B.A.
HISTORY NEW CURRICULUM

FIRST YEAR

PAPER - I   :   History and Culture of India Upto AD 1526

SECOND YEAR

PAPER - II   :   History and Culture of India 1526-1950

THIRD YEAR

PAPER - III   :   History of Modern World (1453-1945 AD)

Note :   The College offers 4 optional in BA III Year.
The student has to choose one option from the below:

PAPER - IV   :   OPTIONALS

(a)   History and Culture of Andhra Pradesh
(from Satavahanas to 1956 AD)

(b)   Ancient Civilisations

(c)   Cultural Tourism in India

(d)   Principles and Methods of Archealogy

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B.A. History New Curriculum

PAPER - I
HISTORY AND CULTURE OF INDIA UP TO AD 1526

UNIT - I :

Influence of Geography on History-Survey of the Sources- Pre-historic period-Paleolithic, Mesolithic and Neolithic cultures- Role of technology. Indus Valley Civilization-its characteristic features-Vedic culture-Early and later Vedic periods-Post-Vedic period-Emergence of Varna and caste system -Rise of new Religious Movements-Jainism and Buddhism in 6ᵗʰ Century B.C Impact on society and culture.

UNIT - II :

A brief survey of political conditions in Ancient India-Magadha. Alexander's Invasion and Mauryas- Ashoka's Dhamma. Its nature and propagation- Mauryan Administration-Economy- Art and Architecture.

UNIT - III :

Post-Mauryan period in North India-A brief political survey of Kushans, Guptas. Pushyabuti and Rajputs: Polity and Administration - Social conditions - Caste System- position of Women- Economy,- Indian Feudalism-Art-Architecture- Education, Literature, Philosophy. Science and Technology.

UNIT - IV :

A brief political survey of South India-Sangam Age- Satavahanas-Pallavas-Cholas- Chalukyas. and Rashtrakutas- Kakatiyas and Vijayanagara-Polity and Administration. Society. Economy-Art and -Architecture.

UNIT - V :

Invasions of Arabs. Ghaznavids and Ghoris and Delhi Sultanate-A brief political Survey, Polity and Administration under Delhi Sultanate,-society, composition of rural Society. Nobility- Status of Women, Economic and Technological developments. Agriculture-Industry-Trade and Commerce-Urbanisation. Art and Architecture-Fine Arts- education and Literature.

UNIT - VI :

Impact of Islam on Indian Society and culture-Bhakti and Sufi Movements Emergence of Composite culture.

PAPER - II
HISTORY AND CULTURE OF INDIA (1526 -1950)

UNIT - I :

Survey of Sources- Establishment of Mughal Empire - Sur Interrugnam - Brief Survey of Political History up to 1707 AD -Polity and Administration -Society-Social Composition-Ulema-Nobility-peasantry - Artisans -Slaves- Status of Women -Economy: Agriculture Industries, Trade and Commerce. Economic and Technogical developments: Religion - Hindu-Muslim Relations-Composite Culture. Education, Literature, Art, Architecture and Fine Arts. Decline and Disintegration of Mughal Empire -Rise of Regional Powers-Marathas - Sikhs

UNIT - II :

Advent of European powers-Portuguese, Dutch, English and French Expansion and consolidation of British Empire-Wars-Diplomacy-Policies pursued-Subsidiary Alliance-Doctrine of Lapse. Economic policies and changes-Mercantilism and Free trade policies-Land Revenue Settlements- Permanent-Ryotwari-Mahalwari Systems-Intrigation Commercialization of Agriculture-Condition of peasants-Famines -Decline of Cottage industries (de-industrialization)

UNIT - III :

Anti-Colonial Upsurge-Peasant and Tribal Revolts-1857 Revolt-Causes- Results and Nature.

UNIT - IV :

Factors for social change-Christian Missionaries-Western Education- Emergence of New Middle Classes-Growth of press-Socio-Religion Reform Movements-Brahma Samaj-Arya Samaj-Theosophical Society-Ramakrishna Mission-Aligarh Movemeit-Self-Respect movements-Jyotiba Phule-Narayana Guru. Periyar and Dr. B.R. Ambedkar.

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UNIT - V :

Indian National Movement -Factors for the growth of Nationalism - Indian National congress-Three Phases of Freedom struggle-revolutionary Movements-Left-Wing movement-Peasant and workers movements.

UNIT - VI :

Emergence of Communal trends-partition of India- Integration of Princely States into Indian Union.

PAPER - III
Paper Code E-H-3

HISTORY OF MODERN WORLD (1453 -1945 AD)

UNIT - I :

Characteristic features of Renaissance-Significance of Reformation and Counter Reformation movements in Europe-Geographical Discoveries and Rise of Colonialism, Mercantilism and Commercial Revolution-Emergence of Modern World Economy.

UNIT - II :

Emergence of Nation States in Europe - Nature of Feudalism in Europe and Asia.

UNIT - III :

Age of Revolutions -Glorious Revolution (1688)-American Revolution (1776)- French Revolution (1789)

UNIT - IV :

Industrial Revolution and Rise of Capitalism -Impact on Asia and Africa-Meizi Restoration and Modernisation of Japan- Unification Movements in Germany and Italy

UNIT - V :

World between 1914-1945 Rivalry among colonial powers Imperialist Hegemony-Causes and consequences of first World War - World between the Wars - League of Nation, Fascism in Italy, Nazism in Germany, Militarism in Japan- Communist Movements in Russia and China.

UNIT - VI :

Causes and consequences of Second World War -UNO.

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PAPER - IV (a)
Code : CHA
HISTORY LAND CULTURE OF ANDHRA PRADESH
(From Satavahanas to 1956 A.D)

UNIT - I :

Influence of Geographical features on History: Sources-A Brief Survey of political history from Satavahanas to Vijayanagara period-Socio- Economic-Cultural conditions _ under Satavahana, Kakatiya and Vijayanagara rulers-Growth and Spread of Jainism and Buddhism and their contribution to Art and Architecture.

UNIT - II :

The Qutb Sahis — A Brief Survey of Political History - Society, Economy and Culture. The Asaf Jahis - A Brief Survey of their political history - Society, Economy and Culture - Salarjung's Reforms.

UNIT - III

Andhra Under Colonial Rule: Coming of European Merchant Companies- Conquest of Andhra by the British- Early Uprisings- Administration- Land Revenue Settlements-Agrarian Conditions - Famines - Impact of Industrial Revolution on Andhra Economy-Sir Thomas Munroe- Impact of 1857 Revolt in Andhra.

UNIT - IV

Social Reform and Literary Movements: Veeresalingam, Raghupathi Venkataratnam Naidu, Gurajada Appa Rao, Komarraju Venkata Lakshmana Rao, Non-Brahmin, Adi Andhra, Dalit, Self-Respect Movements- New Literary Movements-Gurram Jashua, Boyi Bhimanna, Viswanatha Satyanarayana, Rayaprolu Subba Rao, Sri Sri.

UNIT - V

Freedom Movement in Andhra : Vandemataram, Home Rule, Non Co-Operation, Alluri Sitarama Raju- Rampa Rebellion 1922-24- Civil Disobedience and Quit India Movements.

Political Consciousness in Telangana : Nizam Andhra Maha Sabha, Hyderabad State Congress, Razakars, Police Action and Accession of Telangana into Indian Union.

UNIT - VI

Leftist Movements in Andhra and Telangana – Peasant Armed struggle – Tribal Uprisings-Komaram Bhimu- Bhoodan Movement.

Movement for Separate Andhra State : Andhra Manila Sabha- Sree Bagh Pact-Martyrdom of Potti Sree Ramulu-Formation of Andhra State, 1953 - Vishalandhra Movement- State's Re-organization Commission-Gentlemen's Agreement-Formation of Andhra Pradesh in 1956.

PAPER - IV (b)
Paper Code - AZN
ANCIENT CIVILISATIONS

UNIT - I

Environmental human interaction, hunting, gathering of food and food production, Tool making impact and role of Technology, human settlements-Division of labour-craft specialization and Geographical Wealth-Role of Technology in the evolution of the World civilization.

UNIT - II

Egyption Civilization-origin and spread -Polity Society-Economy-Art and Architecture

UNIT - III

Mesopotamia Beginning and Expansion-contacts with other Civilization-Nature of Polity-Socio-Economic and religious conditions evolution of script, Art & Architecture

UNIT - IV

China-Nature and Extent of Civilization -State Structure -Social Divisions-Economic condition- Science & Technology Religion-Philosophy and Culture.

UNIT - V

Greek Civilization, Nature of Polity and Society- agrarian economy-Trade and Urbanization Distinctive features of Greek civilization-Philosophy-Education-Art and Architecture

UNIT - VI

Roman civilization: Origin and spread of Roman Empire -Features or Polity and Roman Republic-Slavery-Social Structure-Economic Organization-Religious System and cultural contribution-Decline

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THIRD YEAR

PAPER - III
INDIAN ECONOMIC DEVELOPMENT & A.P. ECONOMY

NOTE:

In this paper organizing a field study, or project work or assignment with Viva-Voce with a weightage of 20 marks is recommended. The theory paper should consist of 80 marks only.

Module - 1 : CONCEPTS OF DEVELOPMENT

Meaning of Economic growth and development - Measures of. Economic Development - GNP, PCI, PQLI and HDI. Factors influencing Economic development -Sustainable development - Balanced and unbalanced growth - Choice of Techniques Labour intensive and capital intensive methods.

Module - 2 : STRUCTURE OF THE INDIAN ECONOMY

Demographic features - Size and growth of the population - Age and sex composition -Rural and Urban population - Occupational distribution - Population policy. National income in India - Trends and Composition - Poverty, Inequalities and unemployment -Causes and consequences. Current Five Year Plan - Objectives, Mobilization and Allocation of Resources - New Economic Reforms - Liberalization, Privatization and Globalization in India - Inclusive Growth.

Module - 3 : INDIAN AGRICULTURE

Nature and importance; Trends in agricultural Production and Productivity; factors determining productivity. Rural Credit - Micro Finance and Self Help Groups (SHGs). Agricultural price policy, Crop insurance, Agricultural Infrastructure and food security.

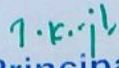### Module - 4 : INDIAN INDUSTRY AND SERVICES

Structure and Growth of Indian Industry - Industrial policies of 1956 and 1991. Growth and problems of Small Scale Industry. Foreign Exchange Management Act (FEMA); Disinvestment policy in India - Foreign Direct Investment - Growing importance of Services Sector in India - Banking, Insurance, Information Technology, Education and Health.

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Module - 5 : ANDHRA PRADESH STATE ECONOMY

GSDP - Sectoral Contribution and Trends; Human Resources - Population Trends, Agricultural Sector - Land use and Cropping pattern; Industrial Sector - Small Scale industries, Investment and employment in industrial sector, SEZs; Service Sector - Growth of income and employment in the service sector, Information Technology (IT).

References :

1. Dhingra, I.C. - "Indian Economy", Sultan Chand, 2007.

2. Ruddar Dutt and K.P.M. Sundaram - "Indian Economy", S. Chand & Co., 2008.

3. G.M. Meier - "Leading Issues in Economic Development", Oxford University Press, New York, 3/e.

4. M.P. Todaro - "Economic Development", Longman, London, 6/e, 1996.

5. Reserve Bank of India - Handbook of Statistics on Indian Economy (Latest).

6. S.K. Misra & V.K. Puri - "Indian Economy", Himalayan Publishing House, 2006.

7. R.S. Rao, V. Hanumantha Rao & N. Venu Gopal (Ed.) - Fifty Years of Andhra Pradesh (1956-2006), Centre for Documentation, Research and Communications, Hyderabad, 2007.

8. Telugu Academy Publications.

9. United Nations, "World Development Report", Oxford, 1990-2008, Different editions.

10. AUSDE - Study Material.

B.A.
ECONOMICS

FIRST YEAR

PAPER - I   :   Micro Economics

SECOND YEAR

PAPER - II   :   Macro Economics

THIRD YEAR

PAPER - III   :   Indian Economic Development

PAPER - IV   :   **OPTIONALS**

            (a)   Rural Development

            (b)   Economics of Statistics

            (c)   Public Finance and
                   International Economies

B.A. (ECONOMICS)
FIRST YEAR

PAPER - I :
MICRO ECONOMICS

Module - 1 : INTRODUCTION

Nature, Definition and scope of Economics - Methodology in Economics - Micro and Macro; Static and Dynamic, Normative and Positive - Inductive and Deductive Analysis - Partial and General Equilibrium - Choice as an economic problem.

Module - 2 : CONSUMER BEHAVIOUR

Utility Analysis - Cardinal and ordinal approaches - Law of Diminishing marginal utility, Law of Equi-marginal utility, Indifference curves - Properties of indifference curves - Price (Budget) line - Equilibrium of the consumer with the help of indifference curves. Demand Analysis - Law of demand - Elasticity of Demand - Price, Income and cross elasticities, Demand forcasting - Meaning and factors influencing demand forecasting - Consumer surplus - Engel curve.

Module - 3 : THEORY OF PRODUCTION AND COSTS

Objectives of a firm - Production function - Concept of Cobb-Douglas production function - Isoquant - Factor substitution - Law of variable proportions, law of Returns to Scale - Expansion path - Different Concepts of Revenue and Costs and their interrelation - Euilibrium of the firm - Break - Even analysis.

Module - 4 : MARKET STRUCTURE

Market forms - Perfect and imperfect markets. Price Determination and Equilibrium of a firm and industry under perfect competition - Monopoly -Price determination under monopoly - Price discrimination - Monopolistic competition - Price determination. Oligopoly (Kinked demand curve).

Module - 5 : FACTOR PRICING

Marginal productivity theory of distribution - Theories of wage determination - Wages and collective bargaining; minimum Wage -

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Rent - Scarcity rent, Differential rent - Quasi rent. Interest - Classical, Neo-Classical and Keynesian theories. Profit - Dynamic, Innovations, Risks and Uncertainty theories.

References :

1. R.G, Lipsey and K.A. Chrystal - "ECONOMICS", Oxford University Press, 10/3, 2004.
2. P.A. Samuelson & W.D. Nordhaus - "ECONOMICS", Tata Mc. Graw Hill, 18/e, 2005
3. N. Gregory Mankiw - "Principles of Economics", Thompson, 4/e, 2007
4. H.L. Ahuja - "Advanced Economic Theory", S. Chand, 2004
5. M.L. Seth - "Micro Economics", Laxmi Narayan Agarwal, 2007
6. D.M. Mithani & G.K. Murty - "Fundamentals of Business Economics", Himalaya Publishing, 2007.
7. Telugu Academy Publications
8. AUSDE - Study Material
9. Bilas, A. - "Micro Economic Theory", International Student Edition, Mc. Graw Hill, 1971.

SECOND YEAR
PAPER - II :
MACRO ECONOMICS

Module - 1 : NATIONAL INCOME

Meaning, Definition and importance of Macro Economics - National Income: Meaning, Definitions: National Income, GNP & NNP, GDP & NDP, Personal Income (PI), Disposable Income (DI), Per Capita Income (PCI), Real National Income (RNI) - Methods of Estimation of National Income (MI) - Measurement of National Income in India.

Module - 2 : THEORIES OF EMPLOYMENT

Classical theory of employment - Say's law of markets - Keynesian theory of employment - Consumption function - APC, MPC, factors influencing consumption function - Investment function - MEC and Rate of Interest and the concept of Multiplier - Accelerator - Applicability of the Keynesian theory to the developing countries.

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Module - 3 : MONEY AND THEORIES OF MONEY

Meaning, functions and classification of Money - Gresham's law - R.B.I. Classification of Money – M_1, M_2. M_3, M_4 Theories of Money - Fisher's quantity theory of Money, Cambridge approach (Marshall, Pigou, Robertson and Keynes).

Module - 4 : TRADE CYCLES AND INFLATION

Trade cycles - Meaning and definition - Phases of a trade cycle - Inflation -Definition - Types of Inflation - Causes and effects of inflation - Measures to control inflation,

Module - 5 : BANKING, STOCK MARKET AND INSURANCE

Functions of Commercial banks - The process of credit creation - Concept of Non Banking Finance Companies (NBFCs) - Concept of SEBI Stock Market - Meaning, functions and importance of Stock Market - Primary and Secondary Markets. Concepts of (a) Shares (b) Debentures. Insurance - Types of Insurance - Life Insurance and General Insurance - Functions of the Reserve bank of India- Methods of credit control -Quantitative and Qualitative Methods.

References :

1. G. Ackley – "Macro Economics Theory and Policy", Collier Macmillan, 1978.

2. E. Shapiro – "Macro Economic Analysis", Galgotia Publications, 1999.

3. Central Statistical Organisations – "National Accolunts Statistics".

4. R. Dornbush, S. Fisher and R. Startz – "Macro Economics", Tata Mc. Graw Hill, 9/e, 2004.

5. M.L. Seth – "Macro Economics", Lakshmi Narayan Agarwal, 2006.

6. K.P.M. Sundaram – "Money, banking & International Trade", Sultan Chand, 2006.

7. Dillard, D – "The Economics of John Maynard Keynes", Crossby Lockwood & Sons.

8. Telugu Academy Publications

9. AUSDE – Study Material.

10. M.N. Mishra & S.B. Mishra – "Insurance Principles & Practice" S. Chand 2007.

11. Bharati V. Pathak "The Indian Financial System Markets, Institutions & Services" Pearson 2008.

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B.A.
POLITICAL SCIENCE

FIRST YEAR

PAPER - I : Political Concepts, Theories and Institutions

SECOND YEAR

PAPER - II : Indian Government and Politics

THIRD YEAR

PAPER - III : Political Thought (Compulsory)

PAPER - IV : **Optionals**

(a) International Relations

(b) Government and Politics in Andhra Pradesh

(c) Principles of Public Administration

POLITICAL SCIENCE
FIRST YEAR

PAPER I
POLITICAL SCIENCE CONCEPTS, THEORIES AND INSTITUTIONS

1. Introduction: Definition, Scope and Importance of Political Science

2. Approaches to the Study of Political Science: Liberal and Marxist

3. State-Nation and Civil Society

4. Sovereignty: Monism and-Pluralism

5. Theories of Origin of the State: Social Contact and Evolutionary (Historical)

6. Concepts:
   a. Law: Sources of Law and Concepts of Rule of Law
   b. Liberty and Equality-Their Relationship
   c. Theories and kinds of Rights
   d. Power and Authority

7. Ideologies: Individualism, Anarchism, Fascism and Socialism .

8. Forms of Government:
   a. Democracy: Direct and Indirect
   b. Unitary and Federal
   c. Parliamentary and Presidential.

9. Theory of Separation of Powers

10. Organs of Government
    a) Legislature   :   i) Unicameral and Bi-cameral
                                  ii) Powers and Functions
    b) Executive   :   i) Powers and Functions
    c) Judiciary   :   i) Powers and Functions
                                  ii) Independence of Judiciary and Judicial Review

Books Recommended:
1. *Principles of Political Science* : A.C. Kapoor
2. *Grammar -of Polities*: Laski H.J.
3. *Substance of Politics* : A. Appadorai
4. *Political Theory* : Ashirvadam
5. *Political Theory*: O.P. Gauba
6. *Political Ideologies*: Their Origins and Impact, Baradat, Prentice Hall of India

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PAPER - III
POLITICAL THOUGHT

1. **Ancient 'Indian Political Thought**

   a) Sources of Ancient Indian Political Thought.

   h) Manu: Varnadharma and Dandaneeti.

   c) Koutilya: State and Society.

   d) Goutama Buddha: Dhamma and Sangha.

2. **Modern Indian Political Thought**

   a) Gandhi: Ahimsa and Satyagraha.

   b) Nehru : Democratic Socialism.

   c) Ambedkar : Annihilation of Caste.

   d) M.N. Roy : Radical Humanism.

3. **Western Political Thought**

   Plato, Aristotle, St. Thomas Aquinas, Machiavelli, Thomas Hobbes, John Locke, J.J. Rousseau, Jermy Benthom, J.S. Mill, Hegel, Marx and Gramsci.

Books Recommended :

1. Political Ideas in Ancient India : R.S. Sharma.

2. Western Political Thought: Amal Kumar Mukopadhyay.

3. A History of Political Thought : Sabine G.H.

4. Annihilation of Caste : Ambedkar B.R.

5. Modern Political Theory : Ebenstein W.

6. A History of Political Thought: Plato to Marx, Mukherjee & Ramaswamy.

7. Political Ideologies: Their Origins and Impact.

PAPER - IV (A) (Optional)
INTERNATIONAL RELATIONS

1) International Relations : Evolution, Nature, Scope and Significance.

2) History of International Relations : Rise of Sovereign Nation-State System. First World War, Second World War – Impact on International Relations.

3) Concepts of International Relations : Power – Elements of National Power, Super Power, Regional Power, Unilateral Hegemony – Uni-Polarity, Bipolarity, Multipolarity & Security.

4) International Political Economy :

   i) Historical Overview : Colonialism, Decolonisation, Developing Nations and Problems

   ii) International Financial Institutions: World Bank, WTO, Functions and Role.

   iii) Globalisation and its Impact on Developing Nations.

5) International Organisations : United Nations, Structure and Role, Need for revision of the charter, Regional Organisations, European Union, SAARC and ASEAN.

6) International Security : Arms Race, Arms Control and Disarmament, Issues in Nuclear Politics.

7) Foreign Policy : India's Foreign Policy, Determinants and Features, Non-Alignment, Evaluation and Relevance – Recent Trends.

8) Contemporary Issues International Relations : Environment, Human Rights and Terrorism.

Books Recommended :

1. Politics Among Nations : Hans J. Margentheu.
2. The Analysis of International Relations : Karl W. Deutsch.
3. International Relations : Palmer and Perkins.
4. India Foreign Policy, Foreign Service Institute, New Delhi, India.
5. International Relations between the two World Wars : Carr E.H.

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PAPER - IV (B) (Optional)
GOVERNMENT AND POLITICS
IN ANDHRA PRADESH

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1) Evolution of Indian Federal Structure – Integration of Indian States – Constitutional Framework.

2) Historical Background of the A.P. State.

   a. Socio-Political Struggle in Hyderabad State.

   b. Socio-Political Struggle in Madras Presidency.

   c. Formation of Andhra State.

   d. States Reorganisation and Formation of Andhra Pradesh.

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PAPER - II
INDIAN GOVERNMENT AND POLITICS

1. Salient Features of Indian Constitution a Comparative Perspective with the Constitutions of UK, USA and Switzerland.

2. Evolutions of Indian Constitution - Nationalist Movement and Philosophical Foundations.

3. Indian Federation - Centre - State Relations - Recent Trends.

4. Fundamental Rights and Duties, Constitutional Remedies with special reference to Writs - Directive Principles of State Policy.

5. President - Election, Powers and Functions - Prime Minister and Council of Ministers.

6. Parliament - Composition, Powers and Functions.

7. Judiciary - Supreme Court, Composition, Powers, Functions and Judicial Review - Judicial Activism.

8. Party System: National and Regional Parties; Coalitional Politics.

9. Election Commission - Electoral Reforms and Voting Behaviour.

10. State Government - Governor, Chief Minister and Council of Ministers - Powers and Functions.

11. Social and Economic Factors- Language, Religion, Caste and Regional Identities.

12. Social Movements: Agrarian, Working Class, Women, Tribal, Dalit and Environmental.

13. Challenges to National Integration - Communalism and Terrorism.

14. Local Government Institutions – 73rd & 74th Constitutional Amendments.

Books Recommended :

1. Politics in India : Rajani Kothari
2. Indian Constitution : M.V. Pylee
3. Indian Government and Polities: S. S. Awasti
4. Introduction for Constitution of India : D.D. Basu
5. Indian Government and Politics : K.R. Acharya
6. Indian Politics: Contemporary Issues and Concerns, Singh & Saxena
7. Introduction to the Constitution of India, 5th ed., Sharma

B.Com.

Restructure course of
B.Com. I Year General (T.M. & E.M.)

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
101.	Financial Accounting	6	30	70
102.	Business Economics	4	-	100
103.	Business Organization & Management	5	30	70
104.	Fundamentals of Information Technology	5	30	70

B.Com. I Year Computer Applications

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
101.	Financial Accounting	6	30	70
102.	Programming Concepts Using 'C'	4	30	70
103.	Business Organization & Management	5	30	70
104.	Fundamentals of Information Technology	5	30	70

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B.Com. II Year (Regular & Restructures Courses) - New General (T.M. & EM.)

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
201.	Advanced Accounting	6(5+1)	30	70
202.	Business Statistics	5(5+1)	30	70
203.	Financial Services - Banking & Insurance	5	30	70
204.	Taxation	4	30	70

B.Com. II Year Computer Applications

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
201.	Electronic Commerce	5(3+2)	30	70
202.	Business Statistics	5(4+1)	30	70
203.	Taxation	4	30	70
204.	Business Data Processing System	5	30	70

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B.Com. III Year (Regular & Restructures Courses) - New General (T.M. & EM.)

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
301.	Business Laws	5(4+1)	30	70
302.	Corporate Accounting	5(4+1)	30	70
303.	Cost & Management Accounting	5(4+1)	30	70
304.	Auditing	5(4+1)	30	70
305.	Business Communication	5	-	100
306.	Advanced Corporate Accounting	5	30	70
307.	Advanced Management Accounting	5	-	100

B.Com. III Year Computer Applications

Part - II	Subjects / Papers	No.of. Hours per Week	Practi-cals	Theory
301.	Business Laws	5(4+1)	30	70
302.	Corporate Accounting	5(4+1)	30	70
303.	Cost & Management Accounting	5(4+1)	30	70
304.	Auditing	5(4+1)	30	70
305.	Business Communication	5	-	100
306.	Web Programming	5(3+2)	30	70
307.	Relational Database Management Systems	5(3+2)	30	70

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B.Com. FIRST YEAR

FINANCIAL ACCOUNTING

Paper : 101   Max. Marks : 70+30
PPW : 6 hours

Objectives:

1. To make the students acquire the conceptual knowledge of accounting
2. To equip the students with the knowledge of accounting process and preparation of final accounts
3. To develop the skills of recording financial transactions and preparation of reports using computers

UNIT - I : Introduction to Accounting:

Need for Accounting - definition, features, objectives, functions, systems and bases and scope of accounting - Book keeping and Accounting— Branches of Accounting - Advantages and limitations- basic terminology used- -Accounting concepts and conventions.

Accounting Process-Accounting cycle-Accounting equation-classification of accounts-rules of double, entry book keeping - identification of financial transactions- Journalizing -Posting to Ledgers, Balancing of Ledger Accounts -- Computerized Accounting: Meaning and Features-Advantages and disadvantages of computerized Accounting Creating of an Organization -Grouping of accounts - Creation of Accounts - creation of inventory-creation of stock groups-, stock categories, units of measurement-stock items-entering of financial transactions-types of vouchers-voucher entry-editing and deleting of-vouchers-voucher numbering-customization of vouchers

UNIT - II: Subsidiary Books and Bank Reconciliation Statement

Sub Division of Journal-Preparation of Subsidiary Books including different types of cashbooks- simple cashbook, cashbook with cash and discount columns, cashbook with cash, discount and. bank columns, cashbook with cash and bank columns and petty cash book. Preparation of sales register, purchase register, journal proper, debit note register, credit note register, and different cash books including interest and discount transactions using computers.

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Bank Reconciliation Statement- Need - Reasons for difference 'between cash book and pass book balances - problems on favourable and over draft balances - Ascertainment of correct cash book balance. Preparation of bank reconciliation statement using computers.

UNIT - III : Trial Balance, Final Accounts; Errors and Rectification

Trial Balance: meaning, objectives, methods of preparation - Final Accounts; Meaning, features, uses and preparation of Manufacturing, Trading Account, Profit & Loss Account and Balance Sheet- Adjusting and Closing entries. Preparation of trial balance, trading, profit and loss account, processing of year ending and closing the books, adjusting and closing entries and balance sheet using computers

Errors and their Rectification - Types of Errors - Rectification before and after preparation of final Accounts - Suspense Account- Effect of Errors on Profit. Rectification of errors using computers.

Unit - IV : Consignment and Joint Ventures :

Consignment – Features, Terms used Proforma invoice – Account sale – Delcredere commission – Accounting treatment in the books of the consignor and the consignee – Valuation of consignment stock – Normal and abnormal Loss – Invoice of goods at a price higher than the cost price.

Joint ventures – features – difference between joint ventures and consignment, Accounting Procedure – Methods of keeping records for Joint venture accounts – method of recording in co ventures books-separate set of books method.

Unit - V : Depreciation – Provisions and Reserves :

Meaning of Depreciation – Causes – objects of providing for depreciation – Factors affecting depreciation – Accounting Treatment – Methods of providing depreciation – Straight line method – Diminishing Balance Method.

Provisions and Reserves – Reserve Fund – Different Types of Provisions and Reserves.

Suggested Readings:

1. R.L. Gupta & V.K. Gupta : Principles and Practice of Accounting, Sulthan Chand & Sons

2. S.P. Jain & K.L. Narang : Accountancy – I, Kalyani Publishers

3. Tulasian : Accountancy – I, Tata Mcgraw Hill Co
4. Dr. V.K. Goyal : Financial Accounting, Excel Books
5. T.S. Grewal : Introduction to Accountancy, S. Chand and Co
6. Haneef and Mukherjee : Accountancy – I, Tata Mcgraw Hill Co
7. Arulanandam : Advanced Accountancy, Himalaya Publishers
8. S.N. Maheshwari & V.L. Maheswari : Advanced Accountancy-I, Vikash Publishing Co.
9. Ashok Benerjee : Financial Accounting, Excel
10. Warren : Financial Accounting, Cengage

BUSINESS ECONOMICS

Paper : 102   Max. Marks : 100
PPW : 4 hours

Objectives :

To facilitate the students to learn the concepts of economics and apply them in real life situations.

UNIT - I : Introduction

Economic and Non-Economic Activities — Business-Meaning — Economics-Definitions—micro and macro economics-method of economics-positive and normative—inductive and deductive approaches—reading of graphs-concept of slope—Utility-cardinal and ordinal utility-Law of diminishing marginal utility-Law of Equi-marginal Utility.

UNIT - II : Demand, Supply and Market Equilibrium

Demand-meaning-individual demand—law of demand-properties of demand curve-income effect and substitution effect-exceptions to the law of demand—individual demand and Market Demand—demand function—determinants of demand and market demand—shift of demand vs. movement along a demand curve—Elasticity of demand-price elasticity-meaning and measurement-price elasticity and total revenue of a firm-income elasticity-classification of goods based on income elasticity-cross elasticity-classification of goods into substitutes and complements—Supply-law of supply- determinants of supply—market equilibrium—concept of consumer surplus.

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UNIT - III : Production and Costs

Production function—Distinction between short-run and long-run—Production with one variable input-relationship between total, marginal and average production functions-law of variable proportion—production with two variable inputs-isoquants-isocosts-techniques of maximization of output, minimization of cost and maximization of profit-scale of production-economies and diseconomies of scale—Cost of production-cost function—short-run total and average costs—long-run total and average cost.

UNIT - IV : Market Structure and Factors of Production

Market structure—characteristics—perfect competition-characteristics-equilibrium price—profit maximizing output in the short and long-run—Monopoly-characteristics-profit maximizing output in the short and long run-defects of monopoly—monopolistic competition-characteristics—product differentiation-profit maximizing price and output in the short and long-run—Oligopoly-characteristics-price rigidity-the kinked demand curve——Factors of Production.

UNIT - V : National Income, Trade Cycles and International Trade

National Income—definition-measurement—GDP-meaning—fiscal deficit—economic systems-socialism-mixed economy system-free market economies- Concepts of Economic Liberalisation, privatization, Globalisation—WTO—objectives—agreements—functions—Trade cycles-meaning-phases-consequences-remedies—International Trade-Balance of payments.

Suggested Books :

Aryasri and Murthy : Business Economics, Tata Mcgraw Hill
Deepashree : General Economics, Tata Mcgrawhill
HL Ahuja : Business Economics, S. Chand
KPM Sundaram : Micro Economics
Mankiw : Principles of Economics,Cengage
Mithani : Fundamentals of Business Economics, Himalaya

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BUSINESS ORGANIZATION AND MANAGEMENT

Paper : 103   Max. Marks : 70+30
PPW : 5 hours

Objective :

To facilitate the students to learn the concepts of business organization and management.

UNIT - I : Fundamental Concepts:

Concepts of business, trade, industry and commerce- Business — features of business, Trade - Classification- Aids to Trade - Industry- Classification - Commerce-Relationship between trade, industry and commerce- Business Organization-Concept- -Functions of Business,

Entrepreneur — Meaning-Characteristics of Entrepreneurs - Types of Entrepreneurs -Functions of an entrepreneur - Steps to start Enterprise- Sources of finance -Long Term-Short Term

Lab Work: The students are expected to go through project reports.

Unit-II : Forms of Organization, Sole Proprietorship, Partnership and Joint Hindu Family:

Business Organization - Forms of Business Organization - Classification - Factors influencing the choice of suitable form of organization.

Sole Proprietorship -Meaning -Characteristics - Advantages and disadvantages - suitability.

Partnership - Meaning -Characteristics -Kinds of partners- Registration of partnership - Partnership deed - Rights and obligations of partners - Joint Hindu Family Business - Characteristics — Advantages and limitations.

Lab Work: The students are expected to go through partnership deed and prepare a simple partnership deed.

Unit-III : Joint Stock Company :

Joint Stock Company - Meaning - Characteristics -Advantages - Kinds of Companies -Difference between private and public companies -Promotion of A Company: Promotion-Stages-Promoters

-Characteristics -Registration -Capital subscription -Commencement of Business - Preparation of Important documents-Memorandum of Association - Significance - Clauses - Articles of Association - Contents — Prospectus-Contents-Statement in lieu of Prospectus.

Lab Work: The students are expected to go through a memorandum of association, articles of association and prospectus. As a group they are expected to prepare a model prospectus.

Unit - IV : Management, Planning and Decision Making

Management- Meaning - Significance- Management Vs Administration - Functions of management - Levels of Management - Skills of management -Leadership-Leader Vs Manager-Traits of successful Leaders- Scientific Management - features- Fayol's Principles of Management .

Planning – Meaning – Significance – Types of Plans – Decision making – Steps in Process Decision making process

Lab Work : The students are expected to prepare a small note of the skills of management required to manage the organization of their choice.

Unit - V : Organizing

Organizing – meaning – Organization – Features – the process of organization – principles of organization-Elements of organizations-organization chart

Delegation of authority – meaning – Elements – Principles – Types – Difficulties in delegation – Guidelines for making delegation effective

Centralization – Decentralization – Meaning – Differences between delegating and decentralization

Lab Work : The students are expected to go through the organization structures of a few organizations and prepare an organization structure for a small unit.

The students are expected to prepare a small project report on how to start a small industry unit of their choice incorporating various aspects learned in this subject.

Suggested Books :

1. Batia RC : Business Organization and Management, Ane Books
2. Talloo : Business Organisation and Management. Tata

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3. RK Sharma and Shashi K. Gupta : Industrial Organization and Management, Kalyani.
4. CB Gupta : Industrial Organization and Management
5. Aryasri and Murthy : Industrial Organization and Management, Tata
6. Govindarajan and Natarajan : Principles of Management, Prentice Hall
7. RK Sharma and Shashi K. Gupta : Industrial Organization and Management, Kalyani
8. CB Gupta : Industrial Organization and Management, Sultan Chand
9. Bhushan YK : Business Organization and Management, Sultan Chand
10. Surendar and Madhavi : Industrial Organization and Management, Himalaya
11. Sherlekar : Business Organization and Management, Himalaya
12. Robins SP : Management, PHI
13. Rao VSP : Management, Excel
14. Gupta CB : Entrepreneurship Development in India, Sultan Chand
15. Prasad LM : Management , Sultan Chand
16. Subba Rao P : Management and Organization Behavior, Himalaya
16. Dubrin : Essentials of Management, Cengage
17. Satyaraju : Management, PHI
18. Moshal : Organization and Management, Galgotia
19. Kumkum Mukhrjee : Principles of Management, Tata
20. Chandra Bose : Principles of Management, PHI
21. James F. Stoneir : Management, PHI

FUNDAMENTALS OF INFORMATION TECHONOLOGY

Paper : 104   Max. Marks : 70+30
PPW : 5 hours

Objective:

To impart basic knowledge about computer with application of various packages.

UNIT - I :

Introduction to computers : Definition, Characteristics and limitations of computers - Elements of Computers - Hardware - CPU - Primary and Secondary memory - Input and Output devices. IT enabled services - BPO, KPO, Call centers.

Modern communications : (Concepts only)- communications — FAX, Voice mail, and information services - E Mail - Creation of

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email id - group communication -Tele conferencing - Video conferencing - File exchange - Bandwidth - Modem -Network Topologies - Network types LAN, MAN, WAN and their architecture - Dial up access

UNIT - II :

Operating System and Windows : Operating Systems: Meaning, Definition, Functions and Types of Operating Systems - Booting process - Disk Operating System: Internal and External Commands - Wild Card Characters - Computer Virus, Cryptology. Windows operating system - Desktop, Start menu, Control panel, Windows accessories.

UNIT - III:

MS Office I : MS Word : Word Processing : Meaning and features of word processing - Advantages and applications of word processing - Parts of MS Word application window - Toolbars - Creating, Saving and closing a document - Opening and editing a document - Moving and copying text - Text and paragraph formatting, applying Bullets and Numbering - Find and Replace - Insertion of Objects, Date and Time, Headers, Footers and Page Breaks - Auto Correct - Spelling and Grammar checking - Graphics, Templates and wizards - Mail Merge : Meaning, purpose and advantages - creating merged letters, mailing labels, envelops and catalogs-Working with Tables - Format Painter.

MS EXCEL : Features of MS Excel - Spread sheet / worksheet, workbook, cell, cell pointer, cell address etc., - Parts of MS Excel window - Saving, Opening and Closing workbook - Insertion and deletion of worksheet - Entering and Editing data in worksheet - cell range - Formatting - Auto Fill -Formulas and its advantages - References : Relative, absolute and mixed - Functions: Meaning and Advantages of functions, different types of functions available in Excel - Templates -Charts -Graphs - Macros : Meaning and Advantages of macros, creation, editing and deletion of macros - Data Sorting, Filtering, validation, Consolidation, Grouping, Pivot Table and Pivot Chart Reports.

UNIT-IV:

MS Office II : MS Access - Data, Information, Database, File, Record, Fields-Features, advantages and limitations of MS Access - Application of MS Access -parts of MS Access window - Tables, Forms, Queries and Reports - Data validity checks - (Theory with simple problems)

MS PowerPoint: Features, advantages and application of Ms Power point - Parts of MS Power point window - Menus and Tool bars - Creating presentations through Auto content wizard, Templates and manually - slide show - saving, opening and. closing a Presentation - Inserting, editing and deleting slides -Types of slides -Slide Views- Formatting -Insertion of Objects and Charts in slides- Custom Animation and Transition.

Multimedia : Meaning, purpose, Usage and application - Images, Graphics, sounds and music - Video presentation devices - Multimedia on web.

UNIT - V : Internet & E-commerce

Services available on internet - WWW - ISP.

E commerce : Meaning .advantages and limitations, applications of E commerce -trading stocks online, ordering products / journals / books etc., online, travel and tourism services, employment placement and job market, internet banking, auctions, online publishing, advertising-Online payment system..(including practicals)

Lab Work:
MS DOS

MS WINDOWS

MS WORD

MS EXCEL

MS ACCESS

MS POWERPOINT

INTERNET AND E COMMERCE PRACTICALS

References:

1. Information Technology : Dennis P. Curtin, McGraw Hill International
2. Fundamentals of Computers : P. Mohan, Himalaya Publishing House
3. Fundamentals of Computers : Atul Kahate, Tata McGraw Hill
4. Fundamentals of Computers : V. Srinivas, Kalyani Publications
5. MS Office : Sanjay Saxsena
6. MS Office : BPB Publications
7. E commerce : CSV Murthy, Himalaya Publishing House
8. Raymond Green Law : Fundamentals of the Internet, Tata McGraw Hill
9. Efraim Turban : Electronic Commerce, Pearson Education
10. E-Commerce, E-Business : C.S. Rayudu, Himalaya Publishing House.

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B.Com. - SECOND YEAR

ADVANCED ACCOUNTING

Paper : 201

PPW : 5+1   Max. Marks : 70+30

Objectives:

1   To appraise the students about the application of accounting knowledge in special business activities.

2.   To impart the skills of preparation of final accounts of non- trading concerns, partnership, organizations.

3.   To develop the skills of recording of transactions relating to issue of shares and debentures, branches and departments manually and using computers.

UNIT - I :   Accounts from Incomplete Records - Hire purchase and installment purchase system.

Single Entry : Features - books and accounts maintained- Recording of transactions -Ascertainment of Profit. -(Statement of Affairs method only).

Hire Purchase System - Features — Accounting Treatment in the Books of Hire Purchaser and Hire Vendor - Default and Repossession -Installment Purchase System -Difference between Hire purchase and Installment purchase systems -Accounting Treatment in the books of Purchaser and Vendor

UNIT - II :   Branch and Departmental Accounts :

Dependent Branches: features-Books of accounts- methods of accounting of dependent branches - Debtors System, Stock and debtors system — Recording of transaction relating to branch accounts using computers.

Departmental Accounts: Need, features, Basis for Allocation of Expenses, treatment of Inter - Departmental Transfer at cost or Selling Price-Treatment of Expenses that cannot be allocated - Preparation of departmental profit and loss.

UNIT - III : Accounting of Non-Profit Organizations :

Non-Profit entities-Features of non-profit entities - Accounting process-Preparation of summaries -Receipts and Payments Account

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meaning and special features-Procedure for preparation-uses and limitations.

Income and Expenditure Account- features- procedure for preparation-preparation of Balance Sheet

UNIT - IV : Partnership Accounts:

Legal provisions in the absence of Partnership Deed - Fixed and Fluctuating Capitals -Preparation of final accounts. - Accounting Treatment of Goodwill and Admission of a partner. .

Accounting treatment of Retirement and Death of a Partner - Dissolution of Firm (Excluding Sale to Firm, Company and Amalgamation) - Recording of partnership transaction and preparation of final accounts using computers. (24 hours)

UNIT - V : Company Accounts:

Issue of Shares at par, Premium and at Discount - Forfeiture and Reissue of Shares-Rights issue (Theory Only) - Recording of transactions relating to issue of shares using computers.

Issue and Redemption of Debentures - Redemption out of profits sinking fund method. Recording of transaction relating to issue and redemption of debentures using computers Underwriting of Issue of Shares(Simple **Problems**)

Suggested Readings:

1. Principles and Practice of Accounting R.L. Gupta & V.K. Gupta Sulthan Chand &sons
2. Accountancy - I : Tulasian, Tata Mcgraw Hill Co
3. Accountancy - I : S.P. Jain & K.L Narang , Kalyani Publishers
4. Financial Accounting : Dr.V.K.Goyal, Excel

Books

5. Introduction to Accountancy : T.S.Grewal, S.Chand and Co
6. Accountancy-I : Haneef and Mukherjee, Tata Mcgraw Hill co
7. Advanced Accountancy : Arulanandam, Himalaya publishers
8. Advanced Accountancy-I : S.N.Maheshwari & V.L.Maheswari, Vikash Publishing Co.

BUSINESS STATISTICS (202)

PPW : 5+1   Max. Marks : 70+30

The objective of this paper is to impart knowledge on the application of statistical- tools and techniques in business decision-making & use of MS-Excel in interpretation of statistical data.

UNIT - I : Introduction to Statistics :

Meaning, definition, importance and limitations of statistics. Collection of data- Primary and Secondary data -(Sampling-Random-Non Random-Census)- Schedule and questionnaire - Frequency distribution -Tabulation-Diagrammatic and. graphic presentation of data using Computers (Excel).

UNIT - II : Measures of Central Tendency :

Definition Objectives and Characteristics of measures of Central Tendency-Types of Averages - Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Deciles, Percentiles, Properties of averages and their applications. Calculation of averages using computers.

UNIT - III : Measures of dispersion and Skewness :

Meaning, definitions, Properties of dispersion-Range-Quartile Deviation -Mean Deviation-Standard Deviation- Coefficient of Variation-Skewness definition-Karl Pearson's and Bowley's Measures of skewness-Normal Distribution Calculation of Dispersion and skewness using Computers.

UNIT - IV : Measures of Relation :

Meaning, definition and use of correlation - Types of correlation-Karlpearson's correlation coefficient - Spearman's Rank correlation-probable error-Calcuation of Correlation by Using Computers.

Meaning and utility of Regression analysis comparison between, correlation and Regression - Regression Equations-Interpretation of Regression Co-efficient. Calcuation of Regression by Using Computers.

UNIT - V : Analysis of Time Series & Index Numbers:

Meaning and utility of time series Analysis- Components of Time series-Measurement of trend and Seasonal Variations - Utility of Decomposition of Time Series-Decentralization of Data-Calculation,

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of trend and seasonal variations using computers.
Meaning, Definition and Importance of Index Numbers-Methods of Construction of Index Numbers - Price Index Numbers - Quantity Index Numbers -Tests of Adequacy of Index Numbers - Deflating Index Numbers - Cost of Index Numbers-Limitation of Index Numbers. Calculation of index numbers using computers.

Suggested Readings:

1. Business Statistics : Reddy, C.R Deep Publications, New Delhi.
2. Statistics-Problems and Solutions : Kapoor V.K.
3. Fundamentals of Statistics : Elhance .D.N
4. Statistical Methods : Gupta S.P.
5. Statistics : Gupta B.N.
6. Fundamentals of Statistics : Gupta S.C.
7. Statistics-Teory,Methods and Applications : Sancheti, D.C. & Kapoor V.K.
8. Practical Business Statistics : Croxton & Crowdorv.
9. Statistics and their applications to Commerce : Borddigtion
10. Statistics Concepts & Applications : Nabendu Pal & Sahadeb Sarkar
11. Business Statistics,An Applied Orientation : P.K. Viswanathan
12. Business Statistics : J.K. Sharma
13. Business Statistics : Bharat Jhunjhunwala
14. Busniess Statistics : R.S. Bharadwaj

PAPER : 203

FINANCIAL SERVICES - BANKING & INSURANCE

PPW : 5   Max. Marks : 70+30

Objectives :

To impart knowledge on Banking and Insurance concepts and to gain an insight on Financial Services

UNIT – I : Introduction of Financial Services

a. Meaning of Financial Services, Structure of Indian Financial System Importance of Financial System for the economic development. (Financial and Banking system charts)

b. Definition of Bank, Functions of Commercial Banks and Reserve Bank of India. (Forms of various accounts and deposits)

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c.   Definition/Meaning of Insurance and reinsurance, Principles of Insurance, kinds of Insurance, advantages of insurance, globalization of insurance and insurance sector reforms in India.

UNIT – II : Banking Systems and its Regulation

a.   Banking Systems – Branch banking, Unit Banking, Correspondent banking, Group banking, Deposit banking, Mixed banking and Investment banking. An overview of banking; Banking Sector Reforms with special reference to Prudential Norms: capital adequacy norms, income recognition norms, classification of assets and NPAs; Innovations in Banking-ATMs, E-Banking, Credit, Online & Offshore Banking, etc (working and operations)

Regional Rural banks, Cooperative banks, Micro Finance, Priority Sector Lending, Indigenous banking, Role of NABARD, Development Financial institutions – **SFC.SIDBI.**

UNIT – III : Banker and customer, loans and advances :

a.   Banker and customer definition and their relationship, types of customers and modes of operations, procedure and precaution for opening an account, pass book & its features, Rights, duties and obligations of the banker. (Application forms for opening accounts, Cheque Books, pass books, requisition slips for withdrawals and deposits, bank statements, etc)

b.   Promissory Note and Bills of Exchange and Cheque, differences between them, types of crossing the cheque, payment of cheque and consequences of wrongful dishonor, collection of local and upcountry cheques, responsibility and liabilities of collecting banker and statutory protection to the collecting banker. (Promissory notes, B/E, Crossed cheques-various modes)

c.   Types of loans and advances, principles of sound lending policies, credit appraisals of various forms of loans and advances- modes of creating charges- lien pledge, mortgage and hypothecation (Documents required for sanction of loans and advances)

UNIT – IV : Financial Markets & Services :

a.   Indian Money Market- Characteristics, Structure, composition (call and noti money, market, treasury bills market, CDs, CPs, short term bill mai MMMFs and DFHI) problems and reforms in Indian money market (CDs, CPs, Treasury Bills)
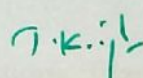
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b. Indian capital market-composition and growth of primary and secondary markets, differences between primary and secondary markets, capital market reforms and NBFCs in capital markets; Stock Exchanges, NSE, OTCEI, Online Trading and role of SEBI.

c. Financial intermediaries and services : Merchant bankers, Mutual funds, Leasing companies, Venture Capital Funds, Forfeiting, Loan Syndics Factoring, Custodial Services, Depository Services, and Depository Participants. (Documentation)

UNIT – V : Types of Insurance and its regulation

a. Life Insurance – Practical aspects of Life Insurance, procedure for issuing a lift insurance policy, issue of duplicate policies, nomination, surrender value, policy loans, assignment, revivals and claim settlement. (Formats of types of Insurance)

b. Non Life Insurance- Types of products and scope of Fire Insurance, Tv Insurance, Health Insurance, Social Insurance and Rural Insurance. Regulate Insurance in India- Insurance Act, 1938 and IRDA 1999. (Formats of types of Life Insurance)

Books Recommended :

1. Maheshwari and Paul R.R. : Banking theory law and practice
2. Sundaram and Varsheney : Banking theory law and practice
3. Tannans : Banking law and practice in India
4. Aryasri : Banking and Financial System
5. M.Y. Khan : Indian Financial System
6. P.K. Gupta : Insurance and risk management
7. Vijaya Raghavan Iyengar : Introduction to Banking
8. Guruswamy : Banking Theory Law and Practice, Tata
9. Aryasri & Murty : Banking and Financial Systems, Tata
10. Guruswamy : Merchant Banking and Financial Services, Tata
11. Murthy and Venugopal : Indian Financial System, IK International
12. Paul Suresh : Management of Banking and Financial Services, Pearson

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Paper - IV :
204 TAXATION

PPW : 4　　　　　　　　　　　　　　　　　　Max. Marks : 70+30

Objectives :

To equip the students with the working knowledge of both direct and indirect taxes.

UNIT - I : Introduction

Taxes - Meaning - Need for and Rationale of taxes - Direct and Indirect Taxes - Constitutional Provisions on Taxation - Union List - State List - Tax Rates - Blanket Rate Method - Slab Rate Method - Surcharge - Cess - Progressive v/s Regressive Taxes. - An Overview of Taxation System in India.

UNIT - II : Income Tax

Income Tax Act 1961 - Important Definitions - Residential Status - Incidence of Tax - Exempted Incomes - Agricultural Income - An overview of five heads of income - Deduction - Set off and Carry Forward of losses - Assessment of Individual - Computation of Taxable Income - Return Filling and Assessment thereof. - Collection and Recovery of Taxes - Tax Deducted at Source - Advance Tax. - (Including Problems)

Lab Work : Filling Relevant Forms for Individual Assessees.
Format and filling of Form : 16
Format and filling & filling of ITR-1 & ITR-2

UNIT - III : WEALTH TAX

Wealth Tax Act 1957 - Charge of Wealth Tax - Valuation Date - Location of Assets - Assets - Meaning - Deemed Assets - Exempted Assets - Net Wealth - Computation of Net Wealth - Valuation of Assets - Return of Wealth and Procedure of Assessment - Time Limit for Completion of Assessment. (Including Problems)

Lab Work : Computation of Tax liability.

UNIT - IV : Sales Tax & Service Tax

Central Sales Tax :- Definitions - Dealer, Declared Goods, Place of Business, Sale, Sale Price, Turnover - Inter State Trade or Commerce - Computation of Taxable Turnover - Assessment and Returns under CST Act (Including Problems)

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APVAT Act, 2005 - Statement of Objectives and Reasons - Definitions : Business Casi Trader, Dealer, Input Tax, Output Tax, Place of Business, Tax Invoice, Total Turnover Tax. - Computation of Taxable Turnover - Registration Procedure (Including Problems)

Service Tax Act, 1994 - Introduction - Meaning of Service - Classification of Taxo Services - Valuation of Taxable Services - Registration - Assessment Procedure.

UNIT - V : Central Excise & Customs

Central Excise Duty - Definitions - Taxable Event under Central Excise - Types Duties - Classification - Valuation - Registration Procedure - CENVAT Credit.

Customs Duty - Important Definitions - Goods, Import, Export, Importer, Expoi Territorial Waters, India, Bill of Entry - Import and Export Procedure - Vary Documents used in Foreign Trade –- Baggage - Stores - Valuation Rules.

References :

1. Direct taxes law & practice - Vinod K Singhania, Kapil Singhania, Taxmann.
2. Direct taxes law & practice - Girish Ahuja, Dr. Ravi Gupta, Bharat's
3. Direct taxes law & practice - BB Lai – Pearson's
4. Indirect taxes law & practice - V.S. Datey, Taxmann's
5. Indirect taxes - V. Nagaragan, Asia Law – House
6. Central Exercise Mannual - Law & Procedure - P. Verra Reddy, Asia Law House
7. Andhra Pradesh VAT Act & Rules - N.K. Acharya, Asia Law House
8. Elements of Income Tax - Dr. P.V. Ramana Rao, Dr. A. Sudhakar D:
9. Krishnaiah Goud, National Publishing House
10. Income Tax Law & Practice - Gaur & Narang, Kalyani Publishers
11. Income Tax - Tata Mcgraw Hill
12. Income Tax Law and Practice - N. Hariharan, Tata
13. Income Tax and Central Sales Tax : Lai Vashist, Pearson
14. Direct Taxes : Lai Vashist, Pearson

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B.Sc. BOTANY (BZC)
Theory & Practicals Syllabus

FIRST YEAR

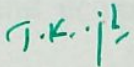PAPER - I : Mocrobial Diversity, Cryptogams and Gymnosperms

SECOND YEAR

PAPER - II : Anatomy, Embryology, Taxonomy and Medicinal Botany

THIRD YEAR

PAPER - III : Cell Biology, Genetics, Ecology and Biodiversity

PAPER - IV : Physiology, Tissue Culture, Biotechnology, Seed Technology and Herticulture

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B.Sc. BOTANY (BZC)
Theory & Practical Syllabus

FIRST YEAR

PAPER - I
MICROBIAL DIVERSITY, CRYPTOGAMS AND GYMNOSPERMS

UNIT – I : Evolution of Life and Diversity of Microbes

1. Origin and evolution of Life – an outline.

2. **Viruses :** Structure, replication and transmission; plant diseases caused by viruses and their control.

3. **Bacteria :** Structure, nutrition, reproduction and economic importance. An outline of Plant diseases of important crop plants caused by bacteria and their control.

4. Brief account of Archaebacteria, Chlamydia, Actinomycetes and Mycoplasma.

5. **Cyanobacteria :** Cell structure, thallus organisation and their prospecting (uses) – Biofertilizers. Structure and life history of *Oscillatoria, Nostoc* and *Anabaena.*

UNIT – II : Algae and Fungi

6. **Algae :** General account, thallus organisation, structure, reproduction, classification and economic importance.

7. Structure, reproduction, life history and systematic position of *Oedogonium, Coleochaete, Chara, Ectocarpus* and *Polysiphonia.*

8. **Fungi :** General characters, classification and economic importance.

9. Structure, reproduction and life history of *Albugo, Saccharomyces, Penicillium, Puccinia, Altermania.* General account of plant diseases caused by Fungi and their control.

10. **Lichens :** Structure and reproduction; ecological and economic importance.

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UNIT – III : Bryophyta and Pteridophyta

11. **Bryophytes :** General characters, classification and alternation of generations.

12. Structure, reproduction, life history and systematic position of *Marchantia, Anthoceros* and *Polytrichum. Evolution* of Sporophyte in Bryophytes.

13. **Pteridophytes :** General characters, classification, alternation of generations and evolution of sporophyte.

14. Structure, reproduction, life history and systematic position of *Rhynia, Lycopodium, Equisetum* and *Marsilea.*

15. Evolution of stele, heterospory and seed habit in Pteridophytes.

UNIT – IV : Gymnosperms and Palaeobotany

16. **Gymnosperms :** General characters, structure, reproduction and classification.

17. Morphology of vegetative and reproductive parts, systemic position, life history of *Pinus* and *Gnetum*

18. Distribution and economic importance; endangered Gymnosperms.

19. **Palaeobotany :** Introduction, Fossils and fossilization; Geological time scale; Importance of fossils.

20. Bennettitales : General account

Suggested Readings:

1. Alemopolus, J. and W.M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.

2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New York.

3. Pandey, B.P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.

4. Pandey, B.P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.

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SECOND YEAR

PAPER - II
ANATOMY, EMBRYOLOGY, TAXONOMY AND MEDICINAL BOTANY

UNIT - I: ANATOMY

1. *Meristems:* Types, histological organization of shoot and root apices and theories.

2. **Tissues** and **Tissue Systems:** Simple, complex and special tissues.

3. Leaf: Ontogeny, diversity of internal structure; Stomata and epidermal outgrowths.

4. **Stem** and **root anatomy,** Vascular cambium - Formation and function. Anomalous Secondary growth-general account. *Ex:* **Stem**-*Achyranthes, Boerhavia, Bignonia, Dracaena;* **Root-** *Beta vulgaris*

5. *Wood structure:* General account. Study of local timbers - Teak (*Tectona grandis*),Rosewood, *(albergia latifolia),* Red sandal, *(Pterocarpus santalinus)*Nalamaddi, *(Terminalia tomentosa (T. alat)* Peddagi *(Pterocarpus marsupiun),* and Neem *(Azadirachta indica)*

UNIT - II: EMBRYOLOGY

6. Introduction to Embryology. Anther structure, Microsporogenesis and development of male gametophyte.

7. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.

8. Pollination - Types; Pollen - pistil interaction. Fertilization.

9. Endosperm - Development and types. Embryo - development and types; Polyembryony and Apomixis - an outline

10. Palynology: Pollen morphology, NPC systems, application of Palynology.

UNIT - III: TAXONOMY

11. Introduction : Principles of Plant Systematics, Systematics vs Taxonomy, Types of classification : Artificial, Natural and Phylogenetic

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12. Systems of classification : Salient features and comparative account of Bentham & Hooker and Engler & Prantle. An introduction to Angiosperm Phylogeny Group (APG)

13. Current concepts in Angiosperm Taxonomy : Embryology in relation to taxonomy, Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy.

14. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief account. Herbarium: concept, techniques and applications.

15. Systematic study and economic importance of plants belonging to the following families: Annonanceae, Capparadaceae, Rutaceae, Fabaceae (Faboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae, Apiaceae, Asteraceae. Asclepiadaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidacae and Poaceae

UNIT- IV : MEDICINAL BOTANY

16. Ethnomedicine: Scope, interdisciplinary nature, distinction of Ethnomedicine from Folklore medicine. Outlines of Ayurveda, Sidda, Unani and Homeopathic systems of traditional medicine. Role of AYUSH, NMPB, CIMAP and CDRI.

17. Plants in primary health care: Common medicinal plants - Tippateega *(Tinospora cordifolia)*, tulasi *(Ocimum sanctum)*, Pippallu *(piper longum)*, Karaka *(Terminalia chebula)*, Kalabanda *(Aloe vera)*, Turmeric *(Curcuma longa.)*.

18. Traditional medicine vs Modern medicine : Study of select plant examples used in traditional medicine as resource (active principles, structure, usage and pharmacological action) of modern medicine : Aswagandha *(Withania somnifera)*, Sarpagandha *(Rauvolfia serpentina)*, Nela usiri *(Phyllanthus amarus)*, Amla *(Phyllanthus emblica)* and Brahmi *(Bacopa monnieri)*.

19. Pharmacognosy : Introduction and scope, Adulteration of plant crude drugs and methods of identification - some examples. Indian Pharmacopoeia.

20. Plant crude drugs : Types, methods of collection , processing and storage practices, Evaluation of crude drugs.

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Practical - II :

ANATOMY, EMBRYOLOGY, TAXONOMY AND MEDICINAL BOTANY

(Total Hours of Laboratory Exercises : 90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

1. Demonstration of double staining techniques

2. Tissue organization in root and shoot apices using permanent slides

3. Preparation of double staining slides
   Primary structure: Root - *Cicer, Canna;* Stem *Tridox, Sorghum*
   Secondary structure: Root - *Tridox sp.;* Stem - *Pongamia*
   Anomalous secondary structure: *Achyranthes, Boerhavia, Bignonia, Dracaena, Beta vulgaris*

4. Stomatal types using epidermal peels

5. Microscopic study of wood in T.S., T.L.S. and R.L.S

6. Structure of anther and microsporogenesis using permanent slides

7. Structure of pollen grains using whole mounts
   (Catharanthus, Hibiscus, Acacia, Zea)

8. Pollen viability test using *in-vitro* germination
   (Catharathus)

9. Study of ovule types and developmental stages of Embryo sac.

10. Structure of endosperm (nuclear ad cellular);
    Developmental stages of dicot and monocot
    Embryos using permanent slides

11. Isolation and mounting of embryo
    (using *Cymopsis/Senna/Crotalaria*)

12. Systematic study of locally available plants
    belonging to the families prescribed in theory
    Syllabus (minimum of one plant representative for each family)

13. Demonstration of herbarium techniques and collection
    of Medicinal Plants.

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THIRD YEAR

Paper- III :
CELL BIOLOGY, GENETICS, ECOLOGY AND BIODIVERSITY

UNIT-I: Cell Biology

1. *Plant cell envelops:* Ultra structure of cell wall, molecular organization of cell membranes.

2. *Nucleus-* Ultrastructure, Nucleic acids - Structures and replication of DNA; Types and functions of RNA.

3. *Chromosomes:* Morphology, organization of DNA in a chromosome. Euchromatin and Heterochromatin, Karyotype.

4. *Special types of chromosomes:* Lampbrush, polytene and B - chromosomes.

5. *Cell division:* Cell cycle and its regulation ; mitoses, meiosis, and their significance.

UNIT- II: Genetics

6. *Mendelism :* Laws of inheritance. Genetic interactions - Epistasis, Complementary, Supplementary and inhibitory genes.

7. *Linkage and crossing over:* A brief account, construction of genetic maps - 2 point and 3 point test cross data.

8. *Mutations:* Chromosomal aberrations - structural and numerical changes; Gene mutations, transposable elements.

9. *Gene Expression:* Organization of gene, transcription, translation, mechanism and regulation of gene expression in prokaryotes (Eac.and Trp Operons).

10. Extra nuclear genome: Mitochondria! and plastid DNA, Plasmids.

UNIT-III: Ecology

11. Concept and components of Ecosystem. Energy flow, food chains, food webs, ecological pyramids, biogeochemical cycles Carbon. Nitrogen. Phosphours.

12. Plants and environment: Ecological factors Climatic (light and temperature), edaphic and biotic. Ecological adaptations of plants.

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13. Population ecology: Natality, Mortality, growth curves, ecotypes. ecads.

14. Community ecology: Frequency, density, cover life forms, biological spectrum, Ecological succession (Hydrosere, Xerosere).

15. Production ecology: Concepts of productivity, GPP.NPP, CR (Community -- Respiration) and secondary production, P/R ration and Ecosystems.

UNIT - IV : Biodiversity and Conservation

16. Biodiversity: Concepts, Convention on Biodiversity - Earth Summit. Types of biodiversity.

17. Level, threats and value of Biodiversity.

18. Hot spots of India - endemism. North Eastern Himalayas, Western Ghats.

19. Agro-biodiversity: Vavilov centres of crop plants.

20. Principles of conservation: IUCN threat - categories, RED data book- Threatened & endangered plants of India. Role of organizations in the Conservation of Biodiversity - IUCN, UNEP, WWF, NBPGR, NBD.

Practical- III :
CELL BIOLOGY, GENETICS, ECOLOGY AND BIODIVERSITY
(Total Hours of Laboratory Exercises:
90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

I.   Major Experiments

1.   Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.

2.   Study of various stages of mitosis using cytological preparations of onion root tips.

3.   Study of various stages of meiosis using cytological preparation of onion flower buds

4.   Study of plant community by quadrate method

5.   Estimation of chemical oxygen demand (COD) in a given water sample.

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II. Minor Experiments

6. Karyotype study using cytological preparation of dividing root tip cells of onion/photographs/permanent slides

7. Study of polytene chromosomes using salivary glands from *Chironomus* / prepared slides/ photographs.

8. Solving genetic problems related to monohybrid, dihybrid ratio and interaction of genes (Minimum of six problems in each topic). **See annexure-I**

9. Demonstration of soil texture (composition of clay, sand silt etc.) pH.

10. Estimation of water purity in given water samples

11. Estimation of OT in given water samples

12. Estimation of chlorides in given water samples

III. Scientific Observations

13. Study in the ultra structure of cell organelles using electron microphotographs.

14. Geographical spotting of certain endemic and endangered plant species of A.P.

15. Minimum of two field visits to local areas of ecological/ conservation of biodiversity Importance (Sacred grove/ Reserved Forest / Botanical garden/ Lakes etc.)

IV. Critical notes on spotters of scientific interest

16. Salivary gland chromosome
17. Lampbrush chromosome
18. Solenoid model of chromosome structure
19. Operon model
20. *Mirabilis jalapa*
21. *Eichhornia 11. Hydrilla*
23. *Pistia*
24. *Nymphaea*
25. *Vallisnaria*
26. *Asperagus*
27. *Opuntia*
28. *Euphorbia antiquorum*
29. *Rhizophora*
30. *Avecenia*

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B.Sc. Botany Practical Syllabus

Paper - III
Annexure - I

Monohybrid cross:

(i)   In pea, tall plant is dominant over dwarf plant. If a homozygous tall is crossed with a dwari plant, describe (i) the genotypes and phenotypes of F_1 and F_2 progeny, (ii) the gametes produced by F_1 and (iii) the genotypes and phenotypes of test cross and back cross progeny.

(ii) In pea, yellow cotyledon is dominant over green cotyledon colour. A plant heterozygous for yellow cotyledon is crossed with a plant homozygous for green cotyledon colour. Determine the gametes produced by these plant, and the genotypes and the phenotypes of progeny obtained from their cross.

(iii) In a cross between two parents 22 plants are round and 8 plants are wrinkled. Find out the genotype of the parents involved in the above cross.

(iv) What gametes will be produced by the plants involved in the following four crosses and what will be the size of the offspring from the each cross.

   (i) TT x Tt (ii) Tt xTt (iii) TT x tt (iv) Tt x tt.

(v)   A tall plant is crossed with a dwarf plant. In the progeny, about one-half of the plants are tall and the renaming one-half dwarf. Determine the genotypes of the tall and dwarf plants.

(vi) In *Mirabilis* (Four 'O' clock), a plant hybrid for red ® and whiter flowers ® had pink flower (Rr). A plant with pink flowers is crossed with one having red flowers and with another having white flowers. Give the genotypic and phenotypic ratios expected in progenies from these crosses.

Dihybrid cross:

(vii) A dwarf pea plant with yellow seed is crossed with a tall plant with green seeds. Give the genotype and phenotype of FI, the gametes produced by FI, the genotypes and phenotypes of p2 and testcross progeny.

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(viii) In snapdragon, tall (DD) is dominant dwarf (dd) and red flowers (RR) are incompletely dominant over white (rr), the hybrid being pink. A pure tall white is crossed to a pure dwarf red and the FI are self-fertilised. Give the expected genotypes and phenotypes in F_1 and F_2

(ix) Let Y.y, S and s represent yellow, green, round and wrinkled characters of the seed of *Pisum sativum*, what will be the colour and shape of the seeds produced by the offspring of the flowing crosses : (i) YYss x yySS, (ii) Yy Ss x Yyss.

(x) In man, brown eyes (V0) are dominant to blue (b) and dark hairs ® dominant to red hairs (r). A man with brown eyes and red hairs and marries a woman with blue eyes and dark hairs. They have two children, one with brown eyes and red hairs and the other with blue eyes and dark hairs. Give the genotypes of the parents and children.

(xi) In Guinea pigs rough coat colour (R0) is dominant over smooth coat ® and black colour (B) is dominant over white (b). when two pigs are mated the following offspring are formed. 28 rough black, 31 rough white, 11 smooth black, 10 smooth white. Find out the genotypic parents involve in the mating.

(xii) In summer squash white fruit colour id governed by a dominant allele W and yellow fruit colour by its recessive w. a dominant allele had another locus (s) produces disc shaped fruit and its recessive (s) is produces sphere shaped fruit. A homozygous white disc variety of genotype WWSS is crossed with a homozygous yellow sphere variety (wwss). What are the phenotypes expected in the F_1, F_2 backcross and test cross progenies?

Gene interactions:

(xiii) A pure Rose combed chicken is mated with a pure Pea combed chicken. All the F1 Wulnut with Rose and Pea separately and how phenotypes and genotypes.

(xiv) A cross between Rose combed chicken and Walnut combed chicken produced 15 Walnut, 14 Rose, 5 Pea and 6 Single comb offspring. Determine the genotypes of the parents.

(xv) In sweet pea, genes C&P are necessary for coloured flowers. The absence of either or both of these genes the flowers are white. What will be the ratio of the offsprings of the following crosses. (i) Cc xccPp (ii) Cc x Ccpp © CcPp x CcPp.

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(xvi) Coloured flowered (purple) are dependent on dominant genes C&P. Presence of any one dominant gene fails to produce colour becoming white. A purple flowered plant is crossed with a white flowered plant. 17 Purple and 16 white flowered plants are produced. Give the genotypes of the parents.

(xvii) In mice, black colour of hair is determined by a dominant gene C. Agouti is a wild character which is dependent on dominant gene A. this wild character is expressed when ever it interacts with coloured gene. Albino micro mice are with recessive genes. Find out the ratios of F1 & F2 offsprings resulting from a cross between black and albino mice.

(xviii) In Shepherd purse, triangular fruits are dependent either one or two dominant genes. Top shaped fruits are recessive. A cross was made between two triangular fruited plants. What will be the first shape of offsprings?

Suggested Readings :

1. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.

2. Fukui, K. and S. Nakayama. 1996. Plant Chromosomes: Laboratory Methods. CRC Press, Boca Raton, Florida.

3. Harris, N. and K.J. Oparka. 1994. Plant Cell Biology: A Practical Approach. IRL Press at University Press. Oxford. UK.

4. Khitoliya, R.K. 2007. Environmental Pollution - Management and Control for Sustainable Development. S. Chand & Company Ltd., New Delhi.

5. Kormondy, E. 1989. Concepts of Ecology (3rd Ed.). Printice Hall of India, New Delhi.

6. Kothari, A. 1997. Understanding Biodiversity: Life, Sustainability and Equity: Tracts for the Times. 11. Orient Longman Ltd., New Delhi.

7. Michael, S. 1996. Ecology. Oxford University Press London.

8. Mishra. D.D. 2008. Fundamental Concepts in Environmental Studies. S. Chand & Company Ltd., New Delhi.

9. Odum, E.P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.

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10. Pandey. B.P. 2007. Botany for Degree Students: Diversity of Microbes, Croptogames, Cell Biology and Genetics. S. Chand & Company Ltd., New Delhi.

11. Sharma P.D. 1989. Elements of Ecology. Rastogi Publications, Meerut.

12. Sharma, A.K. and A. Sharma. 1999. Plant Chromosomes: Analysis, manipulation and Engineering. Harwood Academic Publishers, Australia.

13. Shukla, R.S. and P.S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S. Chand & Company Ltd., New Delhi.

14. Singh, H.R. 2005. Environmental Biology. S. Chand & Company Ltd., New Delhi.

15. Snustad, D.P. and M.J. Simmons. 2000. Principles of Genetics. John Wiley & Sons, Inc., USA.

16. Strickberger, M.W. 1990. Genetics (3rd Ed). Macmillan Publishing Company.

17. Verma, P.S. and V.K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company., New Delhi.

18. Verma, P.S. and V.K. Agrawal. 2006. Genetics. S. Chand & Company., New Delhi.

Paper - IV :

PHYSIOLOGY, TISSUE CULTURE, BIOTECHNOLOGY, SEED TECHNOLOGY AND HORTICULTURE

UNIT - I : Physiology (Part A)

1. *Water Relations:* Importance of waster to plant life, physical properties of water, diffusion, transport of water, ascent of sap; transpiration; Stomatal structure and movements.

2. *Mineral Nutrition:* Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency; absorption of mineral ions; passive and active transport.

3. *Enzymes:* Nomenclature, characteristics, regulation of enzyme action.

4. *Photosynthesis:* Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect; concept of two photosystems; mechanism of photosynthetic electron

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transport and evolution of oxygen; photophosphorylation; Carbon assimilation pathways: C3, C4 and CAM; photorespiration.

5. *Translocation of organic substance:* Mechanism of phloem transport; source-sink relationships.

UNIT - II : Physiology (Part - B)

6. *Respiration:* Aerobic and Anaerobic; Glycolysis, Kreb cycle; electron transport system, mechanism of oxidative phosphorylation, pentose phosphate pathway.

7. *Nitrogen Metabolism :* Biological nitrogen fixation, nitrate reduction, ammonia assimilation, amino acid synthesis and protein synthesis.

8. *Lipid Metabolism :* Structure and functions of lipids; conversion of lipids to carbohydrates, ß-oxidation.

9. *Growth and Development :* Definition, phases and kinetics of growth. Physiological Effects of phytohormon- auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids; Physiology of flowring and photoperiodism, role of phytochrome in flowing.

10. *Stress physiology:* Concept and plant response to water, salt and temperature stresses.

UNIT - II : Tissue Culture and Biotechnology

11. Tissue culture: Introduction, sterilization procedures, culture media - composition and preparation; explants.

12. Callus culture; cell and protoplast culture. Somatic hybrids and cybrids.

13. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds.

14. Biotechnology: Introduction, history and scope.

15. rDNA technology: Vectors and gene cloning and transgenic plants.

UNIT - IV : Seed Technology and Horticulture

16. Seed: Structure and types. Seed dormancy; causes and methods of breaking dormancy.

17. Seed storage: Seed banks, factors affecting seed viabiligy, genetic erosion. Seed production technology; seed testing and certification.

18. Horticulture techniques: Introduction, Cultivation of ornamental and vegetable Crops, Bonsai and landscaping.

19. Floriculture: Introduction. Imporatance of green house, polyhouse, mist chamber, shade nets; Micro irrigation systems. Floriculture potential and its trade in India.

20. Vegetative Propagation of plants: Stem, root and leaf cuttings. Layering and bud grafting. Role of plant growth regulators in horticulture.

Practical - IV :

PHYSIOLOGY, TISSUE CULTURE, BIOTECHNOLOGY, SEED TECHNOLOGY AND HORTICULTURE
(Total Hours of Laboratory Exercises : 90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

I.   Major Experiments

1.   Determination of osmotic potential of vacuolar sap by plasmolytic method using leaves of *Rhoeo / Tradenscantia.*

2.   Determination of stomatal frequency using leaf epidermal peeling.

3.   Separation of chloroplast pigments using paper chromatography technique.

4.   Estimation of protein by biuret method.

5.   Estimation of DNA

II. Minor Experiments

6.   Determination of rate of transpiration using cobalt chloride method.

7.   Determination of catalase activity using plant material/photographs.

8.   Demonstration of seed dressing using fungicide to control diseases.

9.   Demonstration of seed dressing using biofertiliser *(Rhizobium)* to enrich nutrient supply.

10. Demonstration of Micropropagation using explants like axillary buds and shoot meristems.

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11. Testing of seed viability using 2,3,5 - triphenyl tetrazolium chloride (TTC).

III. Scientific Observations

12. Study of mineral deficiency symptoms using plant material / photographs.

13. Study of non-dormant seed germination: Breaking of seed dormancy caused by hard seed coat using scarification technique.

14. Demonstration vegetative plant propagation: Rooting of cutting-Leaf and stem: layering: stem net, glass house and mist chamber.

15. Study of the applications of plant growth regulator (IBA) for rooting of cuttings using Ornamental plants.

16. Study of protocols and photographs/charts related to Plant biotechnology: Isolation of nuclear and plasmid DNA, separation of DNA by gel electrophoresis.

17. Study visits to places of horticultural and biotechnological interest-Commercial nurseries/Botanical gardens; Biotechnology R&D laboratories/Industries.

IV. Critical notes on spotters of scientific interest.

18. Rake	19. Hoe	20. Spade
21. Trowel	22. Digger	23. Pick-axe
24. Shade net (photo)	25. Glass house (picture)	26. Mist chamber (picture)
27. Antibiotics	28. Vaccines	29. Biofertiliers
30. Single Cell Protein	31. Cosmetics	32. Multiple shoots
33. Somatic embryos	34. Artificial/Synthetic seeds	

Suggested Readings :

1. Adams, C.R., K.M. Banford and M.P. Early. 1993. Principles of Horticulture. Butterworth Heineman Ltd., London.

2. Agarwal, P.K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation. National Seed Corporation Ltd., New Delhi.

3. Balasubramanian, D., C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. Biotechnology. Universities Press (India) Private Ltd., Hyderabad.

4. Bedell. Y.E. Seed Science and Technology. Indian Forest Species. Allied Publishers Ltd., New Delhi.

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B.Sc.
ZOOLOGY

FIRST YEAR

PAPER - I : Biology of Invertebrates and Cell Biology

SECOND YEAR

PAPER - II : Biology of Chordates, Embryology, Ecology and Zoogeography

THIRD YEAR

PAPER - III : Animal Physiology, Genetics and Evolutions

PAPER - IV : Applied Zoology

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B.Sc. Zoology

FIRST YEAR

Theory Paper - I
BIOLOGY OF INVERTEBRATES AND CELL BIOLOGY

UNIT - I :

1.0 Protozoa to Annelida

1.1 Phylum Protozoa: Generalcharacters and outline classification up to classes. Type Study : *Paramecium*

1.2. Phylum Porifera : General characters and outline classification up to classes. Type study : *Sycon;* Canal system in Sponges.

1.3. Phylum Coelenterata : General characters and outline classification up to classes. Type study : *Obelia;* Polymorphism in Coelenterates : Corals and Coral reef formation.

1.4. Phylum Platyhelminthes: General characters and outline classification up to classes. Type study : *Fasciola hepatica.*

1.5. Phylum Nemathelminthes: General characters and outline classification up to classes. Type of study : *Ascaris lumbricoides.*

1.6. Phylum Annelida: General characters and outline classification up to classes. Type study : Leech : Coelom and coelomoducts in Annelids.

UNIT - II :

2.0 Arthropoda to Hemichordata

2.1 Phylum Arthropoda: Genera characters and outline classification of up to classes. Type study : *Peripatus* - Characters and Significance.

2.2. Phylum Mollusca: General characters and outline classification of up to classes. Type study : *Pila;* Pearl formation in Molluscs.

2.3. Phylum Echinodermata: General characters and outline classification of up to classes. Type study : Star fish.

2.4. General characters of Hemichordata : Structure and affinities of Balanoglossus.

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UNIT - III :

3.0 Cell Biology

3.1 Cell theory

3.2. Ultra structure of Animal cell

3.3. Structure of Plasma membrane - Fluid-mosaic model. Transport functions of Plasma membrane- Passive transport. active transport (Antiport. symport and uniport) and bulk transport.

3.4. Structure and functions of Endoplasmic reticulum Golgi body, Ribosomes, lysosomes and Mitochondrion.

3.5. Chromosomes - nomenclature types and structure. Giant chromosomes - Polytene and Lampbrush chromosomes.

3.6. Cell division - Cell-cycle stages (G_1 S. G_2 and M phases), Cell-cycle check points and regulation. Mitosis: Meiosis - and its significance.

UNIT - IV :

4.0 Biomolecules of the cell

4.1 Carbohydrates :

    4.1.1 Classification of Carbohydrates

    4.1.2 Structure of Monosaccharides (Glucose and Fructose)

    4.1.3 Structure of Disaccharides (Lactose and Sucrose)

    4.1.4 Structure of Polysaccharides (Starch, Glycogen and Chitin)

4.2 Proteins:

    4.2.1 Amino acids: General properties. nomenclature. classification and structure.

    4.2.2 Classification of proteins based on functions, chemical nature and nutrition, peptide bond and structure (Primary, secondary, tertiary and quaternary structures)

4.3 Lipids:

    4.3.1 Classification. Structure of Fatty acids (Saturated and unsaturated).

    4.3.2 Triacylglycerols. Phospolipids (Lecithin and cephalin) and Steroids (Cholesterol).

4.4 Nucleic acids:

    4.4.1 Structure of purines, pyrimidines. ribose and deoxyribose sugars.

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4.4.2 Watson and Crick model of DNA-Nucleoside, Nucleotide. Chargaff's rule. Structure of RNA. Types of RNA -rRNA. tRNA and mRNA.

Practical Paper - I

INVERTEBRATES:

1. Observation of the following slides specimens models:

   Protozoa : *Amoeba, Elphidium, Monocystis, Paramoecium* - binary fission and Conjugation, *Vorticella.*

   Poriferea : *Spongilla, Euspongia, Sycon*, Spicules, Gemmule. TS&LS of *Sycon*

   Coelentereate : *Physalia, Velella, Aurelia. Corallium, Gorgonia, Pennatula, Obelia colony,* Meduse

   Platyhelminthes and Nemathelminthes: *Planaria, Fasciola,* Larval stages of *Fasciola;* Miracidium, Redia, Cercaria, Echinococcus gramulosus, Taenia solium *Schistosoma haematobium, Ascaris (Male & Female). T.S. Ascaris.*

   Annelida : *Nereis, Aphrodite, Hirudo.* Trochonphore larva. T.S. of leech.

   Arthropoda : Cancer, Palaemon, Sacculina, Scorpion, Limulus, Julus, Scolopendra, Locust, Mantis. Butterfly. Honeybee. Peripatus. Anopheles and Culex mouthparts (male and female) Housefly Mouthparts

   Mollusca: *Chiton, Pila, Unio. Pteredo. Sepia. Octopus. Nautilus,* Glochidium larva.

   Echinodermata : Asterias, Ophiothrix Fehinus. Clypeaster, Cucumaria, Antedon, Bipinnaria larya.

   Hemichordata: Balanoglossus. Tornaria larva.

2. **DESSECTIONS**

   Praw: Nervous system, mounting of statocyst and appendages.
   Pila: Nervous system, Mounting of radula.

CELL BIOLOGY :

1. Identification of stages from permanent slides showing Mitosis and Meiosis.

2. Squash preparation of onion garlic root tip for Mitotic chromosomes.

3. Identification of salivary gland chromosomes and polytene chromosomes (Photographs or figures).

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SECOND YEAR

Theory Paper - II
BIOLOGY OF CHORDATES, EMBRYOLOGY, ECOLOGY AND ZOOGEOGRAPHY

UNIT - I

1.0. Protochordata to Amphibia

1.1. Protochordates: Salient features of Urochordata and Cephalochordata. Structure and life-history *of Herdmania*. Significance of retrogressive metamorphosis

1.2. General characters of Chordates

1.3. General characters of Cyclostomes

1.4. General characters of fishes, classification up to sub-class level with examples

    1.4.1. Type study - *Scoliodon* (Morphology, digestive system, respiratory system, circulatory system, urinogenital system, nervous system and sense organs.

    1.4.2. Types of scales.

1.5. General characters and classification of Amphibia up to order level.

    1.5.1. Type study - *Rana* (Morphology, digestive system, respiratory system, circulatory system, excretory system, nervous system and reproductive system and sense organs)

    1.5.2. Parental care in amphibia.

UNIT-II

2.0. Reptilia to Mammalia

2.1. General characters and classification of Reptilia up to order level

    2.1.1. Type study - *Calotes:* (Morphology. digestive system, respiratory system, circulatory system, nervous system and urinogenital system

2.2. General characters and classifications of Aves up to order level with examples

    2.2.1. Type study - *Pigeon (Columba livia)* (Exoskeleton, respiratory system, circulatory system, excretory system, nervous system and reproductive system).

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Scanned with CamScanner

2.2.2. Flight adaptations in birds

2.2.3. Significance of Migration in birds

2.3. General characters and classification of Mammalia up to order level with examples

2.3.1. Dentition in Mammals

UNIT - III

3.0. Embryology

3.1. Gametogensis and Fertilization

3.2. Types of eggs and cleavages

3.3. Development of frog up to gastrulation and formation of primary germ layers

3.4. Foetal membranes and their significance

3.5. Placenta: Types and functions

UNIT - IV

4.0. Ecology

4.1. Biogeochemical cycles - Gaseous cycles of Nitrogen and Carbon; Sedimentary cycle - phosphorus.

4.2. Definition of Community - Habitat and ecological niche

4.2.1. Community interactions: Brief account of Competition, predation, mutualism, commensalisms and parasitism

4.2.2. Ecological succession

4.3. Population ecology: Density, mortality and natality

4.3.1. Growth curves

4.3.2. Population regulation mechanisms - both biotic and abiotic

4.3.3. Zoogeography: Zoogeographical realms. Fauna of Oriental, Ethiopian and Australian regions.

Practical Paper - II

CHORDATA, EMBRYOLOGY AND ECOLOGY

Observation of the following slides/specimens/models:

1. Protochordata: *Herdmania, Amphioxus, Amphioxus* T.S. through pharynx.

2. Cyclostomata: *Petromyzon* and *Myxine*

3. Pisces: *Pristis, Torpedo. Channa, Pleurenectes, Hippocampus, Exocoetus, Echeneis, Labeo, Catla, Clarius, Anguilla.* Scales of fishes.

4. Amphibia: *Ichthyophis, Amblystoma, Siren,* Axolotl larva, *Rana, Hyla, Alytes.*

5. Reptilia: *Draco, Chamaeleon, Uromastix,* Russels viper, *Naja, Bungarus, Echis carinata*

6. Aves: *Picus, Psittacula, Eudynamis, Bubo, Alcedo, Coracius, Archaeopteryx*

7. Mammalia: *Ornithorhynchus, Tachyglossus, Macropus, Erinacius Pteropus, Funambulus, Mam's, Loris.*

DISSECTIONS:

1. V, VII, IX and X cranial nerves of Scoliodon

2. Arterial system of Scoliodon (afferent, efferent)

3. Brain of Scoliodon

OSTEOLOGY:

1. Appendicular skeletons of Varanus, Pigeon and Rabbit

EMBRYOLOGY:

1. Mounting of sperms (Grasshopper/Rat)

2. Observations of following slides/models T.S. of testis and ovary (Rat/Rabbit/Human)

3. Different stages of cleavage (2-cell, 4-cell and 8-cell), Morula

4. Blastulaand gastrula of frog.

5. 24 hours, 48 hours and 72 hours of chick embryo

ECOLOGY:

1. Determination of pH in a given sample

2. Estimation of dissolved oxygen in the given samples at different temperatures.

3. Estimation of salinity (chloride) of water in the given samples.

4. Estimation of hardness of water in terms of Carbonates and bicarbonates in the given samples.

THIRD YEAR

Theory Paper - III
ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTIONS

UNIT -I

1.0. Physiology of Digestion

1.1. Definition of digestion and types of digestion - extra and intracellular.

1.2. Digestion of carbohydrates, proteins, lipids and cellulose digestion.

1.3. Absorption and assimilation of digested food materials.

1.4. Gastrointestinal hormones - control of digestion.

2.0. Physiology of respiration

2.1. Types of respiration - external and internal respiration.

2.2. Structure .of mammalian lungs and gaseous exchange.

2.3. Transport of oxygen - formation of oxyhemoglobin and affinity of hemoglobin to oxygen, oxygen dissociation curves.

2.4. Transport of CO_2 - Chloride shift, Bohr effect.

2.5. Cellular respiration - Main steps of glycolysis, Krebs cycle, electron transport, Oxidative phosporylation and ATP production (Chemiosmotic theory).

3.0. Physiology of Circulation

3.1. Open and closed circulation

3.2. Structure of mammalian heart and its working mechanism - Heart beat and cardiac cycle. Myogenic and neurogenic hearts.

3.3. Regulation of heart rate - Tachycardia and Bradycardia.

4.0. Physiology of Excretion

4.1. Definition of excretion

4.2. Forms of nitrogenous waste products and their formation; classification of animals on the basis of excretory products.

4.3. Gross organization of mammalian excretory system and structure of kidney.

4.4. Structure and function of Nephron - Counter current mechanism.

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UNIT-II

1.0. Physiology of muscle contraction

1.1 General structure and types of muscles.

1.2 Ultra structure of skeletal muscles.

1.3 Sliding filament mechanism of muscle contraction

1.4 Chemical changes during muscle contraction - role of calcium, ATP utilization and its replenishment.

2.0. Physiology of nerve impulse

2.1. Structure of nerve cell.

2.2. Nature of nerve impulse - resting potential and action potential. Properties of nerve impulse - threshold value, refractory period, all or none response.

2.3. Conduction of nerve impulse along an axon - local circuit theory and salutatory conduction theory

2.4. Structure of synapse, mechanism of synaptic transmission - electrical and chemical transmissions.

3.0. Physiology of Endocrine system

3.1. Relationship between hypothalamus and pituitary gland.

3.2. Hormones of hypothalamus.

3.3. Hormones of Adenohypophysis and Neurohypophysis.

3.4. Hormones of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas.

3.5. Endocrine control of mammalian reproduction - Male and female hormones - Hormonal control of menstrual cycle in humans.

4.0. Physiology of Homeostasis

4.1. Concept of Homeostasis and its basic working mechanism.

4.2. Mechanism of Homeostasis - Giving three illustrations viz., Hormonal control of glucose levels, Water and ionic regulation by freshwater and marine animals and temperature regulation in man.

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UNIT - III

1.0. Genetics

1.1. Mendel's laws - Law of segregation and independent assortment; Gene interaction - Incomplete dominance, co-dominance and epistasis

1.2. Identification of DNA as genetic material - Griffith's experiment and Hershey - Chase experiment

1.3. Central dogma of molecular biology - Brief account of DNA replication (Semi- conservative method). Replication fork (Continuous and discontinuous synthesis); Transcription - Brief account of initiation, elongation and termination in eukaryotes; Translation; Genetic code; gene regulation as exemplified by lac operon.

1.4. Human karyotyping, barr bodies and Lyon hypothesis and Amniocentesis, chromosomal disorders - Autosomal and sex chromosomal.

2.0. Organic Evolution

2.1. Genetic basis of Evolution, Gene pool and gene frequencies, Hardy - Weinberg's Law, Force of destabilization, natural selection, genetic drift, Mutation, Isolation and Migration

2.2. Speciation - Allopatry and sympatry.

2.3. Evolution of Man

Practical Paper - III

ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTIONS

ANIMAL PHYSIOLOGY

1. Identification of carbohydrates, proteins and lipids.

2. Unit oxygen consumption in an aquatic animal [Fish or crab]

3. Qualitative analysis of excretory products.

4. Demonstration of salivary amylase.

GENETICS

5. A, B, O blood group identification.

6. Problems based on Blood grouping.

B.Sc.
CHEMISTRY

FIRST YEAR

PAPER - I : 1) Inorganic Chemistry - I
2) Physical Chemistry - I
3) Organic Chemistry - I
4) General Chemistry - I

SECOND YEAR

PAPER - II : 1) Inorganic Chemistry - II
2) Organic Chemistry - II
3) Physical Chemistry - II
4) General Chemistry - II

THIRD YEAR

PAPER - III : 1) Inorganic Chemistry - III
2) Organic Chemistry - III
3) Physical Chemistry - III

PAPER - IV : 1) Physio Chemical Methods of Analysis
2) Drugs, Cormulations, Pesticide and Green Chemistry
3) Macromolecules and Catalysis

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B.Sc. Chemistry

FIRST YEAR

PAPER - I

UNIT - I : Inorganic Cheistry - I

1. **s-block elements :** General characteristics of groups I & II elements, diagonal relationship between Li & Mg, Be & Al.

2. **p-block elements :**

    General characteristics of elements of groups 13, 14, 15, 16 and 17

    Group-13 : Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9), boron-nitrogen compounds ($B_3N_3H_6$ and BN)

    Group-14 : Preparation and applications of silanes and silicones, graphitic compounds.

    Group-15 : Preparation and reactions of hydrazine, hydroxylamine, phosphazenes.

    Group-16 : Classifications of oxides based on (i) Chemical behaviour and (ii) Oxygen content.

    Group-17 : Inter halogen compounds and pseudo halogens

3. **Organometallic Chemistry**

    Definetion and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of 1, 2 and 13 group elements.

UNIT-II : Organic Chemistry-I

1. **Structural theory in Organic Chemistry**

    Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O, NH_3 & $AlCl_3$).

    Bond polarization : Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect,

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application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions, carbenes and nitrenes.

Types of Organic reactions : Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples (mechanism not required).

2. **Acyclic Hydrocarbons**

alkanes- IUPAC Nomenclature of Hydrocarbons. Methods of preparation: Hydrogenation of alkynes and alkenes, Wurtz reaction, Kolbe's electrolysis, Corey- House reaction. Chemical reactivity - inert nature, free radical substitution mechanism. Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (a) by dehydration of alcohols (b) by dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides (brief mechanism), Saytzeff rule. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markovnikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markovnikov's addition). Oxidation - hydroxylation by $KMnO_4$, OsO_4, peracids (via epoxidation) hydroboration, Dienes - Types of dienes, reactions of conjugated dines - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acedtylides). Preperation of higher acetylenes, Metal ammonia reductions Physical properties. Chemical reactivity - electrophilic addition of X_2, HX, H_2O (Tautomerism), Oxidation with $KMnO_4$, OsO_4, reduction and Polymerisation reaction of acetylene.

3. **Alicyclichydrocarbons (Cycloalkanes)**

Nomenclature, Preparation by Freunds methods, heating dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

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4. **Benzene and its reactivity**

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene.

Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Napthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i). Amino, methoxy and methyl groups (ii). Carboxy, nitro, nitrile, carbonyl and Sulfonic acid groups. (iii). Halogens (Explanation by taking minimum of one example from each type).

5. **Polynuclear Hydrocarbons -**

Structure of naphthalene and anthracene (Molecular Orbital diagram and resonance energy) Any two methods of preparation of naphthalene and reactivity. Reactivity towards electrophilic substitution. Nitration and sulfonation as examples.

UNIT - III : Physical Chemisty-I

I Gaseous state

Compression factors, deviation of real gases from ideal behavior. Van der Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The van der Waal's equation and the critical state. Relationship between critical constants and van der Waal's constants. The law of corresponding states and reduced equation of states. Joule Thomson effect. Liquefaction of gases: i) Linde's method and ii) Claude's method.

II Liquid state

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into

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Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

III Solid state

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravis lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Determination of crystal structure by Bragg's method and the power method. Indexing of planes and structure of $NaCl$ and KCl crystals. Defects in crystals. Stoichiometric and non-stoichiometric defects. Band theory of semoconductors. Extrinsic and intrinsic semiconductors, n- and p-type semiconductors and their applications in photo electrochemical cells.

IV Solutions

Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions. Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure-temperature curves. Azeotropes-HCl-H_2O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consulate temperature. Immiscible liquids and steam distillation.

Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

V Colloids and surface chemistry

Definition of colloids. Solids in liquids (sols), preparation, purifications, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid. Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

Adsorption: Physical adsorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption

UNIT - IV : General Chemistry - I

1. Atomic Structure and elementary quantum mechanics

Blackbody radiation, Planck's radiation law, photoelectric effect, Compton effect, de Broglie's hypothesis, Heisenberg's uncertainty

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principle. Postulates of quantum mechanics. Schrodinger wave equation and a particle in a box, energy levels, wave functions and probability densities. Schrodinger wave equation for H-atom. Separation of variables, Radial and angular functions, hydrogen like wave functions, quantum numbers and their importance.

2. **Chemical Bonding**

Valence bond theory, hybridization, VB theory as applied to CIF_3, BrF_5, $Ni(CO)_4$, XeF_2. Dipole moment - orientation of dipoles in an electric field, dipole moment, induced dipole moment, dipole moment and structure of molecules. Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, HCl, CO and NO). Comparision of VB and MO theories.

3. **Stereochemistry of carbon compounds**

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Stereoisomerism, Stereoisomers: enantiomers, diastereomers- definition and examples. Conformational and configurational isomerism- definition. Conformational isomerism of ethane and n-butane.

Enantiomers: Optical activity- wave nature of light, plane polarised light, interaction with molecules, optical rotation and specific rotation. Chiral molecules- definition and criteria= absence of plane, center, and Sn axis of symmetry- asymmetric and disymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans - 1,2-dichloro cyclopropane).

Chiral centers: definition- molecules with similar chiral carbon (Tartaric acid), definition of mesomers- molecules with dissimilar chiral carbons (2,3- dibromopentane). Number of enantiomers and mesomers- calculation.

D.L. and R.S configuration for asymmetric and disymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture- racemisation and resolution techniques.

Diastereomers: definition- geometrical isomerism with reference to alkenes- cis, trans and E,Z- configuration.

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4. **General Principles of Inorganic qualitative analysis**

Solubility product, common ion effect, characteristic reactions of anions, elimination of interfering anions, separation of cations into groups, group reagents, testing of cations

LABORATORY COURSE - I

Practical Paper - I : Inorganic Chemistry)

Qualitative Analysis and Inorganic preparations :

Analysis of mixtures containing two anions (one simple and one interfering)and two cations (of different groups) from the following:

Anions: Carbonate, sulfide, sulphate, chloride, bromide, iodide, acetate, nitrate, oxalate, tartrate, borate, phosphate, arsenate* and chromate*.

Cations: Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminum, zinc, manganese, nickel, cobalt, calcium, strontium, barium, potassium and ammonium.

*not to be given for examination.

Preparations: Any three of the following inorganic preparations:

1) Ferrous ammonium sulphate
2) Tetrammine copper (II) sulphate
3) Potassium trisoxalato chromate
4) Potash alum $KAl(SO_4)_2. 12H_2O$
5) Hexammine cobalt (III) chloride.

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SECOND YEAR

PAPER - II

UNIT - I : Inorganic Chemistry - I

I. **Chemistry of d-block elements :** Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states and e.m.f. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu triods in respect of electronic configuration and reactivity of different oxidation states.

II. **Chemistry of f-block elements:** Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties, spectral properties and separation of lanthanides by ion exchange and solvent extraction methods. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, position of actinides in the periodic table, comparison with lanthanides in terms of magnetic properties, spectral properties and complex formation.

III. **Theories of bonding in metals :** Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

IV. **Metal carbonyls and related compounds** - EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocene).

UNIT - II : Organic Chemistry - II

1. **Halogen compounds**

   Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl halides.

   Chemical Reactivity, formation of RMgX

   Nucleophilic aliphatic substitution reaction-classification into SN^1 and SN^2.

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Energy profile diagram of S_N1 and S_N2 reactions. Stereochemistry of S_N2 (Walden inversion) S_N1 (Racemisation). Explanation of both by taking the example of optically active alkyl halide - 2bromobutane. Ease of hydrolysis - comparision of alkyl, benzyl, alkyl, vinyl and allyl halides

2. Hydroxy compounds

Nomenclature and classification of hydroxy compounds.

Alcohol: Preparation with hydroboration rection, Grignard synthesis of alcohols.

Phenols : Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene.

Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water.

Chemical properties :

a. acidic nature of phenols.
b. formation of alkoxides/phenoxides and their reaction with RX.
c. replacement of OH by X using PCl_5, PCl_3, PBr_3, $SOCl_2$ and with $HX/ZnCl_2$.
d. esterification by acids (mechanism).
e. dehydration of alcohols.
f. oxidation of alcohols by CrO_3, $KMnO_4$

g. special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, Azocoupling.

Identification of alcohols by oxidation with $KMnO_4$, ceric ammonium nitrate, lucas reagent and phenols by reaction with $FeCl_3$.

Polyhydroxy compounds: Pinacol-Pinacolone rearrangement.

3. Carbonyl compounds

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group.

Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3- dithianes, synthesis of ketones from nitriles and from carboxylic acids.

Physical properties: absence of hydrogen bonding, keto-enol tautomerism, reactivity of carbonyl group in aldehydes and ketones.

Nucleophilic addition reaction with a) $NaHSO_3$, b) HCN, c) RMgX, d) NH_2OH, e) $PhNHNH_2$, f) 2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal.

Halogenation using PCl_5 with mechanism.

Base catalysed reactions: a) Aldol, b) Cannizzaro reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction.

Oxidation of aldehydes- Baeyer- Villiger oxidation of ketones.

Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$.

Analysis of aldehydes and ketones with a) 2,4-DNP test, b) Tollen's test, c) Fehling test, d) Schiff test, e) Haloform test (with equation).

4. **Carboxylic acids and derivatives**

Nomenclature, classification and structure of carboxylic acids.

Methods of preparation by
a) hydrolysis of nitriles, amides and esters.
b) carbonation of Grignard reagents.

Special methods of preparation of aromatic acids by
a) oxidation of side chain.
b) hydrolysis by benzotrichlorides
c) Kolbe reaction

Physical properties: Hydrogen bonding, dimeric association, acidity-strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

Chemical properties: Reactions involving H, OH and COOH groups-salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard-Zelinsky reaction

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Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides, esters (mechanism of the hydrolysis of esters by acids and bases).

5. **Active methylene compounds**

Acetoacetic esters: preparation by Claisen condensation, keto-enol tautomerism. Acid hydrolysis and ketonic hydrolysis.

hydrolysis and ketonic hydrolysis.

Preparation of
a) monocarboxylic acids
b) dicarboxylic acids.

Reaction with urea
Malonic ester: preparation from acetic acid.
Synthetic applications: Preparation of
   a) monocarboxylic acids (propionic acid and n-butyric acid).
   b) dicarboxylic acids (succinic acid and adipic acid).
   c)   -unsaturated carboxylic acids (crotonic acid).

Reaction with urea.

6. **Exercises in interconversion**

UNIT - III : Physical chemistry - II

1. **Phase rule**

Concept of phase, components, degree of freedom. Definition of Gibbs phase rule. Phase equilibrium of one component - water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, desilverisation of lead. Solid solutions- compound with congruent melting point- (Mg-Zn) system, compound with incongruent melting point - NaCl- water system. Freezing mixtures.

2. **Dilute solutions**

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determinattion of

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molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties. Van't Hoff factor, degree of dissociation and association.

3. **Electrochemistry**

Specific conductance, equivalent conductance, measurement of equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements-determination of dissociation constant (K_a) of an acid, determination of solubility product of sparingly soluble salt, conductometric titrations.

Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions, Nernst equation, single electrode potential, standard Hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Applications of EMF measurements, Calculation of thermodynamic quantities of cell reactions (G, H and K). Determination of pH using quinhydrone electrode, Solubility product of AgCl. Potentiometric titrations.

UNIT - IV : General Chemistry - II

1. **Molecular summetry**

Concept of symmetry in chemistry-symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axes. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion centre. Identity element. The symmetry operations of a molecule form a group. Flow chart for the identification of molecular point group.

2. **Theory of quantitative analysis**

a   Principles of volumetric analysis. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations, choice of indicators for these titrations.

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b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and whashing of precipitate, drying and ignition, precipitation from homogenous solutions, requirements of gravimetric analysis.

3. **Evalution of analytical data**

Theory of errors, idea of significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

4. **Introductory treatment to:**

a) Pericyclic Reactions

Concerted reactions, Molecular orbitals, Symmetry properties HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions - electrocyclic, cycloaddition and sigmatropic reactions - one example each.

b) Synthetic strategies

Terminology - Disconnection (dix), Symbol ( ), synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent and Combinatorial syntheses, Target molecule (TM). Retrosynthesis of the following molecules a) acetophenone 2) cyclohexene 3) phenylethylbromide

c) Asymmetric (Chiral) synthesis

Definitions-Asymmetric synthesis, enantiometric excess, diastereometric excess. stereospecific reaction, definition, example, dehalogenation of 1,2-dibromides by I, stereoselective reaction, definition, example, acid catalysed dehydration of 1-phenylpropanol

THIRD YEAR

PAPER - III

UNIT - I : Inorganic Chemistry - III

I. **Coordination Chemistry :** IUPAC nomenclature, bonding theories review of Werner's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordinatiaon numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - factors affecting crystal - field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

2. Spectral and magnetic properties of metal complexes: Electronic absorption spectrum of $(Ti(H_2O)6)^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility - Gouy method.

3. Reactivity of metal complexes: Labile and inert complexes, ligand substitution reactions - S_N1 and S_N2, substitution reactions of square planar complexes - Trans effect and applications of trans effect.

4. Stability of metal complexes: Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

5. Hard and soft acids bases (HSAB) : Classification, Pearson's concept of hardness and softness, application of HSAB principles - Stability of compounds / complexes, predicting the feasibility of a reaction.

6. Bioinorganic chemistry : Essential elements, biological significance of Na, K, Mg, Ca, Fe and Chloride (Cl). Metalloporphyrins - Hemoglobin, structure and funtion, chlorophyll, structure and role in photosynthesis.

UNIT - II : Organic Chemistry-III

1. **Nitrogen compounds**

Nitro hydrocarbons : Nomenclature and classification - Nitro hydrocarbons - structure. Tautomerism of nitroalkanes leading to,

acid and keto form. Preparation of Nitroalkanes. Reactivity - Halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction.

Amines (aliphatic and aromatic): Nomenclature, Classification into 1^0, 2^0, 3^0. Amines and Quarternary ammonium compounds. Prepaative methods-1. Amonolysis of alkyl halides. 2. Gabriel synthesis. 3. Hoffman's bromamide reduction reaction (mechanism). 4. Reduction of Amides and Schmidt reaction. Physical properties and basic character Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline - comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aquous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) reaction with nitrous acid of 1^0, 2^0,3^0 (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines - Bromination and Nitration oxidation of aryl and 3^0 amines.Diazotization Cyanides and isocyanides: Nomenclature (Aliphatic and aromatic) structure. preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iiI) reduction iv) oxidation.

2. **heterocyclic compounds**

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring system - presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character - 6-electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient heteroatom. Explanation of feebly acidic character of pyrrole, electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4-

dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity - Aromaticity - Comparison with pyrrole - one method of preparation and properities - Reactivity toward Nucleophilic substitution reaction - chichibabin reaction.

3. **Carbohydrates**

Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and D(-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid). Number of optically active isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required). Evidence for cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformation formula). Structure of fructose: Evidence of 2-ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give --carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure of fructose (Furanose structure and Hawroth formula).

Interconversion of Monosaccharides: Aldopentose to aldo hexose-eg: Arabinose to D-Glucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D-arabinose by Ruff's degadation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (Fructose) to aldohdexose (Glucose).

4. **Amino acids and proteins**

Introduction : Definition of Amino acids, classification of Amino acids into alpha, beta, and gama amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis : General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, Valine and Leucene)

by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.

Physical properties : Optical activity of naturally occurring amino acids: L-configuration, irrespective of sign rotation, Zwitterion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

5. **Mass Spectrometry :**

Basic principles - Molecular ion / parent ion, fragment ions / daughter ions. Theory formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M + 1), (M + 2), base peaks (relative abundance 100%). Mass spectra of ethylbenzene, acetophenone, n-butylamine and 1-propanol

UNIT - III : Physical Chemistry - III

1. **Chemical kinetics**

Rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second and zero order reactions and examples. Derivation for half life period. Methods to determine the order of reactions. Effect of temperature on rate of reaction Arrhenius equation, concept of activation energy. Theories of reaction rates-collision theory-derivation of rate constant for biomolecular reaction. The transition state theory (Elementary treatment).

2. **Photochemistry**

Difference between thermal and photochemical processes. Laws of photochemistry-grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Photochemical hydrogen-chlorine, hydrogen-bromine reaction. Jablonski diagrm depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative process (internal conversion, intersystem crossing). Photosensilized reactions - energy transfer processes (simple example).

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3. **Thermodynamics**

The first law of themodynamics : Statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law Joule-Thomson effect and coefficient. Calculation of w, q, dE and dH for the expansion of perfect gas under Isotherm and Adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation-Kirchoff's equation.

Second law of thermodynamics : Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropychanges with changes in V & T and P & T. Entropy changes in spontaneous and equilibrium processes.

The Gibbs (G) and Helmholtz (A) energies. A & G as criteria for thermodynamic equilibrium and spontaneity-advantage over entropy change. Gibbs equation and Variation of G with P and T.

PAPER - IV :
CHEMISTRY AND INDUSTRY

UNIT - I : Physico Chemical Methods of analysis

1. **Seperation Techniques**

1. Chromatography : Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, Rf values, factors effecting Rf values.

   a) Paper chromatography : Principles, Rf Values, Experimental procedures, choice of paper and solvent systems, development of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.

   b) Thin layer Chromatography (TLC): Advantages. Principles, factors effecting Rf values. Experiment procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

   c) Column Chromatigraphy : Principle, experimental procedures, Stationary and mobile Phase, Separation technique. Applications.

2. **Spectrophotometry**

General features of absorption - spectroscopy , Beer-Lambert's law and its limitations, trasmittance, Absorbance, and molar absorptivity.

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Double beam spectrophotometer. Application of Beer-Lambert law for quantitative analysis of

1. Chromium in $K_2Cr_2O_7$
2. Mangnanese in $KMnO_4$
3. Iron (III) with thiocyanate.

3. Molecular spectroscopy

(i) Electronic spectroscopy :

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (n). Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore.

(ii) Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Modes of vibrations in like CO CO_2 & H_2O molecules. Characteristic absorption bands of various functional groups. Finger Print nature of infrared specturm.

(iii) Proton magnetic resonance spectroscopy (^{1}H-NMR)

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethonol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

(iv) Spectral interpretation

Interpretation of IR, UV-Visible, ^{1}H-NMR and mass spectral data of the following compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic acid 4. Para-nitro aniline.

UNIT - II : Drugs, formulations, pesticides and green chemistry

1. Drugs

1. Introduction: Drug, Disease (definition), Historical evolution, Sources - Plant, Animal synthetic, Biotechnology and human gene therapy

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2. Terminology: Pharmacy, Pharmocology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief teartment) Metabolites and anti metabolites.

3. Nomenclature: Chemical name, Generic name and trade names with examples.

4. Classification: Classification based on structures and therapeutic activity with one example each.

5. Synthesis: Synthesis and therapeutic activity of the following drugs., L-Dopa, chloroquin, Omeprazole, Albuterol and ciprofloxacin.

6. Drug Development : Pencillin, Separation and isolation, structures of different pencillins.

7. Monographs of drugs: Eg Paracetamol, Sulpha methoxazole (Tablets).

2. Formulations

1. Need of conversion of drugs into medicine. Additives and their role (Brief account only)

2. Different types of formulations.

3. Green Chemistry

Introduction : Definition of green Chemistry, need of green chemistry, basic principles of green chemistry.

Green synthesis : Evalution of the type of the reation i) Rearrangements (100% atom economic), (ii) Addition reaction (100% atom economic), pericyclic reactions (No by-product).

Selection of solvent :

i) Aqueous phase reactions ii) reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)

Microwave and Ultrasound assisted green synthesis :

1) Aldol condensation
2) Cannizzaro reaction
3) Diels-Alder reactions
4) Strecker synthesis

5) Willaimson synthesis

6) Dieckmann condensation

UNIT - III: (polymers, material science, and catalysis)

1. **Polymers**

   Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization - tacticity (isotactic, syndiotactic, atactic poly propelene). Molecular weight of polymers - number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, Osmometry : mechanism of free radical polymerization, Preparation and industrial application of polyethylene, PVC, Teflon, polyacrylonitrile, terylene and Nylon-66.

2. **Material Science :**

   Properties and applications of nano-materials.

3. **Catalysis**

   Homogeneous and heterogeneous catalysis, comparison with examples. Kinetics of specific acid catalyzed reactions, inversion of cane sugar. Kinetics of specific base catalyzed reactions base catalyzed conversion of acetone to diacetone alcohol. Acid and base catalyzed reactions hydrolysis of esters, mutarotation of glucose. Enzyme catalysis: Classification, characteristics of enzyme catalysis. Kinetics of enzyme catalyzed reactions-Michael's Menten law, significance of Michael's constant (K_m) and maximum velocity (V_{max}). Factors affecting enzyme catalysis effect of temperature, pH, concentration and inhibitor. Catalytic efficiency, Mechanism of oxidation of ethanol by alcohol dehydrogenase.

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LABORATORY COURSE - III

Practical Paper - III : Organic Chemistry

I.   Synthesis of Organic Compounds

i.   Aromatic electrophilic substitution Nitration: Preparation of nitro benzene and p-nitro acetanilide, Halogenation: Preparation of p-bromo acetanilide and 2,4,6- tribromo phenol.

ii.   Diazotization and coupling: Preparation of pheyl azo -napthol

iii.   Oxidation: Preparation of benzoc acid frombenzyl chloride

iv.   Reduction: Preparation of m-nitro aniline from m-dinitro benzene

v.   Esterfication: Preparation of methyl para nitro benzoate from p-nitro Benzoic Acid.

vi.   Methylations : Preparation of   -napthyl methyl ether

vii.   Condensation: Preparation of benzilidine aniline

2.   Thin layer Chromatography
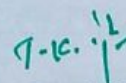
i.   Preparation of the TLC plates. Checking the purity of the compounds by TLC.

ii.   Seperation of ortho and p-nitro aniline mixture by column chromatography.

3.   Organic Qualitative Analysis :

i.   Identification of an organic compound through the functional group analysis. Determination of melting point and preparation of suitable derivatives.

    i. Aniline+Naphthalene   ii. Benzoicacid+Benzophenone.
    iii. p-cresol-chlorobenzene

ii.   Separation of two component mixture Benzoic acid+benzophenone

4.   Demonstration experiments

1. Steam distillation experiment: Separation of ortho and para nitro phenols 2) Microwave assisted Green synthesis, two example: 1. Hydrolysis of Benzamide 2. Oxidation of Toluene.

LABORATORY COURSE - IV

Practical Paper - IV : Physical Chemistry

1. **Chemical Kinetics**

   i. Kinetic study of Acid Catalyzed hydrolysis of methyl acetate and determination of rate constant - Graphical method.

   ii. Kinetic study of Acid catalysed Acetone - Iodine reaction and determination of rate constant - Graphical method.

   iii. Kinetic study of persulphate iodide reaction and determination rate constant - Graphical method

2. **Distribution law**

   i. Determination of distribution coefficient of iodine between water and carbon Tetrachloride.

   ii. Determination of molecular state and partition coefficient of benzoic acid in Toluene and water.

3. **Electrochemistry**

   i. Determination of concentration of HCl conductometrically using standard NaOH solution.

   ii. Determination of concentration of acetic acid conductometrically using standard NaOH solution.

   iii. Determination of solubility and solubility product of $BaSO_4$.

   iv. Determination of redox potentials of Fe2+ by potentiometric titration of ferrous ammonium sulphate vs. $KMnO_4$.

4. **pH metry**

   i. Preparation of phosphate buffer solutions

   ii. pH metric titration of weak acid, acetic acid with strong base NaOH and calculation of dissociation constant.

5. **Colorimetry**

   i. Verification of Beer-Lambert law for $KMnO_4 K_2Cr_2O_7$ and determination of concentration of the given solution

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ii. Verification of Beer-Lambert law for $CuSO_4$ and determination of concentration of the given solution.

6. **Adsorption**

    i. Surface tension and viscosity of liquids

    ii. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm

7. **Project work :**

    i. Collection of spectral data of a minimum of six compounds belonging to different functional groups and submission of the report. (other than those included in the syllabus)

Note : Apart from the experiments (1 to 6) the project work (7) shall also be included in the University Examination.

Recommended Text Books and Reference Books :

Inorganic Chemistry

1. Concise Inorganic Chemistry by J.D. Lee
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Inorganic Chemistry by R R Heslop and P.L. Robinson
5. Modern Inorganic Chemistry by C F Bell and K A K Lott
6. University Chemistry by Bruce Mohan
7. Qualitative Inorganic analysis by A.I. Vogel
8. A textbook of qualitative inorganic analysis by A.I. Vogel.
9. Inorganic Chemistry by J.E. Huheey
10. Inorganic Chemistry by Chopra and Kapoor
11. Coordination Chemistry by Basalo and Johnson
12. Organometallic Chemistry - An introduction by R.C. Mehrotra and A. Singh
13. Inorganic Chemistry by D.F. Shriver, P.W. Atkins and C.H. Langford
14. Inorganic Chemistry by Philips and Williams, Lab Manuals
15. Introduction to inorganic reactions mechanisms by A.C. Lockhart
16. Theoretical inorganic chemistry by McDay and J. Selbin
17. Chemical bonding and molecular geometry by R.J. Gillepsy and P.L. Popelier

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B.Sc.
MATHEMATICS

FIRST YEAR

PAPER - I : Differntial Equations & Solid Geometry

SECOND YEAR

PAPER - II : Abstract Algebra & Real Analysis

THIRD YEAR

PAPER - III : Linear Algebra, Multiple Integrals
and Vector Calculus

PAPER - IV : Electives
1. Numerical Analysis
2. Fourier Series and Integral Transforms

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B.A. / B.Sc. MATHEMATICS
FIRST YEAR

Paper -1
DIFFERNTIAL EQUATIONS & SOLD GEOMETRY

DIFFERENTIAL EQUATIONS

UNIT -I

Differential equations of the first order and the first degree:

Linear differential equations, Differential equations reducible to liner form Exact Differential Equations, Integrating factors, Change of Variables, Simultaneous total differential Equations, Orthogonal trajectories in cartesian coordinates

Differential equations of the first order but not of the first degree:

Equations solvable for p, Equations solvable for y, Equations solvable for x; Equations that do not contain x (or y), Equations of the first degree in x and y - Clairaurt's equation.

UNIT - II

Higher order linear differential equations

Solution of homogeneous linear differential equations of order n with constant coefficients, Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. Method of undetermined coefficients, Method of variation of parameters, Linear differential equations with non-constant coefficients, The Cauchy - Euler equation

System of linear differential equations:

Solution of a system of linear equations with constant coefficients, An equivalent triangular system. Degenerate Case:

$$P_1(D)P_4(D) - P_2(D)P_3(D)=0.$$

(**Prescribed Text Book:** Scope and treatment as in Differential Equations and their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd. New Delhi, Second edition: Sections: -2.5, to 2.9, 3.1, 3.2, 4.20, 5.2 to 5.7, 7.2, 7.3, 7.4.)

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SOLID GEOMETRY

UNIT-III

The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between to planes, Joint equation of two planes, Orthogonal projection on a plane.

Right Line :

Equations of a line, Angle between a line and a plane, The condition that a given line may lie in a given plane, The condition that two given lines are coplanar, Number of arbitrary constants in the equations of a straight line, Sets of conditions which determine a line, The shortest distance between two lines. The length and equations of the line of shortest distance between two straight lines, length of the perpendicular from a given point to a given line, Intersection of three planes.

The Sphere :

Definition and equation of the sphere, Equation of the sphere through four given points, Plane sections of a sphere. Intersection of two spheres, Equation of a circle. Sphere through a given circle, Intersection of a sphere and a line, Power of a point, Tangent plane. Plane of contact. Polar plane, Pole of a Plane, Conjugate points, Conjugate planes, Angle of intersection of two spheres, Conditions for two spheres to be orthogonal, Radical plane, Coaxial system of spheres, Simplified form of the equation of two spheres.

UNIT-IV

Cones, Cylinders and Conicoids :

Definitions of a cone, vertex, guiding curve, generators, Equation of the cone with a given vertex and guiding curve, Enveloping cone of a sphere. Quadratic of cones with vertex at origin, Condition that the general equation of the second degree should represent a cone

Condition that a cone may have three mutually perpendicular generators, Intersection of a line and a quadric cone. Tangent lines and tangent plane at a point. Condition that a plane may touch a cone. Reciprocal cones. Intersection of two cones with a common vertex. Right circular cone. Equation of the right circular cone with a given vertex, axis and semi-vertical angle.

Definition of a cylinder, Equation to the cylinder whose generators intersect a given conic and are parallel to a given line, Enveloping cylinder of a sphere. The right circular cylinder, Equation of the right circular cylinder with a given axis and radius.

The general equation of the second degree, shapes of some surfaces, Nature of Ellipsoid, Nature of Hyperboloid of one sheet.

Prescribed Text Book :

Scope as in **Analytical solid Geometry** by shanti Narayan and P.K Mittal, Published by S.Chand & Company Ltd. Seventeenth edition: Sections : 2.4, 2.7, 2.8, 2.9, 3.1 to 3.8, 6.1 to 6.9, 7.1 to 7.8, 8.1 to 8.2.2.)

Reference Book:

P.K. Jain and Khaleel Ahmed, "A Text book of Analytical Geometry of Three Dimensions" Wiley Eastern ltd. 1999.

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ABSTRACT ALGEBRA & REAL ANALYSIS

UNIT - I : GROUPS:

Binary operations- Definition and properties, Groups- Definition and examples, Elementary properties of groups, Finite groups and group composition tables, Subgroups and cyclic subgroups, Cyclic groups-Elementary properties of cyclic groups, Subgroups of finite cyclic groups. Permutations-groups of permutations, Cayley's theorem, orbits, cycles, even and odd permutations, the alternative groups, cosets, the theorem of Lagrange and its converse, Homomorphism, Definition and examples, properties of homomorphism. The kernel of a homomorphism, normal subgroup. factor groups, The fundamental homomorphism theorem, Normal subgroups and Inner automorphisms.

UNIT - II : RINGS:

Definitions and basic properties, homomorphism and isomorphism, Fields, divisors of zero and cancellation laws, Integral Domain, The characteristic of a ring. Rings of polynomials. Polynomials in an indeterminate, Ideals and factor rings, Homomorphism and factor rings, Fundamental homomorphism theorem, Maximal and prime ideals.

Prescribed text book.

Scope and treatment as in A first course in Abstract Algebra by John B. Fraleigh, Seventh edition, Pearson education (low price edition), New Delhi

Part-I: Sections: 2,4,5,6.
Part-II: Sections: 8,9,10.
Part-Ill: Sections:13,14.
Part-IV: Sections: 18,19, 22.1, 22.2, 22.3
Part-V: Sections : 26,27.1 to 27.16.

Reference Books

(1) A first course in Abstract Algebra by John B. Fraleigh, Third edition, Narosa Publishing house.

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(2) Topics in Algebra by I.N.Herstein, Wiley Estern

(3) Contemporary Abstract Algebra by Joseph A Gallian, Narosa Publishing House.

UNIT - III:

REAL NUMBERS:

The Completeness properties of R, Applications of the supremum property. (No question is to be set from this portion)

Sequences and Series-Sequences and their limits, Limit theorems, Monotone Sequences, Sub-sequences and the Bolzano-Weierstrass theorem, The Cauchy's criterion, Properly divergent sequences, Introduction to series, Absolute convergence, test for absolute convergence, test for non-absolute convergence.

Continuous functions : Continuous functions, combinations of continuous functions, Continuous functions on intervals, Uniform continuity.

UNIT - IV :

DIFFERENTIATION AND INTEGRATION:

The derivative, The Mean value theorem, L'Hospital rules, Taylor's theorem. Riemann integral, Riemann integrable functions, Fundamental theorem.

Prescribed text Book:

Scope as in "Introduction to Real analysis", by Robert G. Bartle and Donald R.Sherbert, John Wiley, third edition, Chapter 2(2.3 to2.4),Chapter 3,(3.1 to 3.7), Chapter 5(5.1 to 5.4),Chapter 6(6.1 to 6.4), Chapter 7(7.1 to 7.3.7), Chapter 9 (9.1 to 9.3.2).

Reference Books:

1. A course of Mathematicl Analysis by Shanthi Narayana and P.K..Mittal, S.Chand & Company.

2. Mathematicl Analysis by S.C.Malik and Savita Arora, Wiley Eastern Ltd.

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FINAL YEAR

Paper - III

LINEAR ALGEBRA, MULTIPLE INTEGRALS AND VECTOR CALCULUS

Part A: Linear Algebra

UNIT - I :

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, Linear combination of vectors. Linear span, Linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace. Linear transformations, Linear operators, Range and null space of linear transformations, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

UNIT - II :

The adjoint or transpose of a linear transformation, Sylvester's law of nullity, Characteristic values and characteristic vectors, Cayley-Hamilton theorem, Diagonalizable operators. Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, Complete orthonormal set, Gram-Schmidt orthogonalisation process.

Prescribed text book:

Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna Prakasham Mandir, Meerut-250002.

Reference Books:

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education (low priced edition), New Delhi.

2. Linear Algebra by Stephen H. Friedberg et.al, Prentice Hall of India Pvt.ltd. 4th edition 2007.

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Part B: Multiple integrals and Vector Calculus

UNIT - III :

Multiple integrals: Introduction, The concept of a plane, Curve, Line integral- Sufficient condition for the existence of the integral. The area of a subset of R^2, Calculation of double integrals, Jordan curve, Area, Change of the order of integration.

Prescribed book:

A Course of Mathematical Analysis by Shanti Narayana and P.K.Mittal, S.Chand Publications. Chapter 16.1 to 16.8

UNIT - IV:

Vector differentiation, Ordinary derivatives of vectors, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators. Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Prescribed text book:

Vector Analysis by Murray.R.Spiegel, Schaum series publishing Company, Chapter 3,4,5,6 and 7.

Reference Books:

1. Text book of Vector Analysis by Shanti Narayana and P.K.Mittal, S.Chand and Company Ltd, New Delhi.

2. Mathematical Analysis by S.C.Mallik and Savitha Arora, Wiley Eastern Ltd.

Paper IV (Elective - 1)
NUMERICAL ANALYSIS

UNIT - I :

Errors in Numerical Computations: Numbers and their Accuracy, Errors and their Computation, Absolute, Relative and Percentage errors , A general error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, New-ton-Raphson method, Generalized Newton-Raphson method, Ramanujan's method, Muller's method.

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UNIT - II :

Interpolation: Errors in polynomial interpolation, Forward differences, Backward differences, Central differences, Symbolic relations, Detection of errors by use of D.Tables, Differences of a polynomial, Newton's formulae for interpolation, Gauss's central difference formula, Stirlings's central difference formula, Interpolation with unevenly spaced points, Lagrange's formula, Derivation of governing equations, End conditions, Divided differences and their properties, Newton's general interpolation.

UNIT - III :

Curve Fitting: Least squares curve fitting procedures, fitting a straight line, Non linear curve fitting, Curve fitting by a sum of exponentials.

Numerical Differentiation and Numerical Integration: Numerical differentiation, Errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration, Trapezoidal rule, Simpsons' 1/3 -rule, Simpsons' 3/8 -rule, Boole's and Weddle's rule.

UNIT - IV :

Linear system of equations: Solution of linear systems-Direct methods, Matrix inversion method, Gaussian elimination method, Method of factorization, ill-conditioned linear systems. Iterative methods: Jacobi's method, Gauss-Siedal method.

Numerical Solution of Ordinary Differential Equations: Introduction, Solution by Taylor's Series, Picards method of successive approximations, Euler's method, Modified Euler's method, Runge-Kutta methods, Predictor-Corrector method, Milne's method.

Prescribed Text Book:

Scope as in Introductory methods of Numerical Analysis by S.S.Sastri, Prentice Hall India (4thEdition), Chapter-1(1.2, 1.4, 1, 1.5, 1.6); Chapter-2(2.2-2.7); Chapter-3(3.2, 3.3, 3.7.2, 3.9.1, 3.9.2, 3.10.1, 3.10.2); Chapter - 5 (5.2-5.4.5); Chapter - 6 (6.3.2, 6.3.4, 6.3.7, 6.4); Chapter - 7 (7.2-7.5, 7.6.2).

Reference Books:

1. G. Shanker Rao New Age International Publishers, New- Hyderabad.
2. Finite Differences and Numerical Analysis by H.C Saxena S.Chand and Company, New Delhi.

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MODEL CURRCULLUM - B.A /B.Sc

Mathematics: Paper IV (Elective - 2)
FOURIER SERIES AND INTEGRAL TRANSFORMS

UNIT - I :

Fourier series: Fourier series, theorems, Dirichlet's conditions, Fourier series for even and odd functions, Half range Fourier series, Other forms of Fourier series.

Prescribed Text Book: Scope as in *A course of Mathematical Analysis* by Shanthi Narayana and P.K.Mittal, published by S.Chand and Company, Chapter 10.

UNIT - II :

Laplace transforms: Definition of Laplace transform, Linearity property - Piecewise continuous function. Existence of Laplace transforms, Functions of exponential order and of class A. First and second shifting theorems of Laplace transform, Change of scale property - Laplace transform of derivatives, Initial value problem, Laplace transform of integrals, Multiplication by t, Division by t, Laplace transform of periodic functions and error function, Beta function and Gamma functions. Definition of Inverse Laplace transform, Linearity property, First and second shifting theorems of Inverse Laplace transform, Change of scale property, Division by p, Convolution theorem, Heaviside's expansion formula (with proofs and applications).

UNIT - III :

Fourier transforms: Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Linearity property of Fourier transforms, Change of scale property, Shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms, Parseval's identity, Finite Fourier sine transform, Inversion formula for sine transform, Finite Fourier cosine transform, Inversion formula for cosine transform.

UNIT - IV :

Application of Laplace and Fourier transforms: Application of Laplace transforms to the solution of ordinary differential equation

with constant coefficients and variable coefficients, simultaneous ordinary differential equations, partial differential equations. Applications of Fourier transforms to initial and boundary value problems.

Prescribed Text Book:

Scope as in *Integral transforms* by A.R.Vasishta and Dr. R.K.Gupta published by Krishna Prakashan Mandir Pvt. Ltd. Meerut.

Chapter I, Chapter II: all sections except 2.3 and 2.18; Chapter III: section 3.1, 3.2, 3.3, 3.4; Chapter VI: section 6.1 to 6.20 except 6.16; Chapter VII: section 7.1 to 7.4; Chapter VIII: section 8.2.

Reference Book:

Operational Mathematics by R.V.Churchill, McGraw Hill Company.

B.Sc.
PHYSICS

FIRST YEAR

PAPER - I : Mechanics, Waves and Oscillations

SECOND YEAR

PAPER - II : Thermodynamics and Optics

FINAL YEAR

PAPER - III : Electricity, Magnetism and Electronics

PAPER - IV : Modern Physics

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B.Sc. PHYSICS

FIRST YEAR

THEORY PAPER – I
MECHANICS, WAVES AND OSCILLATIONS

UNIT -I

1. **Vector Analysis**

   Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Green's theorems- simple applications.

2. **Mechanics of Particles**

   Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering

3. **Mechanics of rigid bodies**

   Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope, precession of the equinoxes

UNIT - II

4. **Mechanics of continuous media**

   Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions, simple supported beam carrying a concentrated load at mid span, cantilever with an end load

5. **Central forces**

   Central forces - definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

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6. **Special theory of relativity (10)**

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

UNIT - III

7. **Fundamentals of vibrations (12)**

Simple harmonic oscillator, and solution of the differential equation- Physical characteristics of SHM, compound pendulum, measurement of 'g', torsion pendulum, - measurements of rigidity modulus. Combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures

8. **Damped and forced oscillations (12)**

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance

9. **Complex vibrations (6)**

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw-tooth wave

UNIT - IV

10. **Vibrations of bars (12)**

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

11. **Vibrating Strings (12)**

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at both ends, overtones, energy transport, transverse impedance

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12. Ultrasonics (6)

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Velocity of ultrasonics in liquids by Sear's method. Applications of ultrasonic waves.
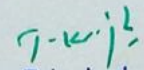
Note: Problems should be solved at the end of every chapter of all units.

Text books

1. Berkeley Physics Course. Vol.1, Mechanics by C. Kittel, W. Knight, M.A. Ruderman -Tata-McGraw hill Company Edition 2008.

2. Fundamentals of Physics. Halliday, Resnick and Walker Wiley India Edition 2007.

3. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy Orient Longman.

4. First Year Physics - Telugu Academy.

5. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, New Age International.

6. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.

7. Introduction to Physics for Scientists and Engineers. F.J. Ruche. McGraw Hill.

8. Waves and Oscillations. N. Subramaniyam and Brijlal Vikas Publishing House Private Limited

Reference Books:

1. Fundamentals of Physics by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.

2. University Physics by Young and Freeman, Pearson Education, Edition 2005.

3. Sears and Zemansky's University Physics by Hugh D. Young, Roger A. Freedman Pearson Education Eleventh Edition.

4. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies.

5. Mechanics. Hans & Puri. TMH Publications.

6. Engineering Physics. R.K. Gaur & S.L. Gupta. Dhanpat Rai Publications.

FIRST YEAR PRACTICALS

1. Study of a compound pendulum determination of 'g' and 'k'.

2. Study of damping of an oscillating disc in Air and Water logarithmic decrement.

3. Study of Oscillations under Bifilar suspension.

4. Study of oscillations of a mass under different combination of springs.

5. 'Y' by uniform Bending (or) Non-uniform Bending.

6. Verification of Laws of a stretched string (Three Laws) - Sonometer

7. Moment of Inertia of a fly wheel.

8. Measurement of errors - Simple Pendulum.

9. Determination of frequency of a Bar - Melde's experiment.

10. 'n' by torsion pendulum.

11. Observation of Lissajous figures from CRO.

12. Study of flow of liquids through capillaries.

13. Determination of Surface Tension of a liquid by different methods.

14. Study of Viscosity of a fluid by different methods.

15. Volume Resonator -determination of frequency of a tuning fork.

Note: Any twelve of the experiments are to be performed.

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SECOND YEAR

Theory Paper-II
THERMODYNAMICS AND OPTICS

UNIT - I

1. Kinetic theory of gases:

Introduction - Deduction of Maxwell's law of distribution of molecular speeds, Experimental verification Toothed Wheel Experiment, Transport Phenomena -Viscosity of gases - thermal conductivity - diffusion of gases.

2. Thermodynamics:

Introduction - Reversible and irreversible processes - Carnot's engine and its efficiency - Carnot's theorem - Second law of thermodynamics, Kelvin's and Claussius' statements - Thermodynamic scale of temperature - Entropy, physical significance - Change in entropy in reversible and irreversible processes - Entropy and disorder - Entropy of universe - Temperature- Entropy (T-S) diagram - Change of entropy of a perfect gas-change of entropy when ice changes into steam.

3. Thermodynamic potentials and Maxwell's equations:

Thermodynamic potentials - Derivation of Maxwell's thermodynamic relations -Clausius-Clayperon's equation - Derivation for ratio of specific heats - Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect - expression for Joule-Kelvin coefficient for perfect and Vanderwals gas.

UNIT - II

4. Low temperature Physics:

Introduction - Joule-Kelvin effect - liquefaction of gas using porous plug experiment. Joule expansion - Distinction between Joule-adiabatic and Joule- Thomson expansions - Expression for Joule-Thomson cooling - Liquefaction of helium, Kapitza's method - Adiabatic demagnetization - Production of low temperatures - Principle of refrigeration, vapour compression type. Working of refrigerator and air conditioning machines. Effects of Chloro and Fluro Carbons on Ozone layer; applications of substances at low-temperature.

5. **Quantum theory of radiation: (10)**

Black body-Ferry's black body - distribution of energy in the spectrum of Black body - Wein's displacement law, Wein's law, Rayleigh-Jean's law - Quantum theory of radiation - Planck's law - deduction of Wein's law, Rayleigh-Jeans law, from Planck's law - Measurement of radiation - Types of pyrometers - Disappearing filament optical pyrometer - experimental determination - Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

6. **Statistical Mechanics:**

Introduction to statistical mechanics, concept of ensembles, Phase space, Maxwell- Boltzmann's distribution law, Molecular energies in an ideal gas, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws. Black body radiation, Rayleigh - Jean's formula, Plank's radiation Law, weins displacement, Stefan's Boltzmann's Law from Plank's formula. Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

UNIT - III

7. Interference:

Principle of superposition - coherence - temporal coherence and spatial coherence -conditions for Interference of light

Interference by division of wave front: Fresnel's biprism - determination of wavelength of light. Determination of thickness of a thin transparent material using Biprism - change of phase on reflection - Lloyd's mirror experiment:

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) - Colours of thin films - Non reflecting films - interference by a plane parallel film illuminated by a point source -Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) - Determination of diameter of wire-Newton's rings in reflected light with and with out contact between Lens and glass plate, Newton's rings in transmitted light (Haidinger fringes). Determination of wavelength of monochromatic light -Michelson Interferometer - types of fringes - Determination of wavelength of monochromatic

light, Difference in wave length of sodium DI, D2 lines and thickness of a thin transparent plate.

8. **Diffraction:**

Introduction - Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit and circular aperture - Limit of resolution -Fraunhoffer diffraction due to double slit - Fraunhoffer diffraction pattern with N slits (diffraction grating)

Resolving Power of grating - Determination of wavelength of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction:-

Fresnel's half period zones - area of the half period zones -zone plate - Comparison of zone plate with convex lens - phase reversal zone plate- diffraction at a straight edge - difference between interference and diffraction.

UNIT - IV

9. **Polarization (10)**

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light - Brewster's law - Malus law - Nicol prism - polarizer and analyzer - Quarter wave plate, Half wave plate -Babinet's compensator - Optical activity, analysis of light by Laurent's half shade polarimeter.

10. **Laser, Fiber Optics and Holography:** (10)

Lasers: Introduction - Spontaneous emission - Stimulated emission - Population inversion . Laser principle - Einstein coefficients - Types of Lasers - He-Ne laser -Ruby laser - Applications of lasers.

Fiber Optics : Introduction - Optical fibers - Types of optical fibers - Step and graded index fibers - Rays and modes in an optical fiber - Fiber material - Principles of fiber communication (qualitative treatment only) and advantages of fiber communication.

Holography: Basic Principle of Holography - Gabor hologram and its limitations, Holography applications.

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11. **The Matrix method in paraxial optics: (8)**

Introduction, the matrix method, effect of translation, effect of re-fraction, system matrix, imaging by a spherical refracting surface. Imaging by a co-axial optical system. Unit planes. Nodal planes. A system of two thin lenses.

NOTE: Problems should be solved at the end of every chapter of all units.

Textbooks

1. Optics by Ajoy Ghatak. *The McGraw-Hill companies.*
2. Optics by Subramaniyam and Brijlal. *S. Chand & Co.*
3. Fundamentals of Physics. Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
4. Optics and Spectroscopy. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. Second Year Physics - *Telugu Academy.*
6. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*

Reference Books

1. Modern Physics by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. Berkeley Physics Course. Volume-5. Statistical Physics by F. Reif. *The McGraw-Hill Companies.*
3. An Introduction to Thermal Physics by Daniel V. Schroeder.*Pearson Education Low Price Edition.*
4. Thermodynamics by R.C. Srivastava, Subit K. Saha & Abhay K. *Jain Eastern Economy Edition.*
5. Modern Engineering Physics by A.S. Vasudeva. *S.Chand & Co. Publications.*
6. Feyman's Lectures on Physics Vol. 1,2,3 & 4. *Narosa Publications.*
7. Fundamentals of Optics by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*

Practical Paper - II
SECOND YEAR PRACTICALS

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.

2. Measurement of Stefan's constant.

3. Heating efficiency of electrical kettle with varying voltages.

4. Determination of diameter of Lycopodium particles.

5. Thickness of a wire-wedge method.

6. Determination of wavelength of light-Biprism.

7. Determination of Radius of curvature of a given convex lens-Newton's rings.

8. Resolving power of grating.

9. Study of optical rotation-polarimeter.

10. Dispersive power of a prism

11. Determination of wavelength of light using diffraction grating-minimum deviation method.

12. Wavelength of light using diffraction grating - normal incidence method.

13. Resolving power of a telescope.

14. Refractive index of a liquid and glass (Boy's Method).

15. Pulfrich refractometer- determination of refractive index of liquid.

16. Wavelength of Laser light using diffraction grating.

Note: Any twelve of the above experiments to be performed.

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FINAL YEAR

Theory Paper-III

ELECTRICITY, MAGNETISM AND ELECTRONICS

UNIT - I

1. Electrostatics

Gauss' law and its applications-Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulmb's law from Gauss law, Mechanical force on a charged conductor Electric potential -Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

2. Dielectrics

An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium- Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric- needle shaped cavity and disc shaped cavity.

3. Capacitance

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser- force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

UNIT - II

1. Moving charge in electric and magnetic field

Hall effect, cyclotron, synchrocyclotron and synchrotron - force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot -Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

2. Electromagnetic induction

Faraday's law -Lenz's law - expression for induced emf - time varying magnetic fields - Betatron -Ballistic galvanometer - theory - damping

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correction - self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid - toroid - energy stored in magnetic field - transformer - Construction, working, energy losses and efficiency.

UNIT - III

1. Varying and alternating currents

Growth and decay of currents in LR, CR and LCR circuits - Critical damping. Alternating current, relation between current and voltage in pure R,C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit - Q-factor. AC & DC motors-single phase, three phase (basics only).

2. Maxwell's equations and electromagnetic waves

A review of basic laws of electricity and magnetism - displacement current -Maxwell's equations in differential form - Maxwell's wave equation, plane electromagnetic waves - Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

UNIT - IV

1. Basic Electronics

Formation of electron energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation - p-n junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave rectifiers and filters, ripple factor (quantitative) - p n p and n p n transistors, current components in transistors, CB,CE and CC configurations - transistor hybrid parameters - determination of hybrid parameters from transistor characteristics - transistor as an amplifier — RC coupled amplifier (qualitative) concept of negative feed back and positive feed back -Barkhausen criterion, and phase shift oscillator (qualitative).

2. Digital Principles

Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal - vice versa and Decimal to Hexadecimal vice versa.

Logic gates: OR,AND,NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates,

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Exclusive - OR gate, De Morgan's Laws - statement and proof, Half and Full adders. Parallel adder circuits.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath - *S. Chand & Co.* for semi conductor & Digital Principles)

2. Fundamentals of Physics- Halliday/Resnick/Walker - *Wiley India Edition 2007.*

3. Berkeley Physics Course - Vol. II - Electricity and Magnetism - Edward M Purcell -*The McGraw-Hill Companies.*

4. Electricity and Magnetism - D.N. Vasudeva. *S. Chand & Co.*

5. Electronic devices and circuits - Millman and Halkias. *Mc.Graw-Hitt Education.*

6. Electricity and Magnetism Brijlal and Subramanyam. *Ratan Prakashan Mandir.*

7. Digital Principles and Applications by A.P. Malvino and D.P. Leach. *McGraw Hill Education.*

Reference Books

1. Electricity and Electronics - D.C. Tayal. *Himalaya Publishing House.*

2. Electricity and Magnetism -C.J. Smith. *Edward Arnold Ltd.*

3. Electricity, Magnetism with Electronics - K K Tewari. *R.Chand & Co.*

4. Third year Physics - *Telugu Akademy*

5. Principles of Electronics by V.K. Mehta - *S. Chand & Co.*

Paper - IV
MODERN PHYSICS

UNIT - 1 : SPECTROSCOPY

1. Atomic Spectra (13 periods)

Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits -relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules - spectra of alkali atoms, doublet fine structure, alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

2. Molecular Spectroscopy: (12 periods)

Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance Vibrational energies and spectrum of diatomic molecule. Raman effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

UNIT - II:

Quantum Mechanics

3. Inadequacy of classical Physics: (5 periods)

Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstien's photoelectric equation. Compton's effect - experimental verification. Limitations of old quantum theory.

4. Matter Waves(10 periods): de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits.Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

5. Schrodinger Wave Equation (10 periods): Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.

Unit - III

Nuclear Physics

6. **Nuclear Structure** (5 **periods**): Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models- liquid drop model, shell model.

7. **Alpha and Beta Decays** (5 **periods**): Range of alpha particles, Geiger - Nuttal law. Gammow's theory of alpha decay. Geiger - Nuttal law from Gammow's theory. Beta spectrum - neutrino hypothesis, Fermi's theory of -decay (qualitative).

8. **Nuclear Reactions and Nuclear Detectors** (5 **periods**) : Types of nuclear reactions, nuclear reaction kinematics. Compound nucleus, direct reactions, channels (concepts).

   GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector

Unit-IV

Solid State Physics Crystollography

9. **Crystal Structure** : Crystalline nature of matter.   Cystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices.   Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and Zinc Blende)

   X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

10. **Bonding in Crystals** (5 **periods**): Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals - determination of Madelung constant for NaCl crystal. Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

11. **Superconductivity: (6 periods)**

    Basic experimental facts - zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect, Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors. High temperature superconductors (discussion only)

12. **Nanomaterials (4 periods)** : Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures - nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Modern Physics by G. Aruldhas & P. Rajagopal. *Eastern Economy Edition.*

2. Concepts of Modern Physics by Arthur Beiser. *Tata McGraw-Hill Edition.*

3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co.*

4. Nuclear Physics by D.C. Tayal, *Himalaya Publishing House.*

5. Molecular Structure and Spectroscopy by G. Aruldhas. *Prentice Hall of India, New Delhi.*

6. Spectroscopy -Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand -*Himalaya Publishing House.*

7. Third Year Physics - *Telugu Academy.*

8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-*Prentice-hall of India Pvt. Ltd.*

Reference Books

1. University Physics with Modern Physics by Young & Freedman. *A. Lewis Ford. Low Price Edition (Eleventh Edition).*

2. Quantum Physics by Eyvind H. Wichman. Volume.4. *The McGraw-Hill Companies.*

3. Quantum Mechanics by Mahesh C. Jani. *Eastern Economy Edition.*

4. Nuclear Physics Irving Kaplan - *Narosa Publishing House.*

5. Introduction to Solid State Physics by Charles Kittel. *John Wiley and Sons.*

6. Solid State Physics by A.J. Dekker. *Mac Millan India*

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Practical Paper - III

THIRD YEAR PRACTICALS

1. Carey-Foster's Bridge - comparison of resistances.

2. Internal resistance of a cell by potentiometer.

3. Figure of merit of a moving coil galvanometer.

4. Voltage sensitivity of a moving coil galvanometer.

5. RC circuit - time constant

6. LR circuit - time constant

7. RC circuit (Frequency response)

8. LR circuit (Frequency response)

9. LCR circuit series/parallel resonance, Q-factor

10. Determination of M and H

11. Power factor of an A.C. Circuit

12. Determination of ac-frequency-sonometer.

13. Design and construction of multimeter.

14. Construction of a model D.C. power supply.

15. Verification of Kirchoff s laws. Note: Any twelve of the above experiments to be performed.

Practical Paper - IV

THIRD YEAR PRACTICALS

1. e/m of an electron by Thomson method.

2. Characteristics of a junction diode

3. Characteristics of a zener diode

4. Characteristics of Transistor

5. Energy gap of semiconductor using a junction diode

6. Temperature-resistance characteristics of thermistor

7. R.C. coupled amplifier

8. Verification of Logic gates AND, OR, NOT, X-OR gates

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9. Verification of De Morgan's theorems.

10. Construction and verification of truth tables for half and full adders.

11. Phase shift Oscillator

12. Hysteresis curve of transformer core

13. Determination of Planck's constant (photocell)

14. Study of hydrogen spectrum (Rydberg constant)

15. Study of absorption of a and P rays

Note: Any twelve of the above experiments to be performed.

Not for examination:

Servicing of domestic appliances - Electric Iron, immersion heater, fan, hot plate grinder, emergency lamp, battery charger, micro-oven, loud speaker, eliminator, cell-phones, servicing of refrigerator.

Suggested Books for Practicais

1. A textbook of Practical Physics by M.N. Srinivasan. *S. Chand& Co.*

2. Practical Physics by M. Arul Thakpathi by *Comptek Publishers.*

3. A. Laboratory manual for Physics Course by B.P. Khandelwal.

4. B.Sc. Practical Physics - C.L. Arora - *S. Chand & Co.*

5. Viva-voce in Advanced Physics - R.C. Gupta and Saxena P.N. - *Pragathi Prakashan, Meerut.*

6. Viva-Voce in Physics - R.C. Gupta, *Pragathi Prakashan, Meerut.*

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