilic substitution mechanism with energy profile diagram (e.g. nitration and sulphonation).

CH – 202: Paper- II (Physical Chemistry)

UNIT- I: Thermodynamics

(7.5 Hrs)

(A) Second law of thermodynamics : Need for second law of thermodynamics, statements of second law of thermodynamics, Carnot's cycle and its efficiency, Carnot theorem, thermodynamic scale of temperature, concept of entropy, entropy change in reversible and irreversible processes, entropy change of the universe, entropy change for an ideal gas with change in P, V & T, entropy change during physical change, physical significance of entropy, entropy as criteria of spontaneity & equilibrium of a process.

(B) Free energy functions: Work function (A) and Gibb's free energy (G), Variation of work function with T and V, variation of Gibb's free energy with T and P. A and G as criteria for spontaneity and equilibrium of a process. Gibb's – Helmholtz equation & its applications.

(C) Chemical equilibrium: Law of mass action, law of chemical equilibrium, relationship between k_p and k_c . Van't-Hoff's reaction isotherm, relation between standard free energy change & equilibrium constant, effect of temperature on equilibrium constant (reaction isochor), integrated form of Van't Hoff equation. Numerical problems.

UNIT-II: Phase Equilibria

(7.5 Hrs)

(A) Phase rule: Statement and meaning of the terms: Phase, component and degree of freedom, Derivation of Gibb's Phase rule. Applications of phase rule to one component system i) water



system, ii) Sulphur system. Need of reduced phase rule equation. Application of phase rule to two component system: Lead silver system, Pattinson's process for desilverization of lead.

(B) Liquid-Liquid mixtures: Raoult's law of ideal solutions, ideal liquid mixtures, Henry's law, non-ideal systems, azeotropes ($\text{HCl} - \text{H}_2\text{O}$ & $\text{C}_2\text{H}_5\text{OH} - \text{H}_2\text{O}$ system). Partial miscible liquids, lower & upper consolute temperature, (phenol-water system, trimethylamine-water and nicotine-water systems), effect of impurity on consolute temperature, Nernst distribution law, conditions for the validity of Nernst distribution law (Association and dissociation). Numerical problems.

UNIT-III: Nuclear chemistry and molecular structure:

(7.5 Hrs)

A) Nuclear chemistry Composition of Nucleus, Mass defects, Nuclear binding energy, Average binding energy per nucleon, explanation of nuclear stability on the basis of graph between average binding energy per nucleon and atomic mass number.

Nuclear reactions: Fission and fusion.

Nuclear models: Shell model and Liquid drop model, comparison between them. Bohr-Wheeler theory. Applications of radioisotopes in medicine, agriculture, carbon dating and structure determination.

(B) Molecular structure:

Dipole moment, polar and non-polar covalent bond, Electrical polarization of molecules, Orientation of dipoles in an electric field. Determination of dipole moment. Application of dipole moment to %age ionic character, Geometry of molecules, study of geometrical isomers and substituted benzene molecules. Numerical problems.

UNIT-IV: Chemical Kinetics

(7.5 Hrs)

(A) Rate of reaction, factors affecting the rate of a reaction (concentration, temperature, pressure, solvent, light and catalyst). Order and molecularity of reaction. Reactions of zero order.

Mathematical expression for rate constant of first and second order reactions, their characteristics. Pseudo unimolecular reactions. Methods of determination of order of reaction: Integration method, differential method, graphical method, half life period and isolation method.

(B) Theories of chemical kinetics: concepts of activation energy. Arrhenius equation, Effect of temperature on rate of reaction.

Collision theory of bimolecular reactions (hard sphere model). Transition state theory (equilibrium hypothesis). Expression for rate constant based on equilibrium constant and thermodynamic aspects. Lindeman's theory of unimolecular reactions. Numerical problems.

CH-203: Laboratory Course



Practical I (Organic Chemistry):

A) Qualitative Analysis: Element detection (N, Cl, Br, F & S), Identification of functional groups (-COOH, Phenolic -OH, -CHO, Aromatic -NH₂, -CONH₂), determination of M.P & B.P.

B) Preparation: i) Hydrolysis : Preparation of Benzoic acid from Benzamide

ii) Oxidation: Preparation of Benzoic acid from Benzaldehyde

iii) Bromination of Phenol

Practical II (Physical Chemistry):

1. To determine the integral heat of solution of a salt at two concentrations and hence determine the integral heat of dilution.

2 To determine the solubility of benzoic acid at different temperatures and to determine heat of solution of benzoic acid.

3. To construct the phase diagram of three component system (Acetic acid-chloroform-water)

4. To determine the critical solution temperature of two partially miscible liquids (phenol-water systems).

5. To study the distribution coefficient of Iodine between Water and Carbon tetrachloride/Kerosene

6. To determine molecular state of benzoic acid in benzene by distribution method.

7. To determine the rate constant of hydrolysis of methyl acetate in presence of acid.

8. To determine the specific reaction rate of hydrolysis of ethyl acetate catalyzed by NaOH (saponification)

(At least six experiments to be performed)

B.Sc. –II, Semester - III
CH – 301: Paper- I (Inorganic Chemistry)
(2018-2019)



Unit – I:

(7.5 Hrs)

(A) Valence Shell Electron pair repulsion (VSEPR) Theory: Structure with respect to H_2O , NH_3 , NH_4^+ , ClF_3 , SF_4 , ICl_4^- .

Preparation, properties and structure of Interhalogen compounds. Polyhalides (Structure of I_3^- , I_5^- , ICl_4^-)

(B) MO theory: LCAO approximation, wave equation for molecular orbitals. Difference between bonding and anti bonding MO in terms of energy and electron density distribution curves, order of energy levels in MO. Molecular Orbital diagrams for homonuclear diatomic molecules of elements (with $Z = 1$ to 9). Concepts of nonbonding MO in HF molecule. Coulson's MO diagram of CO and NO diatomic molecule.

Unit- II:

(7.5 Hrs)

A) Chemistry of elements of first transition series:

Characteristic properties of the elements of first transition series with reference to their: Electronic configuration, Atomic and ionic radii, Ionization potential, Variable oxidation states, Magnetic properties, Colour, Complex formation tendency and catalytic activity.

(B) Chemistry of elements of second and third transition series:

Electronic configuration of 4d and 5d transition series. Comparative treatment with their 3d-analogous (Group Cr-Mo-W, Co-Rh-Ir,) in respect of oxidation states and magnetic behavior.

Unit III:

(7.5 Hrs)

A) Errors in Chemical Analysis:

i) Random and Systematic errors, Explanation of terms: Accuracy and Precision, Uncertainty, Absolute and Relative errors, Mean, Median, Average and Standard deviations, Significant figures, numerical problems.

ii) Statistical Test of Data: Q-test, 2.5d and 4d Rules for rejection of data. Numerical problems.

B) Non-aqueous solvents:

Classification of solvents and characteristic reactions (acid base, redox & precipitation reactions) in Non-aqueous solvents with reference to i) Liquid Ammonia and ii) Liquid Sulphur dioxide.

Unit – IV:

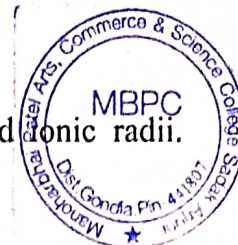
(7.5 Hrs)

A) Chemistry of Lanthanides:

Position in periodic table, electronic configuration, Oxidation states, Atomic and ionic radii, Lanthanide contraction and its consequences, Complex forming tendency. Occurrence and separation of lanthanides (ion exchange and solvent extraction).

B) Chemistry of Actinides:

Position in periodic table, electronic configuration, Oxidation states, Atomic and ionic radii.
Actinide contraction.



CH-302: Paper- II (Organic Chemistry)

Unit – I

(7.5 Hrs)

Orientation: Activating ($-OH$, $-NH_2$) & deactivating ($-Cl$, $-NO_2$, $-COOH$) substituent's, their orientation and directive influence on further electrophilic substitution, o/p ratio. Methods of formation and chemical reactions of alkyl benzene (Toluene) and biphenyl.

Alkyl halides: Nomenclature, classification, methods of formation, chemical reactions. Mechanism of nucleophilic substitution reactions of alkyl halides SN^1 and SN^2 with energy profile diagrams.

Polyhalogen compounds: Chloroform and carbon tetrachloride – formation and chemical reactions.

Nuclear and side chain halogen derivatives of benzene (Aryl halides): Chlorobenzene and benzyl chloride preparation and reactions. Relative reactivity of alkyl halides vs aryl halides. Synthesis and uses of DDT and BHC.

Unit – II

(7.5 Hrs)

A) Alcohols: Classification and nomenclature,

Dihydric alcohols: Nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage ($Pb(OAc)_4$ and HIO_4) and Pinacol – pinacolone rearrangement with mechanism.

Trihydric alcohols : Nomenclature and methods of formation of Glycerol from (i) Propene and (ii) Hydrolysis of oils and fats, chemical reactions of glycerol - with oxalic acid at two different temperatures, HI , HNO_3 , dehydration.

(B) Phenols: Nomenclature, structure and bonding. Preparation of phenols from cumene, chlorobenzene (Dows and Raschig process) and diazonium salts. Physical properties and acidic character, Resonance stabilization of phenoxide ion, Reactions of phenols, Electrophilic aromatic substitution, acetylation and carboxylation, Claisen rearrangement, Gatterman synthesis, Reaction Mechanism of i) Fries Rearrangement, ii) Reimer-Tiemann reaction.

Unit – III

(7.5 Hrs)

Aldehydes and ketones: Nomenclature, structure of the carbonyl group, synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides and ketones from nitriles.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on Benzoin, aldol, Perkin and Knoevenagel condensation. Wittig reaction, Mannich reaction, oxidation of



aldehydes (by KMnO_4 , Tollen's reagent and Fehlings solution), Baeyer-Villiger oxidation of Ketones, Cannizzaro reaction, (with mechanism), MPV, Clemmensen, Wolf-Kishner, LiAlH_4 and NaBH_4 reductions.

Unit IV

(7.5 Hrs)

A) Carboxylic Acids: Nomenclature, structure & bonding. Physical properties, acidity of carboxylic acids, effect of substituent's on acid strengths, preparation of carboxylic acids (from Grignard Reagent and cyanides), Reactions of carboxylic acids, Hell-Volhard-Zelinsky reactions. Reduction of carboxylic acids, Mechanism of decarboxylation with soda lime. Methods of formation and chemical reactions of unsaturated monocarboxylic acids (crotonic acid and cinnamic acid).

Dicarboxylic acids: Methods of formation of succinic acid from ethylene dibromide and Phthalic acid from o-xylene. Effect of heat and dehydrating agents. (Succinic acid, Phthalic acid).

(B) Carboxylic acid derivatives : Structure & nomenclature of acid chlorides, esters, amides and acid anhydrides. Interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, Chemical reactions, Mechanism of esterification and hydrolysis (acidic and basic).

CH- 303: Laboratory Course

Practical-I (Inorganic Chemistry):

Volumetric Analysis (All 5 Expts. to be performed)

Preparation of standard solution by weighing is compulsory

- 1) Estimation of Fe(II) by dichromate using internal indicator.
- 2) Determination of acetic acid in commercial vinegar using NaOH
- 3) Determination of alkali content in antacid tablet using HCl
- 4) Determination of Zn by complexometric titration with EDTA
- 5) Determination of total Hardness of water (permanent and Temporary) by EDTA

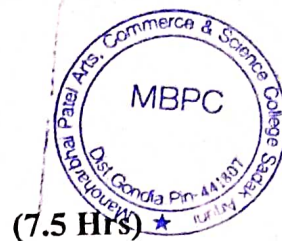
Practical- II(Organic Chemistry):

Complete analysis of simple organic compound involving following steps :-

- (i) Preliminary examination
- ii) Detection of elements
- iii) Detection of functional group
- iv) Determination of M.P. / B.P.
- v) Preparation of derivative and its M.P./B.P.
- vi) Performance of specific test if any

B.Sc. –II, Semester – IV

CH – 401: Paper- I (Inorganic Chemistry)



Unit-I:

Coordination compounds:

Distinction among simple salts, double salts and coordination compounds. Werner's Coordination theory and its experimental verification. Sidgwick's electronic interpretation, EAN rule with examples, Nomenclature of Coordination compounds. Chelates: Classification and their application, Valence Bond Theory of transition metal complexes.

(7.5 Hrs)

Unit- II:

A) Isomerism in coordination compounds:

Structural isomerism and Stereoisomerism in coordination compounds with respect to C.N. 4 & 6

B) Oxidation and reduction:

Concept of oxidation and reduction. Balancing of redox reactions by Electron method numericals. EMF series and its applications. Use of redox potential data: Analysis of Redox cycle, redox stability in water, Latimer diagram of Chlorine and Oxygen, Construction and explanation of Frost diagram. Frost diagram of Nitrogen and Oxygen. Pourbaix diagram of Iron.

Unit- III: 7.5 Hrs

A) Colorimetry and Spectrophotometry:

(7.5 Hrs)

Principles of photometry: Beer-Lamberts Law, derivation and deviation (Numericals). Types of colorimeter and spectrophotometer with simple schematic diagrams. Application of colorimeter and spectrophotometer in quantitative analysis with reference to estimation of Cu(II) as Cu-ammonia complex.

B) Separation Techniques:

a) **Chromatography:** Classification, Principle, Technique and Application of Paper and Column Chromatography.

b) **Ion- Exchange:** Types of ion exchange resins, Equilibria and ion exchange capacity, Application in separation of binary mixtures.

c) **Solvent Extraction:** Principle and Classification, Factors influencing extraction and application in chemistry.

Unit- IV Inorganic Polymers:

(7.5 Hrs)

Silicones: Introduction, Nomenclature, preparation, properties and uses, General introduction to Silicon oils, Silicone Elastomers and Silicon Resins

Phosphonitrilic halide polymers: Introduction, Preparation, properties and uses. Structure and bonding in $(\text{NPCl}_2)_3$ and $(\text{NPCl}_2)_4$



Unit IV: Quantum Chemistry I

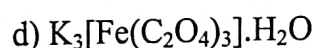
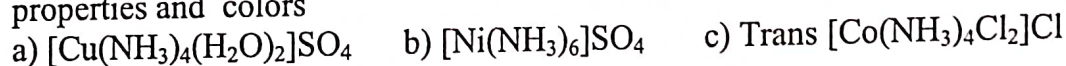
(7.5 Hrs)

A) Failure of classical mechanics, Explanation of Black body radiation, Photoelectric effect, and heat capacity of solids on the basis of classical mechanics. Bohr's model of Hydrogen atom, spectrum of hydrogen atom, Plank's quantum theory. De Broglie's hypothesis (Derivation and experimental proof). Heisenberg's uncertainty principle (Explanation and experimental proof).
B) Introduction to wave functions (Ψ), Schrodinger wave equation. Eigen values and Eigen functions, well behaved wave functions. Interpretation of wave function (Ψ) and its square (Ψ^2), Normalized and orthogonal wave functions. Postulates of quantum mechanics, Derivation of Schrodinger wave equation from postulates of quantum mechanics. Application of Schrodinger wave equation for a particle in one dimensional box and three dimensional box. Concept of degeneracy. Numerical problems.

CH-403: Laboratory Course

Practical-I (Inorganic Chemistry):

A) Preparation of following complexes and Comments on its VBT structure, magnetic properties and colors



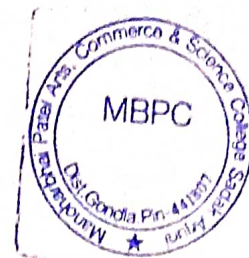
B) **Chromatographic separation** of binary mixtures(at least Two) containing Cu(II), Co(II) and Ni(II) ions by paper chromatography and determination of R_f values.

Practical-II (Physical Chemistry):

1. To construct various crystal lattices.
2. To determine the strength of the given acid (HCl or CH_3COOH) conductometrically using standard alkali (NaOH) solution.
3. To determine the strength of strong acid and a weak acid in a given mixture conductometrically against a standard alkali solution.
4. To determine the solubility and solubility product of a sparingly soluble salt conductometrically.
5. To determine the ionization constant of weak acid conductometrically.
6. To determine heat of solution of solid calcium chloride and calculate lattice energy of calcium chloride from its enthalpy change data using Born-Haber cycle.
7. To determine the molar volume of ethanol at room temperature in dilute aqueous solution
8. To determine the equilibrium constant of the reaction, $\text{KI} + \text{I}_2 \rightleftharpoons \text{KI}_3$ by distribution method.

(At least six experiments to be performed)

B.Sc. –III, Semester – V
CII- 501:Paper- I (Organic Chemistry)
(2019-2020)



UNIT- I

(7.5 Hrs)

Organic compounds of Nitrogen : Preparation of nitroalkanes and nitrobenzene, chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitrobenzene and their reduction in acidic, neutral and alkaline media. Picric acid- preparation and uses,

Amines : Structure and nomenclature of amines, Physical properties, stereochemistry of amines, separation of mixture of 1°, 2° and 3° amines by Hoffmann's method, structural features affecting basicity of amines, preparation of alkyl & aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel phthalimide reaction, Hofmann bromamide reaction, Reactions of amines, Preparation and synthetic transformations of aryl diazonium salts.

UNIT – II - HETEROCYCLIC COMPOUNDS:

(7.5 Hrs)

Molecular orbital picture and aromaticity of furan, thiophene, pyrrole and pyridine. Methods of synthesis of pyridine (i) from hexamethylene diamine and (ii) Picoline. Mechanism of electrophilic and nucleophilic substitution reaction of pyridine. Chemical reaction of pyridine. Structure of pyridine. Comparison of basicity of pyrrole and pyridine. Introduction to condensed five and six membered heterocycles. Preparation and reactions of Indole, Quinoline and Isoquinoline with special reference to Fischer Indole synthesis, Skraup synthesis and Bischler Napieralski synthesis.

UNIT-III

(7.5 Hrs)

A) Quantitative Analysis : Estimation of carbon, hydrogen, nitrogen, sulphur and halogens (only principles and calculations). Calculation of Empirical and molecular formula with Numericals

B) Organometallic compounds :

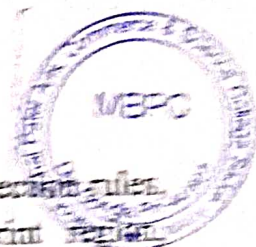
Organomagnesium compound : Grignard reagent formation, chemical reactions and structure.

Organozinc compounds : Formation and chemical reactions. Organolithium compounds: Formation and chemical reactions.

UNIT-IV - SPECTROSCOPY :

(7.5 Hrs)

A) Electromagnetic spectrum : Absorption spectra, Ultraviolet absorption spectroscopy, Absorption laws(Beer Lambert law), molar absorptivity, Presentation and analysis of UV spectra, Types of electronic transitions, Effect of conjugation, concept of chromophores and auxochromes, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.



B) Infrared (IR) absorption spectroscopy : Molecular vibrations, Hooke's law, Selection rules, Intensity and position of IR bands, measurement of IR spectrum. Fingerprint region, characteristic absorptions of various functional groups and application of IR spectra.

CH- 502: Paper- II (Physical Chemistry)

Unit -I Electrochemistry

(7.5 Hrs)

(A) Galvanic cells, irreversible & reversible cells, emf of cell & its measurement, relation between electrical energy and chemical energy, calculation of thermodynamic quantities of a cell reactions (ΔG , ΔH & ΔS & equilibrium constant)

(B) Types of reversible electrodes : metal-metal ion electrode, gas electrode, metal insoluble salt-anion electrode, redox electrodes, amalgam electrode, Nernst equation, calculation of cell emf from single electrode potential, reference electrodes, standard electrode potential, concentration cells with & without transference, liquid-junction potential, salt bridge & its functions.

Applications of emf measurements in : (i) pH-determination using hydrogen electrode, quinhydrone electrode & glass electrode (ii) Potentiometric titration (Acid -Base and Redox titrations). Numericals Problems.

Unit II : Quantum Chemistry and Molecular Orbital Theory:

(7.5 Hrs)

A) Quantum Chemistry Schrodinger wave equation for H-atom, separation in to three equations (without derivation), quantum numbers and their importance, Hydrogen like wave functions, radial wave functions and angular wave functions. Concept of orbital, shapes of orbital. Radial probability distribution curves for 1s, 2s, 2p, 3p and 3d orbitals.

B) Molecular orbital theory : Born-Oppenheimer approximation, Criteria for forming M. O. from A. O., LCAO-MO method for H_2^+ ion, Physical pictures of bonding and antibonding wave functions. Calculation of energy from wave functions. Comparison of bonding and antibonding molecular orbitals. Introduction to M. O. theory for H_2 molecule. Introduction to Valence bond theory for H_2 molecule. Similarities and differences of valence bond and molecular orbital models.

Unit III: Photochemistry and Raman Spectroscopy

(7.5 Hrs)

A) Photochemistry :

Interaction of radiation with matter, difference between thermal and photochemical reactions, Laws governing absorption of light. Laws of photochemistry. Jablonski diagram depicting various processes, quantum yield, determination of quantum yield of reactions, reasons for low and high quantum yields. Some examples of photochemical reactions (e.g. Photochemical decomposition of Hydrogen iodide, Photosynthesis of HBr from H_2 and Br $_2$ and photosynthesis of HCl from H_2 and Cl $_2$) Photosensitization, Photosensitized reactions. Numericals Problems.

B) Raman Spectroscopy :



Raman Effect, explanation of Rayleigh's lines, Stoke's lines and antistoke's lines, Experimental set up of Raman spectrometer. Pure rotational Raman spectra of diatomic molecules, rotational vibration Raman spectra of diatomic molecules. Advantages of Raman spectroscopy over Infra red spectroscopy.

UNIT-IV: Colligative properties and Macromolecules

(7.5 Hrs)

A) Colligative properties: Methods of expressing concentration of solutions, Raoult's law, Relative lowering of vapour pressure, determination of molecular mass from relative lowering of vapour pressure. Osmosis and osmotic pressure of solution. Measurement of osmotic pressure by Barkeley and Hartley method. Determination of molecular mass from osmotic pressure. Elevation of boiling point of solvent, determination of molecular mass from elevation of boiling point. Depression of freezing point of the solvent. Determination of molecular mass from depression of freezing point. Van't Hoff factor, degree of dissociation and association of solute.

B) Macromolecules: Macromolecules, classification of polymers, molar masses of polymers: number average and weight average molar masses, determination of molar masses of macromolecules: viscometry, Osmometry and light scattering method. Kinetics of polymerization, addition and condensation polymerization. Electronically conducting polymers: poly(acetylene) poly(sulphyrnitride), poly(para-phenylene), poly(aniline). Numericals Problems.

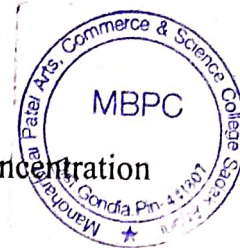
CH-503: Laboratory Course

Practical I (Organic Chemistry):

- Estimations i) Estimation of Glucose
- ii) Estimation of Amide
- iii) Estimation of Nitro group
- iv) Estimation of Carboxylic group
- v) Saponification of oil

Practical II (Physical Chemistry):

1. To determine the strength of given acid (HCL or CH₃COOH) potentiometrically using standard alkali solution
2. To determine the dissociation constant of weak acid potentiometrically by titrating it against alkali.
3. To titrate potentiometrically ferrous ammonium sulphate against potassium dichromate and calculate redox potential of Fe²⁺/Fe³⁺ system.
4. To verify Beer-Lambert law using calorimeter and determine the concentration of given solution.
5. To determine molecular mass of a non-volatile solute by Rast method.
6. To determine the molecular weight of polymer by Viscometric method.



7. To determine the specific rotation of a given optically active compound and the concentration of an unknown solution polarimetrically.

8. To study the rate of acid catalysed iodination of acetone.

(At least six experiments to be performed)

B.Sc. –III, Semester – VI

CH – 601: Paper- I (Inorganic Chemistry)

Unit- I

A) Metal ligand bonding in Transition Metal Complexes: (7.5 Hrs)

Limitations of Valence bond theory, Crystal field theory: Splitting of d-orbital in octahedral, tetrahedral and square planar complexes. Factors affecting the Magnitude of $10 Dq$. Concept of Crystal field Stabilisation Energy of octahedral and tetrahedral complexes. High spin low spin complexes on the basis of Δ_o and pairing energy in octahedral complexes. (Numericals)

B) Electronic spectra of Transition Metal Complexes:

Jahn-Teller Effect, Conditions of distortion with respect to CFT configuration. Selection Rules (Laporte and Spin selection Rules). Hole Formalism Principle with respect to d^1 and d^9 ions.

Electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ complex ions with respect to position of the band, intensity of the band, symmetry of the band and bandwidth.

Unit-II: (7.5 Hrs)

A) Magnetic Properties of Transition Metal Complexes:

Method of determination of Magnetic Susceptibility by Gouy's Method. Spin only formula and orbital contribution to magnetic moment. Magnetic properties of Octahedral and Tetrahedral complexes with respect to CFT. Numericals on magnetic moments.

B) Thermodynamic and Kinetic aspect of metal complexes:

Thermodynamic and Kinetic stability of metal complexes, their relation. Stepwise stability and overall stability constant and their relationship, Factors affecting the Stability of complexes. Determination of composition of Fe(III)-SSA complex by Mole Ratio and Job's Method.

Unit III: (7.5 Hrs)

A) Organometallic Chemistry

Definition, Nomenclature and Classification of Organometallic compounds. Preparation properties and application of Alkyl and Aryls of Li and Al. A brief account of metal ethylenic complexes (Structure only). Homogeneous Hydrogenation (Wilkinson's Catalyst reaction).

B) Metal carbonyls: Definition, preparation, properties. Structure and bonding in mononuclear carbonyls- $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$ and $\text{Cr}(\text{CO})_6$ with respect to back π -bonding.

Unit –IV: (7.5 Hrs)

A) Bioinorganic Chemistry: Essential and Trace elements in biological processes, Metalloporphyrins with special reference to structure and role of Haemoglobin and Myoglobin in transport of Oxygen. Biological role of Na^+ and K^+ and Ca^{2+} metal ions. Sodium and potassium pump. Hypo and hyper calcimia. Calcium triggering and calcium pump.

B) **Hard and Soft Acids and Bases:** Classification of Acids and Bases as Hard and Soft. Pearson's HSAB Concept and its applications. Symbiosis, Antagonism.



CH- 602: Paper- II (Organic Chemistry)

UNIT- I : NMR Spectroscopy:

(7.5 Hrs)

Nuclear Magnetic Resonance (NMR) spectroscopy. Proton Magnetic Resonance spectroscopy. Nuclear shielding and deshielding, chemical shift, Spin-spin splitting and Coupling constant. Areas of signals. Interpretation of NMR spectra of organic molecules such as ethyl bromide, ethanol,

acetaldehyde, 1,2 dibromoethane, ethyl acetate, toluene, acetophenone, acetyl acetone. Problem pertaining to the structure elucidation of simple organic molecules by NMR technique.

UNIT- II

(7.5 Hrs)

A) ORGANIC SYNTHESIS VIA ENOLATES:

Acidity of α - hydrogens, Reactivity of methylene group. Malonic ester preparation and reaction- Acetoacetic ester - synthesis by Claisen condensation reactions, Keto - enol tautomerism of acetoacetic ester, Preparation of acetic acid, succinic acid, crotonic acid and heterocyclic compounds.

B) CARBOHYDRATES: Definition, classification and reaction of glucose. Mechanism of osazone formation. Determination of structure of glucose. Determination of ring size of monosaccharides. Epimerisation, mutarotation, conversion of glucose into fructose and vice-versa. Chain lengthening and shortening of aldoses(Wohl's degradation).Introduction to structures of maltose, sucrose, lactose, starch , cellulose, ribose and deoxyribose without involving structure determination.

UNIT-III

(7.5 Hrs)

A) AMINO ACIDS, PEPTIDES, PROTEINS & NUCLEIC ACIDS:

Classification, structure and stereochemistry of amino acids. Acids base behavior, isoelectric point and electrophoresis. Structure and nomenclature of peptides and protein. Classification of proteins. Protein denaturation. Structure determination of proteins (primary and secondary).

NUCLEIC ACIDS: Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. Double helical structure of DNA.

B) FATS, OILS AND DETERGENTS : Natural fats, edible and industrial oils of vegetable origin, Glycerides, hydrogenation of unsaturated oils, Definition of Saponification value, Iodine value, Acid value, Soaps, Synthetic detergents, Alkyl and aryl sulfonates.



UNIT- IV

(7.5 hrs)

A) SYNTHETIC DYES: Colour and constitution (Witt theory, electronic concept) Classification of Dyes based on chemical constitution. Synthesis and uses of Congo red, Crystal violet, Phenolphthalein and Alizarin dye.

B) SYNTHETIC DRUGS: Definition, Classification, Preparation, properties and uses of: Aspirin, aracetamol, Dettol, Chloroquine, Phenobarbitone, Chloramphenicol, Chloramine T.

C) SYNTHETIC POLYMERS: Addition or chain growth polymerization, free radical. Vinyl polymerization, Ionic vinyl polymerization, Ziegler - Natta polymerization .Condensation or step growth polymerization. Polyesters, polyamides,

CH-603: Laboratory Course

Practical-I (Inorganic Chemistry):

A) Gravimetric Analysis

- i) Estimation of Ba^{2+} as $BaSO_4$,
- ii) Estimation Ni^{2+} as Ni-DMG

B) Colorimetry

- i) Colorimetric or spectrophotometric estimation of copper (II) in commercial copper sulphate sample as ammonia complex.
- ii) Jobs method of determination of composition of Fe- SSA complex
- iii) Mole Ratio Method of determination of composition of Fe- SSA complex

Practical-II (Organic Chemistry):

Separation of an organic mixture containing two solid components using NaOH /NaHCO₃ for separation , identification of the components and preparation of suitable derivatives (minimum five mixtures)



**RASHTRASANT TUKADOJI MAHARAJ, NAGPUR UNIVERSITY, NAGPUR
SYLLABUS FOR B.Sc. ZOOLOGY (SEMESTER PATTERN)**

(With effect from the academic year 2013-2014)

The semester pattern syllabus for B.Sc. Three Year Degree Course in the Subject - Zoology comprises of six semesters. Each semester is based on six theory periods and six practical periods per week. The examination of each semester shall comprise of two theory papers each of three hours duration and carries 50 marks each and a practical of 4 hours duration carries 30 marks. Internal assessment for each semester based on two theory papers of 10 marks each and shall be conducted by university approved teachers. Internal assessment marks should be submitted to the university one month prior to the final examination. Candidates are expected to pass separately in theory, internal assessment and practical examination.

The Structure of Syllabus for B.Sc. Zoology (Semester Pattern) along with distribution of marks is also displayed in the following Table

Semester	Semesterwise Theory Papers and Practicals	Marks			Total Marks
		Theory	Internal Assessment*	Practical	
Semester - I	Theory Paper – I : Life and Diversity of Animals-Nonchordates (Protozoa to Annelida)	50	10		150
	Paper -II : Environment Biology	50	10		
	Practical - I (Based on Paper I & II)			30	
Semester- II	Theory Paper - III : Life and Diversity of Animals- Nonchordates (Arthropoda to Hemichordata)	50	10		150
	Paper - IV : Cell Biology	50	10		
	Practical - II (Based on Paper III & IV)			30	
Semester- III	Theory Paper - V : Life and Diversity of Animals-Chordates (Protochordata to Amphibia)	50	10		150
	Paper - VI : Genetics	50	10		
	Practical - III (Based on Paper V & VI)			30	
Semester - IV	Theory Paper - VII : Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals)	50	10		150

Contd. on Pg. 2

For IQAC

	Paper - VIII : Molecular Biology and Immunology	50	10		
	Practical - IV (Based on Paper VII & VIII)			30	
Semester - V	Theory Paper - IX : General Mammalian Physiology I	50	10		150
	Paper - X : Applied Zoology I (Aquaculture and Economic Entomology)	50	10		
	Practical - V (Based on Paper IX & X)			30	
Semester - VI	Theory Paper - XI : General Mammalian Physiology II	50	10		150
	Paper - XII : Applied Zoology II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)	50	10		
	Practical - VI (Based on Paper XI & XII)			30	
		Grand total			900

*Internal assessment –

- (For Semester I to IV) Based on students attendance and the performance during Unit test exam. and field work
- (For Semester V & VI) Based on students attendance and the performance during Unit test exam., field work and seminar

Semester - I

Paper – I : Life and Diversity of Animals - Nonchordates (Protozoa to Annelida)

Unit – I

(9 Periods)

- 1.1 Protozoa : General characters and classification up to classes
- 1.2 *Paramecium* : Structure and reproduction
- 1.3 *Plasmodium* : Structure and life cycle
- 1.4 Parasitic Protozoans of Man : *Entamoeba*, *Trypanosoma*, *Giardia* and *Leishmania* - Mode of infection and its control

Unit – II

(9 Periods)

- 2.1 Porifera : General characters and classification up to classes
- 2.2 *Sycon* : Structure, reproduction and development, Canal system in sponges
- 2.3 Coelenterata : General characters and classification up to classes
- 2.4 *Obelia* : Structure and life cycle, corals and coral reef formation



Unit – III

(9 Periods)

- 3.1 Helminthes : General characters and classification up to classes
- 3.2 *Ascaris* : External morphology, reproductive system and life cycle
- 3.3 *Taenia solium* : Structure and life cycle
- 3.4 Elementary idea of parasitic adaptations in helminthes

Unit – IV

(9 Periods)

- 4.1 Annelida : General characters and classification up to classes
- 4.2 Leech : Morphology, digestive and urinogenital system
- 4.3 Trochophore larva and its significance
- 4.4 Vermiculture and its importance

Semester – I

Paper – II : Environmental Biology

Unit – I

(9 Periods)

- 1.1 Atmosphere: Major zones and its importance, composition of air
- 1.2 Hydrosphere: Global distribution of water, Physico-chemical characteristics of water
- 1.3 Lithosphere: Types of rocks, formation of soil
- 1.4 Renewable and non-renewable energy sources

Unit – II

(9 Periods)

- 2.1 Ecosystem - Definition and types
- 2.2 Detailed study of pond ecosystem
- 2.3 Food chain, food web and ecological pyramids
- 2.4 Energy flow in an ecosystem, Single channel, Y – shape and Universal model

Unit – III

(9 Periods)

- 3.1 Biodiversity and its conservation
- 3.2 Causes of reduction of biodiversity
- 3.3 Wildlife conservation acts (1972 and 1984), Introductory study of national parks and sanctuaries – Tadoba, Kanha, Bharatpur and Nagzira
- 3.4 Hot spots of biodiversity in India

Unit – IV

(9 Periods)

- 4.1 Sources, effect and control measures of air pollution, Acid rain, green house effect, ozone depletion and global warming
- 4.2 Sources, effect and control measures of water pollution
- 4.3 Sources effect and control measures of noise pollution
- 4.4 Toxic effect of heavy metals (lead, cadmium and mercury) – Bioaccumulation and biomagnification

Semester – I

PRACTICAL – I (Based on Paper – I and II)

Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)
& Section B : Environmental Biology

Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)

1. Study of museum specimens (Classification of animals up to orders)

- I. Protozoa (Slides) : *Paramecium*, *Euglena*, *Amoeba*, *Plasmodium vivax*
- II. Porifera: *Sycon*, *Leucosolenia*, *Hyalonema*, *Euplectella*, *Spongilla*
- III. Coelenterata : *Obelia*, *Aurelia*, *Tubipora*, *Fungia*, *Adamsia*
- IV. Platyhelminthes : *Planaria*, *Fasciola*, *Taenia*
- V. Aschelminthes : *Ascaris*, *Drancunculus*, *Ancylostoma*, *Wuchereria*
- VI. Annelida : *Aphrodite*, *Nereis*, *Chaetopteurs*, *Tubifix*, *Hirudinaria*

2. Study of permanent slides

Enatmoeba, *Giardia*, Sponge gemmules, Sponge spicules, V.S. *Sycon*, T.S. *Sycon*, *Obelia* medusa, Miracidium, Redia and Cercaria larvae of *Fasciola*, T.S. male and female *Ascaris*, Scolex of *Taenia*, Mature and gravid proglottids of *Taenia solium*, T.S. of Leech through crop pockets, Trochophore larva

3. Dissection

Digestive, nervous and reproductive system of Earthworm

4. Mounting

Spicules and gemmules of Sponge, *Obelia* colony, *Nereis* parapodia, Jaws of Leech, Nephridia of Leech.

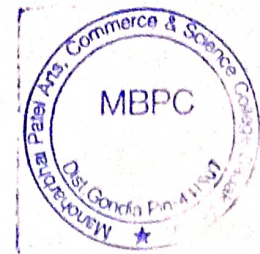
Section B: Environmental Biology

1. Estimation of dissolved oxygen of water
2. Estimation of free CO₂ of water
3. Estimation of pH of water sample
4. Estimation of total hardness of water
5. Study of pond ecosystem - Producers, consumers and decomposers
6. Quantitative analysis of plankton

Visit to a National park and Sanctuary

Distribution of Marks –

	Total Marks	30
i. Identification and Comment on Spots (4 Museum specimens + 1 Env. bio. spot + 3 slides)	08	
ii. Dissection -	08	
iii. Environmental biology experiment	04	
iv. Permanent stained preparation	03	
v. Submission of certified practical record	03	
vi. Submission of Slides & tour diary	02	
vii. Viva voce	02	



Semester – II
Paper – III : Life and Diversity of Animals – Nonchordates
(Arthropoda to Hemichordata)

Unit – I **(9 Periods)**

- 1.1. **Arthropoda** : General characters and classification up to classes
- 1.2. **Cockroach** : Mouth parts, digestive system and reproductive system
- 1.3. **Insects as Vectors** : Mosquito, Housefly, Sandfly, Tse-Tse fly
- 1.4. **Study of crustacean larvae** : Nauplius, Zoea and Megalopa; **Social behavior in honey bees**

Unit – II **(9 Periods)**

- 2.1 **Mollusca** : General characters and classification up to classes
- 2.2 **Pila** : Morphology, digestive, respiratory and reproductive system
- 2.3 **Pearl formation in Mollusca**
- 2.4 **Molluscan larvae** : Glochidium and Veliger

Unit – III **(9 Periods)**

- 3.1 **Echinodermata** : General characters and classification up to classes
- 3.2 **Asterias** : External features and digestive system
- 3.3 Water vascular system and locomotion in Starfish
- 3.4 **Echinoderm larvae** : Bipinnaria and Auricularia

Unit – IV **(9 Periods)**

- 4.1 **Hemichordata** : General characters and phylogeny
- 4.2 **Balanoglossus** : External features and digestive system
- 4.3 Reproduction in *Balanoglossus* , Tornaria larva
- 4.4 Affinities of *Balanoglossus*

Semester – II
Paper – IV: Cell Biology

Unit – I **(9 Periods)**

- 1.1 **Ultrastructure of prokaryotic and eukaryotic cell**
- 1.2 **Plasma membrane: Structure- Fluid Mosaic Model and functions**
- 1.3 **Endoplasmic reticulum: Types, ultrastructure and functions**
- 1.4 **Golgi complex: Ultrastructure and functions**

Unit – II **(9 Periods)**

- 2.1 **Ultrastructure of mitochondria**
- 2.2 **Oxidative phosphorylation – Glycolysis and Krebs's cycle**
- 2.3 **Electron Transport Chain and terminal oxidation**
- 2.4 **Lysosome: Structure, polymorphism and functions**



Unit – III

(9 Periods)

- 3.1 Nucleus: Ultrastructure of nuclear membrane
- 3.2 Structure and functions of nucleolus
- 3.3 Chromosome: Structure and types, structure of nucleosome
- 3.4 Giant chromosomes: Lamp-brush and polytene chromosome

Unit - IV

(9 Periods)

- 4.1 Ribosome: Structure, types, Lake's model and functions
- 4.2 Somatic cell division: Cell cycle and Mitosis
- 4.3 Meiosis (different phases and significance), synaptonemal complex
- 4.4 Cellular ageing and cell death, Elementary idea of cancer and its causative agents

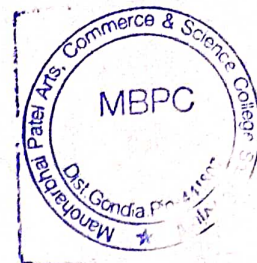
Semester – II

PRACTICAL – II (Based on Paper – III and IV)

Section A : Life and Diversity of Animals – Nonchordates (Arthropoda to Hemichordata) & Section B: Cell Biology

Section – A : Life and Diversity of Animals – Nonchordates (Arthropoda to Hemichordata)

1. **Study of museum specimens** (Classification of animals up to orders)
 - I. Arthropoda : *Peripatus, Cyclops, Daphnia, Lepas, Sacculina, Limulus, Crab, Scolopendra, Julus, Dragonfly, Grasshopper, Moth*
 - II. Mollusca : *Chiton, Dentalium, Aplysia, Pila, Mytilus, Loligo, Sepia, Octopus*
 - III. Echinodermata : *Asterias, Ophiothrix, Holothuria, Antedon, Echinus*
 - IV. Hemichordata : *Balanoglossus, Saccoglossus*
2. **Study of permanent slides-**
Nauplius, Zoea and Megalopa larva of Arthropoda, Veliger and Glochidium larva of Mollusca, T.S. of arm of star fish, Bipinnaria and Auricularia larva, T.S. *Balanoglossus* through collar and proboscis, Tornaria larva
3. **Dissection -**
 - I. Digestive system of Cockroach
 - II. Reproductive system of Cockroach
 - III. Nervous system of *Pila*
4. **Mounting-**
Crustacean larvae and plankton; Mouth parts, trachea and salivary gland of Cockroach; Gill lamella, osphradium and radulla of *Pila*



Section B: Cell Biology

1. Study of pictures of ultra structure of prokaryotic cell & eukaryotic cell
2. Study of osmosis in human RBCs (hypotonic, hypertonic and isotonic medium)
3. Demonstration of mitotic cell division in onion root tips by squash method
4. Demonstration of meiosis in *Tradescantia bud*/ Grasshopper testis by squash method
5. Demonstration of salivary gland chromosome in Chironomous larva
6. Demonstration of mitochondria in buccal epithelium/ lip mucosa by Janus Green-B method
7. Use of ocular micrometer and measurement of micro objects
8. Demonstration of Barr body in blood smear

Distribution of Marks –


Total Marks 30

i. Identification and Comment on Spots (5 Museum specimens + 3 slides)	08
ii. Dissection -	08
iii. Cell biology experiment	04
iv. Permanent stained preparation	03
v. Submission of certified practical record	03
vi. Submission of Slides	02
vii. Viva voce	02

List of Recommended Books : (For Semester – I & II)

Life and Diversity of Animals – Non Chordates

1. Barnes – **Invertebrate Zoology (Holt-Saunders international)** Philadelphia, USA
2. Barradaile L.A. & Potts F.A. – **The Invertebrate**
3. Nigam – **Biology of Nonchordates**
4. Kotpal, Agrawal & Khetrpal – **Modern Text Book of Zoology - Invertebrates**, Rastogi Publication, Meerut
5. Puranik P.G. & Thakur R.S. – **Invertebrate Zoology**
6. Majupuria T.C. – **Invertebrate Zoology**
7. Dhami & Dhami – **Invertebrate Zoology**
8. Parker & Hashwell, **Textbook of Zoology Vol. I (Invertebrates)** A.Z.T.B.S. Publishers & Distributors, New Delhi
9. Dr. S.S. Lal **Practical Zoology Invertebrates 9th edition**, Rastogi Publication Meerut
10. EJW Barrington– **Invertebrate Structure and Function** ELBS III Edition

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11. R.L. Kotpal – Phylum Protozoa to Echinodermata (series), Rastogi and Publication, Meerut
 12. Parker J. and Haswell W. – Text Book of Zoology, ELBS Edition
 13. Vidyarthi – Text Book of Zoology, Agrasia Publishers, Agra
 14. Jordan E.L. and Verma P.S. – Chordate Zoology, S. Chand and Co., New Delhi
 15. Ayer E. – Manual of Zoology
 16. M.D. Bhatia – The Indian Zoological Memories – Leech
 17. Beni Prasad – The Indian Zoological Memories – Pila
 18. P. K. Gupta – Vermicomposting for Sustainable Agriculture, Agrobios India Ltd
 19. A manual of Practical Zoology Invertebrates – P. S. Verma

Environmental Biology

1. Ashthana D.K. – Environmental Problem & Solution
2. Agrawal K.C. – Environmental Biology
3. Agrawal K.C. - Biodiversity
4. Mukharjee – Environmental Biology
5. S. Arora – Fundamentals of Environmental Biology
6. Sharma – Ecology & Environmental Biology
7. Verma P.S. & Agrawal V.K. – Environmental Biology, S. Chand.
8. Trivedi & Rao – Air Pollution
9. Chapman & Reiss – Ecology-Principles and Applications, Cambridge
10. Chatterjee B – Environmental Laws-Implementation and Problems
11. Sharma P.D. – Environmental Biology, Rastogi Publication, Meerut
12. Trivedi R.K. – Hand Book of Environmental Laws, Rules, Guidelines, Compliances and Standards, Enviromedia
13. Odum E.P. and Barret – Fundamentals of Ecology, Thomson
14. Smith R.L. – Ecology and Field Biology, Harper Collins
15. D.N. Saxena – Environmental Biology, Studium Press (India)
16. Davis – Behavioral Ecology
17. Kumar and Asija – Biodiversity – Principle of Conservation
18. Rao and Rao – Air Pollution
19. S. Satyanarayan, S. B. Zade, S.R. Sitre and P.U. Meshram – A Text Book of Environmental Studies, Allied publisher (India)
20. Smitz – Introduction to Water Pollution
21. N.S. Subrahmanyam A V.S.S. Sambamurthy – Ecology

Cell Biology

1. C.B. Powar, Cell Biology – Himalaya Publication, New Delhi
2. Dr. S.P. Singh, Dr. B.S. Tomar – Cell Biology 9th revised edition, Rastogi Publication, Meerut
3. Gupta P.K. – Cell and Molecular Biology, Rastogi Publication, Meerut



4. Veer Bala Rastogi – **Introduction to Cell Biology**, Rastogi Publication, Meerut
5. Gerald Karp – **Cell and Molecular Biology-Concepts and Experiments**, John Wiley, 2007
6. De-Robertis – **Cell Biology**
7. Verma and Agrawal – **Concepts of Cell Biology**
8. Dowben – **Cell Biology**
9. Witt – **Biology of Cell**
10. Ambrose and Eastyr – **Cell Biology**

Semester – III

Paper – V : Life and Diversity of Animals - Chordates (Protochordata to Amphibia)

Unit – I (9 Periods)

- 1.1 **Protochordata** : General characters and classification up to order
- 1.2 **Herdmania** : Structure, digestive system, ascidian tadpole and retrogressive metamorphosis
- 1.3 **Amphioxus** : Structure, digestive system, circulatory system, sense organs and protonephridia
- 1.4 **Agnatha** : General characters of Cyclostomata (*Petromyzon* and *Myxine*)

Unit – II (9 Periods)

- 2.1 **Pisces** : Salient features of Chondrichthyes and Osteichthyes, Origin of paired fins in fishes
- 2.2 Migration and Accessory respiratory organs in fishes
- 2.3 **Amphibia** : General characters and classification up to order
- 2.4 Parental care and Neotony in Amphibia

Unit – III (9 Periods)

- 3.1 **Gametogenesis and type of eggs**
- 3.2 **Fertilization of egg**
- 3.3 **Post fertilization development of fish**
- 3.4 **Types of scales of fishes, Development of placoid scales**

Unit – IV (9 Periods)

- 4.1 **Frog Embryology - Cleavage , blastulation and gastrulation**
- 4.2 **Fate map, Morphogenetic movements in gastrula of frog**
- 4.3 **Development of respiratory organs in frog**
- 4.4 **Development of Aortic arches of frog**



Semester – III
Paper – VI : Genetics

Unit – I

(9 Periods)

- 1.1 Mendelian Principles- Dominant recessive relationships, Mendelian laws
- 1.2 Interaction of genes- Epistasis - dominant and recessive, codominance, incomplete dominance
- 1.3 Quantitative genetics – Polygenic traits, inbreeding and outbreeding, hybrid vigor
- 1.4 Extracellular genome – Presence and functions of mitochondrial DNA, plasmids

Unit – II

(9 Periods)

- 2.1 Cytoplasmic inheritance- Kappa particles in *Paramecium*, CO₂ sensitivity in *Drosophila*, milk factor in mice
- 2.2 Linkage and crossing over – Basic concepts of linkage, types and theories
- 2.3 Concepts of genes – Cistron, muton and recon
- 2.4 Genetic disorders in human beings – Haemoglobin disorders – Thalassemia and Sickle cell anemia. Metabolic disorder: Phenylketonurea

Unit – III

(9 Periods)

- 3.1 Sex determination – ZZ, XY, XO, ZW pattern, Sex determination in *Drosophila* – Genic balance theory, Environmental sex determination in *Bonellia*
- 3.2 Chromosomal aberrations: addition, deletion, duplication and inversion
- 3.3 Gene mutations- Spontaneous and induced mutations, mutagenic agents
- 3.4 Disorders related to chromosomal number- Turner syndrome, Klinefelter syndrome and Down syndrome

Unit – IV

(9 Periods)

- 4.1 Lethal genes – Concepts and consequences
- 4.2 Population genetics: Basic concepts in population genetics, Hardy Weinberg equilibrium and its significance
- 4.3 Genetic counseling – Introduction, purpose, hereditary diseases and disorders
- 4.4 Applied genetics - DNA fingerprinting, amniocentesis, sperm banks, karyotyping



Semester – III

PRACTICAL – III (Based on Paper – V and VI)

Section A : Life and Diversity of Animals – Chordates (Protochordata to Amphibia)
& Section B : Genetics

Section A : Life and Diversity of Animals – Chordates (Protochordata to Amphibia)

1. Identification, classification , distinguishing characters and adaptive features of
 - I. Urochordata : *Herdmania, Salpa, Dollolum*
 - II. Cephalochordata : *Amphioxus*
 - III. Cyclostomata : *Petromyzon, Myxine*
 - IV. Pisces : *Pristis, Torpedo, Notopterus, Exocoetus, Clarius, Ophiocephalus, Catla, Rohu, Mrigal*
 - V. Amphibia : *Ichthyophis ,Bufo, Salamander*
2. Dissection of the locally available culturable fish-
 - i. Digestive system
 - ii. Reproductive system
 - iii. Brain
3. Developmental Biology –
Study of permanent slides of Frog embryology: T.S. Blastula, T.S. Gastrula, T.S. Neurula, T.S. tadpole passing through internal and external gill stage
4. Study of permanent slides-
Amphioxus through Pharynx, Intestine, Gonad and Caudal region; V.S. skin, T.S. Testis, T.S. Ovary of Frog; T.S. Stomach, T.S. Intestine, T.S. Liver of fish
5. Permanent stained preparation:
Fish scales – Placoid, cycloid, ctenoid; Hyaline cartilage and striated muscle

Section B : Genetics –

1. Study of monohybrid and dihybrid ratio
2. Study of normal human karyotype (Normal male and female)
3. Study of characters and karyotypes of Syndrome like Down, Klinefelter & Turner
4. Study of the genetic traits (Hardy Weinberg law) in human being (Tongue rolling, ear lobe, PTC taster/ non taster)



Distribution of Marks –	Total Marks	30
i. Dissection	06	
ii. Identification and comment on spots (4 Museum specimens, 4 slides – 2 from frog embryology and 2 from histology)	08	
iii. Genetics experiment	03	
iv. Genetics study – Karyotypes , syndromes, genetic traits in man	03	
v. Permanent stained preparation	03	
vi. Submission of certified practical record	03	
vii. Submission of slides	02	
viii. Viva voce	02	

Semester – IV

**Paper - VII : Life and Diversity of Animals – Chordates
(Reptilia, Aves and Mammals)**

Unit – I (9 Periods)

- 1.1 **Reptilia**- Classification based on temporal vacuities
- 1.2 **Poison apparatus, biting mechanism , snake venom and its importance**
- 1.3 **Aves** – Comparison of Ratitae and Caranitae, Flight adaptations and migration
- 1.4 **Mammals** – General characters of Prototheria, Metatheria and Eutheria

Unit –II (9 Periods)

- 2.1 **Modern theories of evolution : Darwinism and Neo-Darwinism**
- 2.2 **Adaptations – Cursorial, Aquatic, Terrestrial, Fossorial and Volant**
- 2.3 Introduction to genetic basis of evolution – Species Deme, Variation
- 2.4 **Races in Man (Caucasoid, Negroid, Mongoloid and Australoid)**

Unit –III (9 Periods)

- 3.1 **Comparative account of aortic arches and heart in Reptiles, Birds and Mammals**
- 3.2 **Structure of hen's egg**
- 3.3 Development of chick up to primitive streak stage
- 3.4 Development of extra embryonic membranes in chick and functions



Unit –IV

(9 Periods)

- 4.1 Blastocyst and implantation in Mammals; Types of placenta on the basis of morphological and histological structure; functions of placenta
- 4.2 Stem cells : Sources, types and their use in human welfare
- 4.3 Biological clock : Diurnal and rhythmic behavior in birds and mammals
- 4.4 Role of pheromones in reproductive behavior

Semester – IV

Paper - VIII : Molecular Biology and Immunology

Unit - I

(9 Periods)

- 1.1 DNA: Structure of DNA, forms of DNA, properties of DNA, DNA as a genetic material
- 1.2 RNA: Structure of RNA, types of RNA, RNA as a genetic material
- 1.3 Prokaryotic and eukaryotic gene structure
- 1.4 **Recombination in Bacteria:** Bacterial transformation – Griffith's experiment, Conjugation in bacteria, transduction

Unit - II

(9 Periods)

- 2.1 **DNA replication:** Semiconservative model, Meselson Stahl experiments. Process of replication – origin of replication, concept of replication, directionality of replication
- 2.2 **Genetic code:** Characteristics of genetic code, Wobble hypothesis
- 2.3 **Protein synthesis:** Transcription mechanism – Initiation, elongation and termination of transcription. Translation – activation of amino acids, transfer of activated amino acids to tRNA, Initiation, elongation and termination of polypeptide chain; inhibitors of protein synthesis
- 2.4 **Gene regulation models** - Lac operon and tryptophan operon

Unit - III

(9 Periods)

- 3.1 **Concepts of immunity** – Innate and acquired immunity, organs of the immune system
- 3.2 **Antigen** - Structure, diversity, functions and types of antigen
- 3.3 **Antibody**- Structure, types and functions
- 3.4 **Antigen-antibody interaction** – Precipitation and agglutination

Unit - IV

(9 Periods)

- 4.1 **Types of immune response:** B cell response (antibody mediated), T cell response (cell mediated)

- 4.2 Complement system: Basic concepts of complement cascades, classical, alternative and MBL pathways, Implications of complement system in immune defense
- 4.3 Cytokines- General account on cytokines, Cytokine related diseases
- 4.4 Autoimmunity and Immunodeficiencies- Autoimmune diseases and their treatment, AIDS and other Immunodeficiencies

Semester – IV

PRACTICAL – IV (Based on Paper – VII and VIII)

Section A : Life and Diversity of Animals – Chordates

(Reptilia, Aves and Mammals) & Section B: (Molecular Biology and Immunology)

Section A : Life and Diversity of Animals – Chordates (Reptilia, Aves, Mammals, Embryology)

1. Identification, classification, distinguishing characters and adaptive features of –
 - i. Reptilia : *Chameleon, Varanus, Pharynosoma, Draco, Tortoise, Cobra, Krait, Russel's viper, Sea snake*
 - ii. Birds : *Owl, Woodpecker, Kingfisher, Kite, Duck, Parrot*
 - iii. Mammals : *Squirrel, Mongoose, Bat, Loris, Rabbit*

2. Study of skeleton of Rabbit and Fowl

3. Developmental Biology –

Study of permanent slides of chick embryology W.M.: 18 hrs, 24 hrs, 30 hrs, 36 hrs, 72hrs

4. Study of permanent slides- V.S. skin of Bird, Filoplume of bird, V.S. Skin of Mammal

Section B: Molecular Biology and Immunology

Molecular Biology :

1. Staining of DNA and RNA in blood smear of fish/human by methyl green pyronin technique
2. Introduction to basic laboratory instruments and equipments- Autoclave, Centrifuge, pH meter, Micropipettes, Digital balance, Homogenizer, Electrophoresis apparatus; Molar and normal solutions calculations
3. Isolation of DNA (Genomic DNA from any available source) by phenol extraction method

Immunology :

1. Determination of blood groups (ABO and Rh) in humans
2. Antigen – Antibody interaction by double diffusion method (Ouchterlony)
3. Study of histological slides of organs of immune system – Thymus, Lymph nodes and Spleen



Distribution of Marks –

Total Marks 30

i.	Identification and comment on spots- (3 Museum specimens, 5 slides – 2 from chick embryology; from histology and 1 from immunology, 2 bones)	10
ii.	Molecular biology experiment	08
iii.	Immunology experiment	07
iv.	Submission of certified practical record	03
v.	Viva voce	02

List of Recommended Books: (For Semester - III and IV)

Life and Diversity of Animals -Chordates

1. T. B. of Zoology vol II – Parker & Haswell
2. T. B. of Vertebrate Zoology -S. N. Prasad
3. Chordate Zoology –E. L. Jordan and P. S. Verma
4. Vertebrate Zoology – Vishwanath
5. Zoology of Chordates – Nigam H. C.
6. Phylum: Chordata – Newman H.H.
7. Biology of Vertebrates –Walter & Sayles
8. The Vertebrate Body – Romer A. S.
9. Comparative Anatomy of the Vertebrates – Kingslay J. D.
10. The Biology of Amphibia – Noble G. K.
11. Snakes of India – Gharpura K. G.
12. Life of Mammals – Young J.Z.
13. Vertebrates – Kotpal R. L.
14. Introduction to Chordates – Majupuria T.C.
15. Vertebrate Zoology – Dhami & Dhami
16. T. B. Vertebrate Zoology – Agrawal
17. Protochordates – Chatterjee & Pandey
18. Protochordates – Bhatia
19. T. B. of Chordates – Bhamrah and Juneja
20. Chordate Anatomy – Arora M.P.
21. The Chordates – Alexander.
22. T. B. of Animal Embryology – Puranik
23. T. B. of Chordate Embryology – Dalella & Verma
24. T. B. of Embryology – Sandhu
25. T. B. of Embryology – Armugam



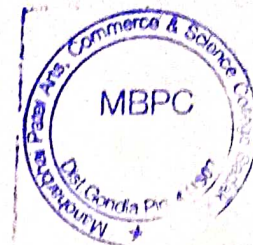
26. Early Embryology of Chick – Pattern
27. Chordate Embryology – Verma & Agrawal
28. Chordate Embryology – Tomar
29. The Frog – Rugh
30. An Introduction to Embryology – Balinsky
31. Comparative Vertebrate Embryology – Mcwen
32. Developmental Biology – S. C. Goel
33. Introduction to Embryology – Berry
34. Organic Evolution – N. Armugam
35. Evolution – M. P. Arora
36. Animal Behavior – Smith and Hill
37. Animal Behavior – Arora
38. Animal Behavior – Gundevia and Singh
39. Practical Zoology Vertebrates – Dr. S. S. Lal, Rastogi Publication, Meerut
40. A manual of Practical Zoology Vertebrates – P. S. Verma

Genetics

1. Genetics & Genetic Engineering – Joshi
2. Genetic Engineering & its applications – Joshi
3. Genetics – Gardener
4. Genetics – Winchester
5. Genetics – Gupta
6. Principles of Genetics – Sinnot Dunn, Dobzansy
7. Genetics – Ahluwalia
8. Genetics – Sarin
9. Elementary Genetics – Singleton
10. General Genetics – SRb, Owen & Edger
11. Genetics – Alenberg
12. Foundation of Genetics – Pai
13. Genetics - Stickberger
14. T. B. of Genetics- Veerbala Rastogi
15. Gene VI by Benjamin Lewis, Oxford press
16. Gene VIII by Benjamin Lewis, Oxford press
17. Genetics Vol. I and II by Pawar C. B., Himalaya publication

Molecular Biology

1. Cell and Molecular Biology by De Robertis- E. D. P., I. S. E. publication
2. Molecular Biology by Turner P. C. and Mc Lennan , Viva Books Pvt. Ltd
3. Advanced Molecular Biology by Twyman R. M., Viva Books Pvt. Ltd
4. Molecular Biology by Freifelder D., narosa publication House



5. Molecular Biology of Gene by Watson J. D. et. al., Benjamin publication
6. Molecular Cell Biology by Darnell J. Scientific American Books USA
7. Molecular Biology of the Cell by Alberts B., Bray D. Lewis J., Garland publishing Inc
8. Essentials of Molecular Biology by Freifelder D., narosa publication House
9. Molecular Cell Biology by Lodish H., Berk A., Zipursky S. L., Matsudaira P. Baltimore D. and Darnell J., W. H. Freeman and Co.
10. The Cell: Molecular Approach by Cooper G. M.
11. Molecular Biology by Upadhyay A and Upadhyay K. Himalaya publication
12. Molecular cell Biology by Bamrath
13. Cell and Molecular Biology by P.K. Gupta

Immunology

1. Immunology – R. C. Kubly et al.
2. Immunology - Tizzard
3. Immunology -. Roitt, Brostoff and D. Male
4. Immunology - Abbas

Semester – V

Paper - IX : General Mammalian Physiology –I

Unit – I : Enzymes

(9 Periods)

- 1.1 Enzymes – Distribution and chemical nature of enzymes
- 1.2 General properties of enzymes
- 1.3 Classification of enzymes
- 1.4 Factors affecting enzyme activity

Unit-II : Nutrition and Digestion

(9 Periods)

- 2.1 Structure and functions of digestive glands - (Salivary, Gastric, Intestinal, Liver and Pancreas)
- 2.2 Gastrointestinal hormones
- 2.3 Digestion and absorption of proteins, carbohydrates and lipids.
- 2.4 Vitamins- Fat soluble and water soluble vitamins; Sources, deficiency and diseases

Unit-III :Respiration

(9 Periods)

- 3.1 Respiratory pigments - Types , distribution and properties
- 3.2 Mechanism of Respiration
- 3.3 Transport of O₂ and CO₂
- 3.4 Respiratory disorders and effects of smoking

Unit-IV : Circulation

(9 Periods)

- 4.1 Composition and functions of blood
- 4.2 Blood clotting – Intrinsic and extrinsic factors, blood groups and Rh factor
- 4.3 Cardiac cycle
- 4.4 E.C.G. and Blood pressure

Semester – V

Paper –X : Applied Zoology-I

(Aquaculture and Economic Entomology)

Unit –I : Aquaculture

(9 Periods)

- 1.1 Site selection and construction ,Pre stocking and post stocking management of nursery, rearing and stocking ponds
- 1.2 Breeding of fishes by bund and Chinese hatcheries. Induced breeding by hypophysation. New generation drugs in induced breeding
- 1.3 Brief study of freshwater aquaculture system – Polyculture, cage culture, sewage fed fish culture, integrated fish farming
- 1.4 Fish products and byproducts, Fish preservation

Unit-II

(9 Periods)

- 2.1 Prawn culture and Pearl culture
- 2.2 Fabrication and setting up of aquarium and its maintenance
- 2.3 Breeding of aquarium fishes – Live bearers and egg layers
- 2.4 Diseases caused by fungi, bacteria, protozoa and helminthes

Unit-III : Economic Entomology (Methods of pest control)

(9 Periods)

- 3.1 Chemical control : Insecticides - Pyrethroids, carbamate and HCN – mode of action, merits and demerits
- 3.2 Biological control – Biological agents – predators and parasites; merits and demerits
- 3.3 Crop pest: Life cycle, damage and control of
 - I. Cotton spotted boll worm -*Earias vitella*
 - II. Stored grain pest- Rice Weevil, *Sitophilus oryzae*
- 3.4 Animal pest: Life cycle, damage and control of –
 - I. House fly – *Musca nebulo*
 - II. Stable fly – *Stomoxys calcitrans*



Unit-IV : Economic Entomology (Industrial entomology)

(9 Periods)

- 4.1 Sericulture- Types of Silkworm. Life cycle and rearing of mulberry silkworm, *Bombyx mori*
- 4.2 Life cycle and rearing of non mulberry silkworm (Tasar), *Antheraea mylitta* ; Brief idea of cocoon processing for silk fabric - cocoon boiling, reeling, rereeling, winding, doubling, twisting and weaving
- 4.3 Apiculture – Types of honey bees. Life cycle, culture, movable frame hive, bee product and its economic importance
- 4.4 Lac culture – Lac insect, *Laccifer lacca* - Life cycle, Lac processing, Lac products and Economic Importance

Semester – V

PRACTICAL – V (Based on Paper IX and X)

Section A: General Mammalian Physiology - I and Section B : Applied Zoology –I (Aquaculture and Economic Entomology)

Section A: General Mammalian Physiology – I

1. Detection of action of salivary amylase on starch
2. Detection of carbohydrates, proteins and Lipids
3. Detection of Vitamin A and Vitamin C
4. Measurement of lung capacity
5. Preparation Haemin crystal
6. Total count of WBC and RBC
7. Study of histological slides of Mammal – T.S. salivary gland, T.S. stomach, T.S. intestine, T.S. pancreas, T.S. liver and T.S. lung

Section B : Applied Zoology –I (Aquaculture and Economic Entomology)

Aquaculture:

1. Collection and identification of fishes
 - a. Freshwater edible fishes – catla, rohu, mrigal, grass carp, silver carp, *Cyprinus carpio*, *Ophiocephalous*, *Clarius*, *Heteropneustes*, *Wallago*, *Mystus*,
 - b. Aquarium fishes – Gold fish, Molly, Sword tail, Kissing Gourami
2. Dissection:
 - a. Digestive, reproductive and brain with pituitary of culturable fishes
 - b. Gonosomatic index
3. Fabrication and setting up of aquarium
4. Mounting: Scales of fishes, zooplankton

Economic Entomology:

1. Study of Insect Pest

- a. Agriculture pest – Grasshopper , Red Cotton bug, Gram pod borer, Cotton pink bollworm, Cotton spotted bollworm
- b. Medical pest – House fly, Mosquito , *Pediculus humanus*
- c. Veterinary pest – Stable fly , Dog tick, Bird louse
- d. Stored grain pest – Stored grain weevil, Flour moth
- e. Useful Insects – Honeybee, Silk moth, Lac insect, Dragon fly, Lady bird beetle

2. Mounting : Mouth parts, Legs, wings of any insects and sting of Honeybee
3. Visit to – Fish farm, Apiculture, Sericulture, Agricultural educational centre, Sea shore and Lake

Distribution of Marks	Total Marks 30
i. Physiology experiment	05
ii. Identification and comment on spots (2 from Mammalian histology, 3 from Aquaculture and 3 from Economic Entomology)	08
iii. Dissection of fish / Gonosomatic index	05
iv. Permanent stained preparation	02
v. Submission ,collection and study tour report	02
vi. Submission of certified practical record	03
vii. Viva voce	05

Semester – VI

Paper -XI : General Mammalian Physiology - II

Unit –I : Nerve and Muscle Physiology

(9 Periods)

- 1.1 Types of neurons, E.M. structure of neuron
- 1.2 Conduction of nerve impulse
- 1.3 Ultrastructure of striated muscle, Sliding filament theory of muscle contraction
- 1.4 Properties of muscles (Twitch, Tetanus, Tonus, Summation, All or None Principle, Muscle fatigue)



Unit-II : Excretion

(9 Periods)

- 2.1 Structure of uriniferous tubule
- 2.2 Mechanism of urine formation
- 2.3 Counter – current mechanism
- 2.4 Normal and abnormal constituents of urine; Elementary idea of dialysis

Unit-III : Endocrinology

(9 Periods)

- 3.1 Structure and functions of pituitary gland
- 3.2 Structure and functions of thyroid and parathyroid gland
- 3.3 Structure and functions of adrenal gland
- 3.4 Structure and functions of pineal gland

Unit-IV : Reproduction

(9 Periods)

- 4.1 Oestrous and menstrual cycle
- 4.2 Male and female sex hormones
- 4.3 Causes of infertility in male and female
- 4.4 Contraceptives – Mechanical and hormonal ; *In-vitro* fertilization

Semester - VI

Paper - XII : Applied Zoology –II

(Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)

Unit –I : Biotechniques

(9 Periods)

- 1.1 Concepts of sterilization: Filtration, autoclaving, dry heat sterilization, wet sterilization and radiation
- 1.2 Separation of biomolecules: Centrifugation (Sedimentation, density gradient); Chromatography (Elementary idea of thin layer, gel filtration and ion exchange - Principles and applications)
- 1.3 Electrophoresis: Agarose gel electrophoresis, SDS-PAGE
- 1.4 Principles of colorimeter and spectrophotometers

Unit-II : Microtechnique

(9 Periods)

- 2.1 Fixation, dehydration, clearing, embedding & section cutting
- 2.2 Difficulties encountered during section cutting (causes and remedies)
- 2.3 Double staining with Haematoxylin and Eosin
- 2.4 Histochemical staining techniques for carbohydrates (Periodic acid schiff), proteins (Mercury-bromophenol blue) and lipids (Sudan black-B)

(9 Periods)

Unit-III : Biotechnology

- 3.1 Basic concepts in recombinant DNA technology, Gene isolation method- Shotgun cloning
- 3.2 Isolation of gene- DNA manipulation enzymes: Nucleases, ligases, polymerases
- 3.3 Basic concepts of cloning vectors and splicing : Insertion of DNA and ligation using blunt ends, cohesive ends, Cloning vectors
- 3.4 Application of biotechnology: Insulin and vaccine production

(9 Periods)

Unit-IV : Bioinformatics and Biostatistics

- 4.1 Bioinformatics: Definition, Basic concepts in bioinformatics, importance and role of bioinformatics in life sciences
- 4.2 Bioinformatics databases- introduction, types of databases
- 4.3 Nucleotide sequence databases, Elementary idea of protein databases
- 4.4 Biostatistics – Tabulation of data, presentation of data, sampling errors, mean, mode, median, probability, standard error and standard deviation

Semester – VI

PRACTICAL – VI (Based on Paper XI and XII)

**(Section A: General Mammalian Physiology – II and Section B: Applied Zoology – II ,
Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)**

Section A : General Mammalian Physiology – II

1. Detection of urea, albumin, sugar and creatin in urine
2. Sperm count in a given semen sample
3. **Dissection:** Endocrine glands of Culturable fishes
4. **Study of histological slides of Mammal** – T.S. kidney, pituitary, thyroid, adrenal, testis, ovary; uterus, placenta, medulated and non medulated nerve fibre, smooth and striated muscle

**Section B : Applied Zoology – II (Biotechniques, Microtechnique, Biotechnology,
Bioinformatics and Biostatistics)**

1. Separation of amino acids by paper chromatography
2. Separation of proteins by electrophoresis technique
3. Block preparation and section cutting
4. Double staining method (H-E)
5. Demonstration of carbohydrates, proteins and lipids by histochemical methods
6. Determination of mean, mode, median from a given biostatistical data and/or graphical representation of the data using computers



7. Use of internet for survey of literature using protein and nucleotide databases(NCBI)
8. Use of softwares like Microsoft offices
9. Visit to Biotechnology centre to study working principles of different instruments

Distribution of Marks

	Total Marks 30
I. Physiology experiment	05
II. Identification and comments on spots (Mammalian histology 3 spots)	03
III. Microtechnique - Section cutting, spreading and H-E staining of given slide	03
IV. Dissection of fish	05
V. Analysis of given biostatistical data	02
VI. Retrieval of specific literature from given information	02
VII. Submission of slides and study tour report	02
VIII. Submission of certified practical record	03
IX. Viva voce	05

List of Recommended Books: (For Semester V and VI)

Physiology

1. Human Physiology – Chatterjee A. G. vol. I & II
2. Medical Physiology – Gyton
3. T. B. of Animal Physiology – Berry
4. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
5. Animal Physiology – Arora M.P.
6. General and Comparative Physiology – Hoar W. S.
7. T. B. of Animal Physiology – Hurkat and Mathur
8. Animal Physiology – Nahbushan and kodarkar
9. T. B. of Animal Physiology & General Biology – Thakur & Puranik
10. General Endrocrinology – Turner Bagnaro
11. Reproduction and Human welfare – Greep and koblinsky
12. Animal Physiology – Shashtri & Goel
13. Animal Physiology – Verma & Tyagi
14. Human Physiology - Vander and sheman
15. Applied Physiology – Keels, Neils and Joels
16. Animal Physiology – Rastogi S. C.
17. Animal Physiology – Veerbala Rastogi

18. Comparative Vertebrate Endocrinology – Beutley

Aquaculture

1. Wealth of India, Raw Material, Vol. IV – ICAR
2. Fishes of India vol I & II- Day
3. Fish & Fisheries of India – Jhingran
4. Hatchery Manual for Common Indian & Chinese carps – Jhivgan & Pallin
5. Fish Pathology – Roberts
6. Introduction of Fishes – Khanna
7. Fishery Science & Indian Fishes – Khanna
8. Fishery Science & Indian Fisheries – Shrivastava
9. A Manual of F. W. Aquaculture – Santhanam
10. An Aid to Identification of Commercial Fishes of India & Pakistan- Mishra
11. Standard Methods for Examination of Water & Waste Water - APHA
12. Hand Book of Breeding of Major Carps by Pituitary Hormones – S. L. Chonder
13. Principles of Aquaculture – Zade S. B., Khune C. J., Sitre S.R. and Tijare R.V.

Entomology

1. T. B. of Applied Entomology – K. P. Shrivastava
2. T. B. of Agricultural Entomology - II S Pruthi
3. Modern Entomology – D. B. Tembhare (2nd Edition)
4. A Hand Book of Practical Sericulture – Ullar S. R. & Narsimhanna M.N.
5. Destructive and Useful Insects – Metcalf C.L. & Flint W.P.
6. General Text Book of Entomology – Richards O. W. & Davis R. G.
7. Agricultural Pests of India & South East Asia – Atawal A.S.
8. Hand Book of Economic Entomology for South Asia – Ayyar & Ram Krishna.
9. Medical Entomology – Hati A. K.
10. Bee-Keeping in India – Singh S

Biotechnique and Microtechnique

1. Animal Tissue Technique – Humason
2. Histological Technique – Devaenport
3. Microtechnique – Jiwaji & Patki
4. Microtechnique – Wankhede
5. Biophysical Chemistry – Upadhyay, Upadhyay and Nath
6. Techniques in Life Sciences – D. B. Tembhare

Biotechnology

1. Elements of Biotechnology – Gupta
2. T. B. of Biotechnology – Dubey
3. Modern Concept of Biotechnology – Kumar H. D
4. Advances in Biotechnology – Jogdand



5. T. B. of Biotechnology – Chatwal
6. Molecular Biotechnology – Primrose

Bioinformatics and Biostatistics

1. Mount W. 2004. Bioinformatics and Sequence Genome Analysis 2nd Edition CBS Pub. New Delhi.
2. Bergman, N. H. Comparative Genomics. Humana Press Inc. Part of Springer Science+Business Media, 2007.
3. Baxevanis, A. D. Ouellette, B. F. F. 2009. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. John-Wiley and Sons Publications, New York.
4. Campbell A. M. and Heyer, L. J. 2007. Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings.
5. Des Higgins and Willie Taylor 2000. Bioinformatics: Sequence, Structure and Databanks. Oxford University Press.
6. Rashidi H. H. and Buehler 2002. Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
7. Gibas Cynthia and Jambeck P. 2001. Developing Bioinformatics Computer Skills: Shroff Publishers and Distributors Pvt. Ltd. (O'Reilly), Mumbai.

RTM NAGPUR UNIVERSITY, NAGPUR

Semester Pattern Syllabus with Skill Development

For B. Sc. Botany



B. Sc. SEMESTER-I 2020-21 onwards

- PAPER-I : Viruses, Prokaryotes, Algae and Biofertilizers
- PAPER-II : Fungi, Plant-Pathology, Lichen, Bryophyta and Mushroom Cultivation

B. Sc. SEMESTER-II 2020-21 onwards

- PAPER-I : Palaeobotany, Pteridophytes, Gymnosperms and Soil Analysis
- PAPER-II : Morphology of Angiosperms and Floriculture

B. Sc. SEMESTER-III 2021-22 onwards

- PAPER-I : Angiosperm Systematics, Embryology and Indoor Gardening
- PAPER-II : Angiosperm Anatomy and Horticulture

B. Sc. SEMESTER-IV 2021-22 & onwards

- PAPER-I : Cell Biology, Plant Breeding, Evolution and Seed Technology
- PAPER-II : Genetics, Molecular Biology and Plant Nursery

B. Sc. SEMESTER-V 2022-23 & onwards

- PAPER-I : Plant Physiology, Mineral Nutrition and Hydroponics
- PAPER-II : Plant Ecology and Organic Farming

B. Sc. SEMESTER-VI - 2022-23 & onwards

- PAPER-I : Biochemistry, Biotechnology and Herbal Technology
- PAPER-II : Phytogeography, Utilization of plants, Techniques and Pharmacognosy

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For JPAC

Pravin
Alkesh
Dr. Dinkar
Dr. Dinkar
25.12.19
25/12/19
25.12.19



B. Sc. SEMESTER- I
PAPER- I
(Viruses, Prokaryotes, Algae and Biofertilizers)

Unit-I: Virus and Prokaryotes:

1. **Viruses: Nature of viruses (Non-living and living, characteristics), Ultra-structure of TMV, Structure and multiplication of T-4 bacteriophage, Economic importance of viruses.**
2. **Mycoplasma: Properties, Structure and Reproduction.**
3. **Bacteria: General characteristics, Ultrastructure of bacterial cell, Reproduction (Binary Fission and Conjugation), Economic importance of bacteria (with reference to their role in Agriculture and industry).**

Unit-II: Cyanobacteria and Algae:

1. **Cyanobacteria: Cell ultrastructure, Structure of heterocyst, Structure and Reproduction in Nostoc, Economic importance of Cyanobacteria.**
2. **Algae: General characteristics, Classification (Fritsch, 1954), Economic importance of Algae.**

Unit-III: Algae:

Life cycles in Algae: Chara, Vaucheria, Ectocarpus and Batrachospermum.

Unit-IV: Skill Development: Biofertilizers:

1. **Biofertilizers: Definition, scope and importance**
2. **Various microbes used as Biofertilizers**
3. **Commercial production of Biofertilizers: Rhizobium, Azotobacter, PSB (Phosphate Solubilizing Bacteria, e.g. Bacillus polymyxa) and Azolla.**

List of Practical: Paper-I

1. Study of viruses from models/photographs (TMV and T4 bacteriophage).
2. Gram staining of Bacteria, ultra-structure of bacteriophage from TEM photographs.
3. Study of Cyanobacteria: *Nostoc*
4. Study of vegetative and reproductive structures in *Nostoc*
5. Study of Algal genera: *Chara*, *Vaucheria*, *Ectocarpus* and *Batrachospermum*.
6. Identification and characterization of *Rhizobium*, *Azotobacter*, PSB and *Azolla*.

[Handwritten signatures and dates]

B. Sc. SEMESTER- I
PAPER-II
(Fungi, Plant Pathology, Lichens, Bryophyta and Mushroom Cultivation)



Unit-I: Fungi:

1. **Fungi:** General characteristics, Classification (Alexopoulos, 1996), **Economic importance.**
2. Life history of *Albugo*, *Mucor*, *Puccinia* and *Cercospora*.

Unit-II: Plant Pathology and Lichens:

1. **Plant-Pathology:** Host, Pathogen, Symptoms, Causes and control of diseases: Leaf curl of Papaya, Citrus canker and red rot of Sugarcane
2. **Lichens:** Introduction, Types, Reproduction and **Economic importance.**

Unit-III: Bryophyta:

1. Bryophyta: General Characteristics, Classification (Proskauer, 1957), **Economic importance.**
2. Life history of *Marchantia*, *Anthoceros* and *Funaria*.

Unit-IV: Skill Development: Mushroom Cultivation:

1. **Introduction:** **Nutritional and medicinal value of edible mushroom; Poisonous mushroom. Edible mushroom: *Volvariella volvacea*, *Plerotuscitrino pileatus*, *Agaricus bisporus*.**
2. **Technology of Mushroom cultivation: Infrastructure:** Mushroom unit (Thatched house); **Tools:** Polythene bags, vessels, inoculation hook, inoculation loop, low cost stove, sieves, culture rack, water sprayer, tray, medium.
3. **Techniques:** Substrate, preparation of medium and spawn, sterilization, multiplication, bed preparation (Paddy-straw, sugarcane trash, banana leaves)

Note: 1. Developmental stages are not expected
2. Short excursion tour/visit to biofertilizer laboratory or Mushroom cultivation center is expected

List of practical: Paper-II:

1. Study of Fungal genera: *Albugo*, *Mucor*, *Puccinia*, *Cercospora*
2. Study of Lichen: Thallus structure, Types of lichens.
3. Plant pathology: Leaf curl of Papaya, Red rot of Sugarcane, Citrus canker
4. Study of Bryophytes: *Marchantia*, *Anthoceros*, *Funaria*.
5. To study different instruments/tools used in mushroom cultivation.
6. To study method of preparation of spawn.
7. To study preparation of mushroom beds.

BOTANY PRACTICAL EXAMINATION
B. Sc.
SEMESTER-I



TIME: FIVE HOURS

- Q. 1: Gram stain the given bacterial strain/stain the Cyanobacterial material (A) and identify giving reasons. 04 M
- Q. 2: Identify the given Algal material (B). Prepare temporary mount and write identifying characters. 04 M
- Q. 3: Identify the given Fungal material (C). Prepare temporary mount and write identifying characters. 04 M
- Q. 4: Identify the given Bryophytic material (D). Prepare temporary mount and write identifying characters. 04 M
- Q. 5: Spotting: 04 M
(E) Virus/Bacteria (F) Algae/Fungi/Bryophyte (G) Plant pathology 06 M
(H) Lichen (I) Biofertilizers (J) Mushroom cultivation
- Q. 6: Viva-voce. 03 M
- Q. 7: Practical Record and Excursion report. 05 M
-

Suggested readings: B. Sc. Semester I

- Alexopoulos, C. J. and G. W. Min & M. Blackwell, Introductory Mycology, CBS distributors & publishers, Delhi.
- Alexopoulos, C.J. (1962): Introductory Mycology, John Wiley Eastern Pvt. Ltd.
- Alexopoulos, C.J. and Mims C.W. (1979): Introductory Mycology 3rd Edition, John Wiley and Sons, Inc. Wiley, New York.
- Aneja, K.R. (1993): Experimental in Microbiology, Plant Pathology & Tissue Culture, Wiswa Prakashan, New Delhi.
- Barnett, J.H. (1968): Fundamentals of Mycology. The English Language Book Society and Edward Arnold Publication, Limited.
- Bold, H. C. and M. J. Wynne [1978]: Introduction of Algae: Structure and Reproduction (Prentice Hall Of India, Pvt. Ltd)
- Bold, H.C. C.] Alexopoulos and T Delevoryas [1980]: Morphology of Plants and Fungi (Harper and Row Publishers, N.Y.)
- Cavers, F. (1910): The interrelationship of Bryophyta I-IV. New Phytologist.
- Cavers, F. (1911): The interrelationship of Bryophyta VII-IX. New Phytologist.
- Chopra, G. Land D I Yadav [1980]: A text Book of Bryophyta (Arihant Press)
- Chauhan, N. M., Gajre, N. K. and Prajapati, V. P. (2013). Scientific Cultivation of Mushroom, Biotech Books.
- Dube, H. C. [1990] Introduction to Fungi (Vikas Publishing House Pvt. Ltd, Delhi)
- Dube, R.C. and D. K. Maheshwari (1999): A Text Book of microbiology, S.Chand & Co. Ltd.
- Dube, R.C. and D. K. Maheshwari (2000): Practical Microbiology -S.Chand & Co. Ltd.
- Dubey, R. C. and D. K. Maheshwari [1999]: Text Book of Microbiology (S. Chand & Co)
- Eggins, H.O.W and Allsop (1975): The Filamentous Fungi Vol. I Industrial Mycology (Biodegradation and Biodegradation by Fungi) Eds. J.E. Smith and D.R. Berry Edward Arnold, London.



**B. Sc. SEMESTER-II
PAPER-I**

(Palaeobotany, Pteridophytes, Gymnosperms and Soil analysis)

Unit-I: Palaeobotany:

1. Palaeobotany: Definition; fossil and Pseudo-fossil, Importance of fossils.
2. Types of fossils: Compression, Impression, Cast-Mold, Petrification and Amber.
3. Geological time scale: Definition, Outline and brief account of Eras.
4. Fossil leaf: *Glossopteris*, Fructification: *Scutum*.

Unit-II: Pteridophytes:

1. Pteridophyta: General characteristics, Classification (Smith, 1952).
2. Fossil Pteridophyte: *Rhynia*
3. Life history of: *Selaginella* and *Equisetum*.
4. Heterospory and seed habit.
5. Brief account of types of steles

Unit-III: Gymnosperms:

1. Gymnosperms: General characteristics, Classification (Steward, 1982), **Economic Importance**
2. Fossil Gymnosperms: *Cycadeoidea* flower
3. Life cycle of: *Cycas* and *Pinus*.

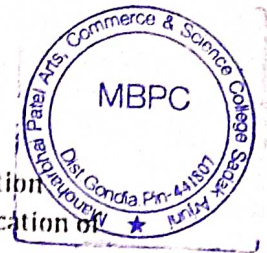
Unit-IV: Skill Development: Soil analysis:

1. **Soil:** Types of soil, method of collection of soil samples.
2. **Physical properties of soil:** Soil texture, soil colour, Water Holding Capacity (WHC), Water Rising Capacity (WRC), Bulk Density (BD) and Porosity (P).
4. Chemical properties of soil: pH, Carbonates as CaCO_3 , Available Nitrogen, Available Phosphorous, Available Potassium.

List of Practical: Paper-I:

1. Fossils: Types (Compression, Impression, Cast-Mold, Petrification); *Glossopteris*, *Rhynia*, *Cycadeoidea*.
2. Study of Pteridophytes: *Selaginella* and *Equisetum*.
3. Study of Gymnosperms: *Cycas* and *Pinus*
4. Types of soil
5. To study Physical properties of soil samples
6. To study Chemical properties of soil samples

B. Sc. SEMESTER-II
PAPER-II
(Morphology of Angiosperms and Floriculture)



Unit-I: Vegetative Morphology:

1. **Root:** Tap root and adventitious root, modification of root for storage and respiration
2. **Stem:** Shape, surface, and nature. Branching (Monopodial and Sympodial), Modification of stem (Runner, Rhizome, Tuber, Bulb)
3. **Leaf:** Typical leaf, Types (Simple and Compound), Types of phyllotaxy, Venation, Modification of leaf (Tendrils, Phyllode)

Unit-II: Reproductive Morphology:

1. **Inflorescence:** Definition, Racemose, Cymose and Special types
2. **Flower:** Definition, Structure of Typical flower, Variation in thalamus (Androphore, Gynophore and Gynandrophore)
3. **Calyx and Corolla:** Cohesion, Forms of corolla and aestivation.
4. **Androecium:** Parts, Cohesion, Adhesion and Fixation.

Unit-III: Carpel and Fruit:

1. **Gynoecium:** Parts, Cohesion, Adhesion and Placentation.
2. **Fruit:** Definition, Pericarp, Types of fruits: Simple (Dehiscent, Schizocarpic, Dry Indehiscent, Fleshy Indehiscent); Aggregate (Etaerio) fruits, Composite Fruits (Sorosis and Syconus).

Unit-IV: Skill Development: Floriculture:

1. **Floriculture:** Definition, commercial aspects.
2. **Methods of cultivation of:** Important cut flowers such as Carnation, Asters, Gerbera, Dahlia, Marigold with reference to soil type, sowing pattern, weather condition, irrigation regime, fertilizers and harvesting.
3. **Diseases and control measures.**

List of practical: Paper-II:

1. Study of different root modifications
2. Study of nature of branching and modification of stem
3. Study of leaf: Types (Simple & Compound), Phyllotaxy, Venation and Modifications.
4. Inflorescence: Types mentioned in theory.
5. Flower: Parts, calyx, corolla, androecium, gynoecium, variation in thalamus.
6. Fruits: Study of different types of fruits
7. Identification and commercial aspect of cut flowers mentioned in theory.

Note: 1. Developmental stages are not expected

2. Short excursion tour/visit to soil testing laboratory or Polyhouse is expected

8m-5

JH

BOTANY PRACTICAL EXAMINATION
B. Sc.
SEMESTER-II



TIME: FIVE HOURS

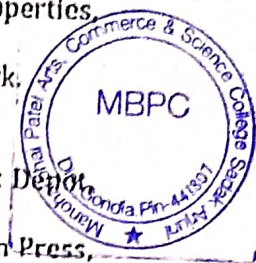
MAX. MARKS: 30

- Q. 1: Identify the given Pteridophytic material (A). Prepare temporary mount and write identifying characters. 04 M
- Q. 2: Identify the given Gymnospermic material (B). Prepare temporary mount and write identifying characters. 04 M
- Q. 3: To study the physical or chemical properties (any two) of given soil sample (C) 03 M
- Q. 4: Describe the given leaf material (D). 03 M
- Q. 5: Describe the given flower (E). 03 M
- Q. 6: Spotting: 05 M
(F) Palaeobotany (G) Pteridophyta (H) Gymnosperm
(I) Fruit (J) Floriculture
- Q. 7: Viva-voce. 03 M
- Q. 8: Practical Record and Excursion report. 05 M

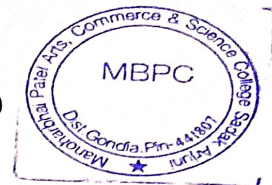
Suggested Readings: B. Sc. Semester-II

- Agashe, S. N. (1995): Palaeobotany, Plants of the past, their evolution, palaeo-environment and application in exploration of fossil fuels. Oxford & IBH publishing company-New Delhi.
- Arnold, C.A. (1947): Introduction to Palaeobotany, Mc-Graw Hill Book Co. Inc., New York and London.
- Beck, C.B.(1976): Current status of the Progymnospermosida, Review of Palaeobotany and Palynology
- Bhatnagar, S. P. and Moitra A. (1996): Gymnosperms. New Age International Limited, New Delhi
- Bierhorst, D.W. [1971]: Morphology of Vascular Plants. Macmillan & Co, N. R.
- Biswas, T. D. and Mukherjee, S. K. (2017), Text Book of Soil Science, Tata McGraw Hill Education, New Delhi (India)
- Bold, H.C. C. J Alexopoulos and T Delevoryas [1980]: Morphology of Plants and Fungi (Harper and Row Publishers, N.Y.)
- Chandra, S. and Surange, K.R.(1979): Revision of the Indian species of Glossopteris, Monograph, Birbal Sahni Institute of Palaeobotany.
- Davis, P. H. and Heywood V. H. (1963): Principals of Angiosperm Taxonomy. Oliver and Boyd London.
- Das, D. K. (2015), Introductory Soil Science, Kalyani Publishers, Lukhnow (India)
- Des R. (2013): Floriculture at glance. Kalyani Publ., New Delhi.
- Ganguly and Kar : College Botany. Vol II (New Central Book Agency, Calcutta)
- Hartmann HT, Kester DE, Davies FT and Geneva RL. (2002): Plant Propagation: Principles and Practices. Prentice Hall India Ltd.
- Kubitzki K. (1990): The Families and genera of vascular plants Pteridophytes and Gymnosperms, Springer Verlag, New York

- Majumdar, S. P. and Singh, R. A. (2000), Analysis of soil: Physical and Chemical properties, Agrobios (India), Jodhpur
- Meyen, S.V. (1987): Fundamentals of Palaeobotany Chapman and Hill, London, New York.
- Nair, P.K.K. (1970): Pollen morphology of Angiosperms. Scholar Publ. House, Lucknow,
- Parihar, N.S. (1995): Essentials of Palaeobotany, Central Book - Allahabad.
- Parihar N.S. (1977): The biology and morphology of the Pteridophytes (Central Book Depot, Allahabad).
- Pichi-Sermolli REG (1959): Pteridophyta in vistas in botany, WB Turrill, ed. (Pergamon Press, London) pp 421-493.
- Prasad, K.N. (1999): An introduction to Palaeobotany, APH Pub.
- Randhawa GS and Mukhopadhyay A. (2004): Floriculture in India. Allied Publishers Pvt. Limited.
- Randhawa G. S. and Mukhopadhyay A (1986): Floriculture in India. Allied Publ., New Delhi.
- Rashid A. (1982): (4th edn) An introduction to pteridophyta (Vikas Publ House Pvt Ltd.)
- Rashid, A. [1989]: An Introduction to Pteridophyta Vikas Publishing House, Pvt. Ltd. New Delhi
- Rowley, J.R. (1967): Fibrils, microtubules and lamellae in Pollen grains. Rev. Palaeobotany. Palynol 3:213-226,
- Sai Prasad, S. V., Ramesh, A., Jat, J. R. and Patidar, C. P. (2016), Soil Science, New Vishal Publication,
- Sharma O.P (1996): Textbook of Pteridophyta (Mac Millan India Ltd, New Delhi)
- Sharma, O. P. [1990]: Text Book of Pteridophyta (McMillan India Ltd.)
- Siddiqui, K.A. (2002): Elements of Palaeobotany, Kitab Mahal, Allahabad.
- Singh, H. (1978): Embryology of Gymnosperms, Encyclopedia of Plant Anatomy X, Gebryder, Bortragear, Berlin.
- Smith G. M. (1955): Cryptogamic Botany-vol. 2 Bryophyta and Pteridophyta (McGraw Hill Book Company, New York)
- Smith, G. M. [1971]: Cryptogamic Botany, vol. II, Bryophytes and Pteridophytes (THM)
- Spicer, R.A. & Thomas, B.A. (1986): Systematic and taxonomic approaches in Palaeobotany. Systematic Association Special Volume.
- Sporne K.R. (1962): The morphology of pteridophyta (Hutchinson Univ. Library, London)
- Sporne, K. R. (1965): The Morphology of Gymnosperms. Hutchinson University Library Press, London.
- Steil W.N. (1939): Apogamy, Apospory and Parthenogenesis in the Pteridophyta, Bot. rev, 5, 433-453.
- Stewart, W. N. and G. W. Rothwell (1993): Paleobotany and the Evolution of Plants, 2nd Edn. Cambridge University Press.
- Swarup Vishnu. (2003): Garden Flowers. National Book Trust
- Vashishtha, B. R. [1992]: Gymnosperm (S. Chand & Co. New Delhi)
- Vashishtha, B. R. [1992]: Pteridophyta (S. Chand & Co. New Delhi)



B. Sc. SEMESTER-III
PAPER-I
(Angiosperm Systematics, Embryology and Indoor Gardening)



Unit-I: Systemic botany:

1. **Origin of Angiosperms:** (Benettitalean theory)
2. **Fossil angiosperms:** Flower (*Sahianthus*); Fruit (*Eulymocarpon*)
3. **Angiosperm Taxonomy:** Floras, Herbarium, Keys (Intended and Bracketed)
4. **Botanical Nomenclature:** Principles (Rank and taxon, Principle of priority)
5. **Modern trends in taxonomy:** Cytotaxonomy (Karyotype), Phytochemistry (Proteins and Flavenoids)

Unit-II: Angiosperm: Classification and Families:

1. **Systems of Classification:** Benthem and Hooker; Engler and Prantl (along with merits - demerits)
2. **Study of families:** Dicot: *Malvaceae, Brassicaceae, Papillonaceae, Asteraceae, - Asclepiadaceae;* Monocot: *Poaceae.*

Unit-III: Embryology:

1. **Pollination:** Types and Significance.
2. **Anther:** T. S. Anther, Microsporogenesis; Structure of pollen grain, Development of male gametophyte.
3. **Ovule:** Types of ovule, Structure of anatropous ovule, Megasporeogenesis, Development of - female gametophyte (*Polygonum* type)
4. **Fertilization:** Double fertilization and triple fusion, Endosperm and its types, Structure of Dicot embryo (*Onagrad*) and Monocot embryo.

Unit-IV: Skill Development: Landscaping and Indoor gardening

1. **Landscaping:** Definition, scope of landscaping (Landscaping at offices, industrial premises, educational institutes and parks)
2. **Indoor gardening:** Brief account of places of house plants, pots and containers; Factors required for growing house plants (Temperature, light, humidity, ventilation, watering, soil, feeding, potting)
3. **Popular house plants: Foliage Plants:** *Coleus blumei, Begonia sp., Ferns: Adiantum sp., Nephrolepis sp., Palms: Chrysalidocarpus lutescens- Areca palm, Howea forsteriana- Kentia palm, Flowering plant: Anthurium sp., Begonia sp., Orchids: Vanda sp., Dendrobium sp.*

List of practical: Paper-I

1. Study of fossil Angiosperms from specimens/slides.
2. Study of dicot and monocot families mentioned in theory syllabus.
3. To calculate percent germination of pollen grains in the given material.
4. Study of structure of anther and pollen grain
5. Study of different types of ovule.
6. Study of dicot and monocot embryos from permanent micro-preparation.
7. Study of different popular house plants.

B. Sc. SEMESTER-III
PAPER-II
(Angiosperm Anatomy and Horticulture)



Unit-I: Anatomy:

1. Tissue: Definition, Characteristics of Meristematic tissue; Classification of meristems (based on origin and position).
2. Simple Permanent Tissue and their functions: Parenchyma, Collenchyma, and Sclerenchyma
3. Complex Permanent Tissue and their functions: Xylem and Phloem
4. Apical meristem of root and shoot: Apical cell theory, Histogen theory, Tunica-Corpus theory, Newman's theory
5. Cambium: Structure, Types and functions.

Unit-II: Primary and Secondary Growth in stem and root:

1. Types of vascular bundles: Radial, Conjoint, Concentric.
2. Normal Primary structure of root: Dicot (*Sunflower*) and Monocot (*Maize*)
3. Normal Primary structure of stem: Dicot (*Sunflower*) and Monocot (*Maize*)
4. Normal secondary growth in dicot stem: *Sunflower*
5. Anomalous Secondary growth in: Dicot stem (*Bignonia*) and Monocot stem (*Dracaena*)

Unit-III: Periderm, growth rings, Sap-heartwood, leaf anatomy:

1. Growth rings: Spring wood and winter wood
2. Sap wood, Heart wood, Tyloses
3. Periderm: Composition, functions and Structures associated with periderm (Lenticel, Bark, Commercial cork)
4. Anatomy of leaf: Dicot (*Nerium*) and Monocot (*Maize*)
5. Senescence and Abscission.

Unit-IV: Skill Development: Horticulture

1. Horticulture: Definition and scope; importance of horticulture, water requirement and irrigation, nutrient management.
2. Methods of propagation of following horticultural crops (propagation by seeds, vegetative propagation, propagation through specialized organs): Rose, *Chrysanthemum*, *Crotons*, Mango, Citrus, Guava, *Lilium*.
3. Technique of Bonsai preparation.

List of Practical: Paper-II:

1. Study of simple and complex tissue from permanent micro-preparation.
2. Study of different types of vascular bundles.
3. Study of internal structure of dicot and monocot roots with the help of temporary micro-preparation.
4. Anatomy of dicot and monocot stem with the help of temporary or double stained permanent micro-preparation.
5. Anatomy of normal and anomalous secondary growth in stem with the help of double stained permanent micro-preparation.
6. Study of internal structure of dicot (*Nerium*) and monocot leaf (*Maize*) with the help of temporary micro-preparation.
7. Study of various horticultural crops mentioned in syllabus.

Note: 1. Developmental stages are not expected

2. Short excursion tour is expected

BOTANY PRACTICAL EXAMINATION

B. Sc.
SEMESTER-III



TIME: FIVE HOURS

MAX. MARKS: 80

- Q. 1: Describe in technical language the given Angiospermic material (A). Classify and identify the family giving reasons. 05 M
- Q. 2: Calculate percent germination of pollen grains in given material (B). 03 M
- Q. 3: Prepare temporary mount of the given root/leaf material (C) and identify giving diagnostic characters. 04 M
- Q. 4: Prepare double stained permanent mount of the given stem material (D). Identify giving diagnostic characters. 05 M
- Q. 5: Spotting: 05 M
- | | | |
|-------------------------|-------------------------|------------|
| (E) Fossil angiosperms | (F) Embryology | (G) Tissue |
| (H) Popular house plant | (I) Horticultural plant | |
- Q. 6: Viva-voce. 03 M
- Q. 7: Practical Record and Excursion report. 05 M

Suggested Readings: Semester-III

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B. Sc. SEMESTER-IV
PAPER-I
(Cell Biology, Plant Breeding, Evolution and Seed Technology)



Unit-I: Cell organization:

1. **Cell:** Brief account of Cell theory, Comparison between Prokaryotic and Eukaryotic cell organization, Structure of typical plant cell.
2. **Structure and functions of:** Cell wall, Plasma membrane (Fluid Mosaic model), Endoplasmic reticulum, Golgi complex, Ribosomes and Vacuole.

Unit-II: Cell biology:

1. **Structure and functions of:** Chloroplast, Mitochondria and Nucleus
2. **Chromosome morphology:** Chromatid, chromomeres, centromere, telomere, secondary constriction, satellite.
3. **Molecular organization of chromosome:** Nucleosome model.
4. **Sex Chromosomes:** Definition, Structure of sex chromosomes (X and Y) in *Melandrium* plant.
5. **Cell division:** Mitosis and Meiosis (Mechanism and significance).

Unit-III: Plant breeding and Evolution.

1. **Plant Breeding:** Definition and objectives
2. **Methods of Plant breeding:** Definition; Procedure or technique of Pure line selection, Clonal selection, Hybridization, Heterosis (Definition and Scope)
3. **Biostatistics:** Mean; Median, Mode, Standard deviation and Standard error
4. **Evolution:** Neo-Darwinism and Miller's theory.

Unit-IV: Skill Development: Seed Technology

1. **Seed:** Structure and types
2. **Seed dormancy:** Causes of seed dormancy, methods to break seed dormancy
3. **Seed technology:** Seed storage, seed banks, factors affecting seed viability, genetic erosion, methods of seed production, seed testing and certification.
4. **Commercial types of seeds:** Farmers seed, foundation seeds, breeders seed and certified seed.

List of Practical: Paper-I:

1. Study of cell organelles with the help of photographs or slides.
2. Study of mitosis in suitable plant material.
3. Study of meiosis in suitable plant material.
4. To calculate mean, median, mode and standard error of the given data.
5. To study the methods of breaking seed dormancy.
6. To study the seed viability and percentage seed germination by paper slot method or tetrazolium salt.



**B. Sc. SEMESTER-IV
PAPER-II
(Genetics, Molecular Biology and Plant Nursery)**

Unit-I: Genetics: (Mendelism, Linkage and crossing over).

1. **Mendelism:** Basic terminology, Law of segregation and law of independent assortment.
2. **Interaction of genes:** Allelic: Incomplete dominance (1:2:1); Non-allelic: Complementary factors (9:7) and Dominant epistasis (12:3:1).
3. **Linkage:** Definition, Theory of linkage: Coupling and Repulsion, Types: Complete and Incomplete linkage
4. **Crossing over:** Definition, Breakage and reunion theory, significance of crossing over.

Unit-II: Genetics: (Mutation)

1. **Mutation:** Definition, Types: Spontaneous and induced mutation, Physical and Chemical mutagens, applications of induced mutations.
2. **Chromosomal aberrations:** Deficiency, Duplications, Inversion and Translocation
3. **Variation in chromosome number:** Aneuploidy (Nullisomics, Monosomics, Trisomics and Tetrasomics), Euploidy (Autopolyploidy, Allopolyploidy); Significance.
4. **DNA Damage and Repair:** Photoreactivation and Excision Repair

Unit-III: Molecular biology

1. **DNA:** Structure of DNA (Watson and Crick's model), Replication of DNA: Semiconservative method of DNA replication,
2. **RNA:** Types, Clover leaf model of t-RNA
3. **Concept of gene:** Classical: Cistron, Muton and Recon
4. **Genetic code:** Definition and characteristics
5. **Protein synthesis:** Transcription and Translation
6. **Regulation of gene action:** Lac-Operon model

Unit-IV: Skill Development: Plant nursery

1. **Nursery:** Definition and Role or objective; nursery infrastructure
2. **Planning and seasonal activities:** Preparation of nursery beds, Planting: direct seeding and transplant, Air layering, Budding, Grafting, cutting, rooting medium, hardening of plant
3. **Nursery management:** Routine garden operations, soil sterilization, seed sowing, pricking, planting and transplanting, shading, stopping or pinching, defoliation, wintering, mulching and topiary.

List of Practical: Paper-II:

1. To prove Mendel's law of segregation with the help of colored beads.
2. To prove Mendel's law of independent assortment with the help of colored beads.
3. To work out the type of gene interaction mentioned in theory from given data.
4. To study different methods of vegetative propagation (Air layering, cutting, budding and grafting)
5. To study the method of soil sterilization for plant nursery.

Note: 1. Developmental stages are not expected,
2. Short excursion tour/visit to Nursery is expected

BOTANY PRACTICAL EXAMINATION
B. Sc.
SEMESTER-IV



TIME: FIVE HOURS

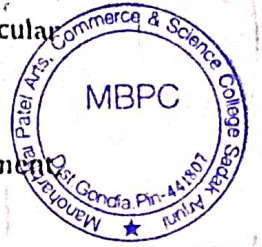
MAX. MARKS: 30

- Q. 1: To prepare semi-permanent squash/smear of the given plant material (A), identify stage/s of cell division. 04 M
- Q. 2: To solve given problem of Biostatistics from the given data (B). 03 M
- Q. 3: To determine seed viability of the given seeds (C) and report the finding. 03M
- Q. 4: To prove Mendel's law of inheritance by using colored beads (D) and apply Chi-Square test. 04 M
- Q. 5: To work out the type of gene interaction from the given data (E). 04 M
- Q. 6: Spotting: 04 M
- (F) Cell organelle (G) Cell division
- (H) Tools used in nursery (I) Method of vegetative propagation.
- Q. 7: Viva-voce. 03 M
- Q. 8: Practical Record and Excursion report. 05 M
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Suggested Readings: Semester: IV

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- Hawkins, J. D. [1991]: Gene Structure and Expression 2nded (Cambridge University Press Cambridge U.K.)
- Karp, G. [1996]: Cell and Molecular Biology- Concepts and Experiments (John Wiley and Sons Inc.)
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B. Sc. SEMESTER-V
PAPER-I
(Plant Physiology, Mineral Nutrition and Hydroponics)



Unit-I: Plant-Water relation:

1. **Water relation:** Concept and significance of Imbibition, Diffusion, Osmosis, Osmotic pressure, Cell as osmotic system, DPD, Plasmolysis.
2. **Ascent of sap:** Definition, Root pressure theory, Cohesion-adhesion theory.
3. **Transpiration:** Definition, Types, Mechanism of Stomatal movements (K^+ Malate Hypothesis)
4. **Phloem transport:** Munch Hypothesis
5. **Mineral uptake:** Passive (Donnan's Equilibrium), Active (Carrier Concept).

Unit-II: Photosynthesis and Respiration:

1. **Photosynthesis:** Definition, Significance; Photosynthetic pigments (Type and role). Photosystems.
2. **Mechanism of photosynthesis:** Light reaction: Cyclic and non-cyclic photophosphorylation, Dark Reaction: Calvin Cycle (C_3), HSK pathway (C_4), CAM pathway.
3. **Respiration:** Definition, Types, significance and Respiratory Quotient (RQ)
4. **Mechanism of respiration:** Glycolysis, Krebs's Cycle, Oxidative phosphorylation (ETS).
5. **Fermentation:** Definition, Types, Mechanism of fermentation: Lactic acid and Alcoholic.

Unit-III: N- Fixation, Plant Movements, Photoperiodism:

1. **Nitrogen Metabolism:** Definition, Mechanism of Biological N-Fixation (Symbiotic and Non-symbiotic)
2. **Plant Movements:** Definition, Outline, Tropic (Geotropic, Phototropic, Thigmotropic) and Nastic (Seismonastic).
3. **Photoperiodism:** Definition, Classification (Short Day Plant, Long Day Plant and Day Neutral Plant), photoperiodic induction, Florigen hormone.
4. **Circadian rhythms and Biological clock.**

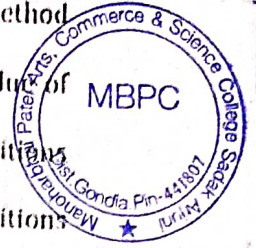
Unit-IV: Skill Development: Mineral nutrition and Hydroponics:

1. **Mineral nutrition:** Definition, source, types (Macro and micronutrients)
2. **Role and deficiency symptoms of Macronutrients:** Nitrogen, Phosphorous, Potassium and Calcium
3. **Role and deficiency symptoms of Micronutrients:** Iron, Manganese, Boron and Zinc.
4. **Hydroponics:** Definition, advantages and disadvantages, Types of hydroponic systems (Deep water culture and Nutrient Film Technique); Nutrient composition.
5. **Methods:** Hydroponic farming of Tomato, Cucumber, Spinach and Cabbage.

List of Practical: Sem.-V, Paper-I:

- A. **Major Physiology Experiments:**
 1. To study the effect of temperature on the permeability of cell membrane.
 2. To study the effect of various organic solvents on the permeability of cell membrane.
 3. To determine the osmotic pressure/potential of vacuolar sap by plasmolytic method.
 4. To study ascent of sap in suitable plant material.

5. To compare rate of transpiration from two surfaces of leaf by cobalt chloride method and Bell jar method.
6. To separate chlorophyll pigments by paper chromatography and calculate Rf value of different pigments.
7. To measure the rate of photosynthesis by Willmott's bubbler under variable conditions of light (quantity and quality).
8. To measure the rate of photosynthesis by Willmott's bubbler under variable conditions of temperature and CO₂ concentration.
9. To determine the respiratory quotient (RQ) of the given plant material.



B. Minor Physiology Experiments:

1. To demonstrate the phenomenon of imbibition.
2. To demonstrate root pressure in suitable plant material.
3. To demonstrate that light is necessary for photosynthesis (Ganong's light screen).
4. To demonstrate that light, chlorophyll and CO₂ is necessary for photosynthesis (Moll's half leaf experiment).
5. To demonstrate fermentation by Kuhne's tube.
6. To demonstrate the evolution of CO₂ during respiration.

C. Plant movement, Photoperiodism, mineral nutrition and hydroponics:

1. To demonstrate the phenomenon of nastic movement in *Mimosa pudica* plant
2. To demonstrate the phenomenon of soil less growth in plants mentioned in syllabus.

B.Sc. SEMESTER-V
PAPER-II
(Plant Ecology and Organic Farming)



Unit-I: Plant and environment:

1. **Ecology:** Definition, branches and significance.
2. **Climatic factors:** Atmospheric (Gaseous composition); Effect of Light and Temperature on vegetation
3. **Edaphic factors:** Pedogenesis, Soil profile, Soil micro-organisms.
4. **Physiographic factors:** Biotic factors: Interaction between plants and animals and humans and interaction between plants growing in a community.

Unit-II: Ecosystem:

1. **Ecosystem:** Definition, types; Components: Biotic and abiotic components, Food chain, Food web, Ecological pyramids.
2. **Autecology:** Definition, Importance, Ecads, Ecotypes: Characteristics and importance, Growth curve.
3. **Synecology:** Definition, Study of community: Quantitative characteristics: Frequency, Density, Abundance; Qualitative characteristics: Life forms, Raunkier's Biological Spectrum and Synthetic characteristics: Presence, fidelity and dominance.

Unit-III: Plant Succession and adaptations:

1. **Plant Succession:** Definition, Causes of succession, Hydrosere, Xerosere
2. **Plant Adaptations:** Morphological and anatomical adaptations of Hydrophyte (*Hydrilla*, *Nymphaea*), Xerophyte (*Casuarina*, *Nerium*), Halophyte and Epiphyte (*Vanda*).
3. **Biogeochemical cycles:** Nitrogen and Phosphorous

Unit-IV: Skill development: Organic farming:

1. **Organic farming:** Definition, concept, advantages and disadvantages, green manure and organic fertilizers.
2. **Methods:** Recycling of biodegradable kitchen, agricultural and industrial waste.
3. **Methods of:** Preparation of Bio compost, preparation of vermicompost and its type, isolation and inoculum production of VAM.
4. **Organic manure:** Effect of organic manures on growth and yield productivity of various crop plants.

List of Practical: Paper-II:

1. To determine frequency, density and abundance of community by quadrat method.
2. To determine homogeneity of vegetation by Raunkier's frequency diagram.
3. To determine the minimum number of quadrates required for reliable estimate of biomass in grasslands.
4. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkier's standard frequency diagram.
5. To measure the above ground plant biomass in a grassland.
6. To study soil profile at different locations of nearby area.
7. To estimate transparency, pH and temperature of different water bodies.
8. To estimate salinity of different water samples.

9. To study the morphological and anatomical characteristics of hydrophyte, xerophyte, halophytes and epiphyte with reference to ecological adaptations.
 10. Collection and identification of various organic manures.
 11. To study the methodology of preparation of vermi-compost.

- Note: 1. Developmental stages are not expected,
 2. Short excursion tour/ visit to Organic farm is expected



**BOTANY PRACTICAL EXAMINATION
 SEMESTER-V**

TIME: FIVE HOURS

MAX. MARKS: 30

- Q 1. To perform the given major physiology experiment (A) and report the findings. 05 M
 Q 2. To perform the given minor physiology experiment (B) and report the findings. 03 M
 Q 3. To perform the given ecological experiment (C) and report the finding. 05 M
 Q 4. To study morphological and anatomical characteristics of the given plant material
 (I) with reference to ecological adaptations. 05 M
 (J) Spotting: 04 M
- (I) Plant physiology (F) Ecology
 (II) Hydroponics (H) Manures.
- Q 6. Viva-voce. 03 M
 Q 7. Practical Record and Excursion report. 05 M

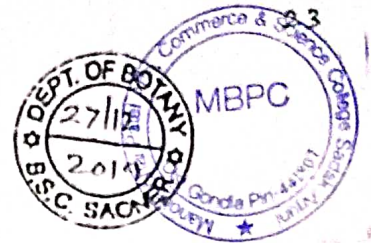
Suggested Reading: Semester-V

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B. Sc. SEMESTER-VI
PAPER-I
(Biochemistry, Biotechnology and Herbal Technology)



Unit-I Biochemistry: Lipids and Enzymology:

1. **Lipids: Definition, Properties and role of fatty acids, oils and waxes; Degradation of fats (β -Oxidation and Glyoxylic acid cycle)**
2. **Enzymology: Enzymes: Definition, Nomenclature and classification of enzymes; Characteristics (Properties) of enzymes**
3. **Basic concepts of enzymology: Holoenzyme, Apoenzyme, Prosthetic group, Co-enzyme, Co-factor, Active site, Isoenzyme**
4. **Mechanism of enzyme action: Enzyme-substrate complex theory, Lock and key model, Induced fit model**
5. **Enzyme inhibitors: Definition, Competitive and noncompetitive.**

Unit-II Plant tissue culture:

1. **Brief account of: Tissue culture, Totipotency, Explant, Aseptic cultures, Micropropagation, Differentiation and Morphogenesis.**
2. **Methods of sterilization: Autoclaving, Dry heat and Chemical sterilization**
3. **Culture Media: MS media (Preparation and nutrient contents)**
4. **Tissue Cultures: Callus and organ culture (Shoot tip and Anther culture) and its applications**
5. **Protoplast culture and its applications.**
6. **Applications of tissue culture**

Unit-III: Genetic engineering:

1. **Genetic engineering: Definition, Tools in genetic engineering: Enzymes (Restriction enzymes, Ligases, DNA-polymerases), Host.**
2. **Cloning vectors: General Characteristics, method of Isolation of vector, Plasmid as a vector (pBR³²²).**
3. **DNA Library: Definition, Construction of Genomic library and c-DNA library and their significance**
4. ***Agrobacterium* mediated gene transfer: Structure of Ti-plasmid, mechanism of transfer.**
5. **Role of biotechnology in crop improvement**

Unit-IV: Skill Development: Herbal technology:

1. **Herbal technology: History and importance of herbal technology**
2. **Basic concepts: Drugs, cosmetics, Natural dyes, Difference between organized and unorganized drugs**
3. **Methods: Cultivation, harvesting, processing, storage and utilization of *Withania somnifera*, *Aloe vera*, *Ocimum sanctum***
4. **Dye yielding herbal plants: *Lawsonia alba* (Henna), *Rivina humilis*, *Indigofera tinctoria***
5. **Herbs used in cosmetics: *Cocos nucifera* (Coconut oil), *Curcuma longa* (Turmeric), *Cucumis sativa* (Cucumber), *Lavendula* sps. (Lavender oil), *Rosa* sps. (Rose), *Hibiscus rosa-sinensis* (China rose) (With reference to parts used, chemical constituents, uses and Marketed products)**



List of Practical: Paper-I:

1. To study the effect of temperature on the activity of enzyme Amylase in the suitable plant material.
2. To study the effect of temperature on the activity of enzyme Catalase/Peroxidase in the suitable plant material.
3. To perform micro-chemical test for oils/lipids.
4. To study principle and working of autoclave, oven, pH meter, laminar air flow.
5. To study the structure of plasmid vector and Ti-plasmid from the photograph/diagrams.
6. Extraction and preparation of *Aloe vera* juice from mature leaves of plant.
7. To study the method of preparation of Rose-water.
8. To study the method of preparation of oil from *Hibiscus* flower.
9. To study the method of extraction of natural dye from suitable dye yielding plant.

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B. Sc. SEMESTER-VI
PAPER-II

(Phytogeography, Utilization of Plants, Techniques and Pharmacognosy)

Unit-I: Phytogeography, Pollution, Natural resources:

1. **Phytogeography:** Principles of phytogeography, Distribution (Wides, Endemic, Discontinuous species); Climatic regions of India, Phytogeographic regions of India (Chatterjee, 1962) (Name, Distribution area, Typical Vegetation)
2. **Environmental pollution:** Causes and Control measures of Agriculture pollution and Noise pollution
3. **Natural Resources:** Renewable and Non-renewable resources, factors for their depletion
4. **Conservation strategies:** Conservation of forest and water resources.

Unit-II: Utilization of plants and Ethnobotany:

1. **Utilization of plants:** Morphology, Utilization and important chemical constituents of the plants: Food (Wheat), Oil (Groundnut), Fiber (Cotton), Spices (Clove), Beverages (Coffee), Medicinal (*Adhatoda vassica*), and Rubber.
2. **Ethnobotany:** Definition, Brief history, branches and importance of Ethnobotany.
3. **Plants of ethnobotanical importance:** Vegetable, Fruits, Seeds, Medicinal and Narcotics (Two plants each with reference to family, parts used and tribal areas)

Unit-III: Microscopy and Techniques:

1. **Microscopy:** Principle, types and application of microscope (Light, Fluorescent, SEM and TEM).
2. **Techniques:** Principle, types and application of Centrifugation, Electrophoresis (SDS-PAGE and Agarose), Spectroscopy (UV-Vis), Chromatography (Paper and Thin Layer Chromatography (TLC))

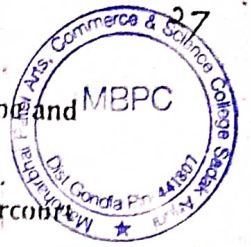
Unit-IV: Skill development: Pharmacognosy:

1. **Pharmacognosy:** Definition and scope, Drug adulteration: Types; methods of drug evaluation: Biological testing of herbal drugs, phytochemical screening tests for secondary metabolites (Alkaloids and Flavonoids)
2. **Pharmacological plants:** Biological source, staining, diagnosis, micro-chemical tests, chemical constituents, preparation and uses of drug extracted from the plants: *Datura* leaf, *Vinca rosea*, *Plantago ovata* (Isapgol) seeds, *Linum usitatissimum* (Linseed) seeds, *Elettaria cardamomum* fruit, *Coriandrum sativum* fruit, *Eugenia caryophyllus* (Clove) flower-bud, *Rauwolfia serpentina* root, *Zingiber officinale* (Ginger) rhizome.

- Note: 1. Developmental stages are not expected,
2. Short excursion tour is expected

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