B.Com (Computer Applications)
Syllabus (CBCS)
(w.e.f. 2019–2020)

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FACULTY OF COMMERCE
OSMANIA UNIVERSITY
HYDERABAD - 500 007 T.S.

2019

B.COM (Computer Applications)
CBCS COURSE STRUCTURE
w.e.f. 2019-'20

Sl.No.	*Code*	*Course Title*	*HPW*	*Credits*	*Exam Hrs*	*Marks*
(1)	(2)	(3)	(5)	(6)	(7)	(8)
		SEMESTER – I				
1.	ELS1	English (First Language)	4	4		
2.	SLS1	Second Language	4	4		
3.	AECC1	a)Environmental Science/ b)Basic Computer Skills	2	2	1 ½ hrs	40U+10I
4.	DSC101	Financial Accounting–I	5	5	3 hrs	80U+20I
5.	DSC102	Business Organization and Management	5	5	3 hrs	80U+20I
6.	DSC103	Fundamentals of Information Technology	3T+4P	5	1 ½ hrs	50T+35P + 15I
		Total	27	25		
		SEMESTER – II				
7.	ELS2	English (First Language)	4	4		
8.	SLS2	Second Language	4	4		
9.	AECC2	a)Basic Computer Skills/ b)Environmental Science	2	2	1 ½ hrs	40U+10I
10.	DSC201	Financial Accounting–II	5	5	3 hrs	80U+20I
11.	DSC202	Business Laws	5	5	3 hrs	80U+20I
12.	DSC203	Programming with C & C++	3T+4P	5	1 ½ hrs	50T+35P + 15I
		Total	27	25		
		SEMESTER – III				
13.	ELS3	English (First Language)	3	3		
14.	SLS3	Second Language	3	3		
15.	SEC1UGC Specified Course	Communication Skills / Professional Skills	2	2	1 ½ hrs	40U+10I
16.	SEC2Dept. Specified Course	**a)**Principles of Insurance/ **b)**Foundation of Digital Marketing & Web Design	2	2	1 ½ hrs	40U+10I
17.	DSC301	Advanced Accounting	5	5	3 hrs	80U+20I
18.	DSC302	Business Statistics-I	5	5	3 hrs	80U+20I
19.	DSC303	Relational Database Management System	3T+4P	5	1 ½ hrs	50T+35P + 15I
		Total	27	25		
		SEMESTER – IV				
20.	ELS4	English (First Language)	3	3		
21.	SLS4	Second Language	3	3		
22.	SEC3 UGC Specified Course	Leadership & Management Skills / Universal Human Values	2	2	1 ½ hrs	40U+10I
23.	SEC4Dept. SpecifiedC	**a)**Practice of Life and General Insurance / **b)**Social Media Marketing Search Engine Optimization & Online Advertising	2	2	1 ½ hrs	40U+10I

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24.	DSC401	Income Tax	5	5	3 hrs	80U+20I
25.	DSC402	Business Statistics-II	5	5	3 hrs	80U+20I
26.	DSC403	Web Technologies	3T+4P	5	1 ½ hrs	50T+35P+ 15I
		Total	27	25		
		SEMESTER – V				
27.	ELS5	English (First Language)	3	3		
28.	SLS5	Second Language	3	3		
29.	GE	a)Business Economics / b) Advanced Aspects of Income Tax	4	4	3 hrs	80U+20I
30.	DSE501	a) Cost Accounting/ b) Financial Planning & Performance/ c) InternationalFinancial Reporting-I	5	5	3 hrs	80U+20I
31.	DSE502	a) Computerized Accounting/ b) Financial Decision Making-I/ c) International Tax &Regulation	3T+4P/ 5	5	1 ½ hrs/3 hrs	50T+35P + 15I/ 80U+20I
32.	DSE503	a) Management Information Systems/ b) Ecommerce/c) Mobile Applications	3T+4P	5	1 ½ hrs	50T+35P + 15I
		Total	29/27	25		
		SEMESTER - VI				
33.	ELS6	English (First Language)	3	3		
34.	SLS6	Second Language	3	3		
35.	PR	Research Methodology and Project Report	2T+4R	4	1 ½ hrs	40U+10I 35R+15VV
36.	DSE601	a) Cost Control and Management Accounting/ b) Financial control/ c) International Financial Reporting-II	5	5	3 hrs	80U+20I
37.	DSE602	a) Theory and Practice of GST/ b) Financial Decision Making-II / c) InternationalAuditing	3T+4P/ 5	5	1 ½ hrs/3 hrs	50T+35P + 15I/ 80U+20I
38.	DSE603	a) Multimedia Systems/ b) Cyber Security/c) Data Analytics	3T+4P	5	1 ½ hrs	50T+35P + 15I
		Total	31/29	25		
		GRAND TOTAL	168/164	150		

ELS: English Language Skill; SLS: Second Language Skill; AEC: Ability Enhancement Compulsory Course; *SEC: Skill Enhancement Course; DSC: Discipline Specific Course; DSE: Discipline Specific Elective; GE: Generic Elective; T: Theory; P: Practical; I: Internal Exam U: University Exam: PR: Project Report; VV: Viva-Voce Examination.*

Note: If a student should opt for "a" in SEC in III semester, the student has to opt for "a" only in IV semester and so is the case with "b" and "c". In the case of DSE also the rule applies.

SUMMARY OF CREDITS

Sl. No.	Course Category	No. of Courses	Credits Per Course	Credits
1	English Language	6	4/3	20
2	Second Language	6	4/3	20
3	AECC	2	2	4
4	SEC	4	2	8
5	GE	1	4	4
6	Project Report	1	4	4
7	DSC	12	5	60
8	DSE	6	5	30
	TOTAL	40		150
	Commerce	24		106
CREDITS UNDER NON-CGPA		**NSS/NCC/Sports/Extra Curricular**	**Up to 6 (2 in each year)**	
		Summer Internship	**Up to 4 (2 in each after I & II years)**	

Paper AEC1 (a): BASIC COMPUTER SKILLS

Hours Per Week: 2 **Credits**: 2
Exam Hours: 1 ½ **Marks:** 40U+10I

Objective: to impart a basic level understanding of working of a computer and its usage.

UNIT I: UNDERSTANDING OF COMPUTER AND WORD PROCESSING:

Knowing computer: What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.

Operating Computer using GUI Based Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.

UNIT II: SPREAD SHEET, PRESENTATION SOFTWARE & INTRODUCTION TO INTERNET, WWW AND WEB BROWSERS:

Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.

Basics of presentation software: Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

Introduction to Internet, WWW and Web Browsers:

Introduction to Internet: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting.

World Wide Web: Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website.

Web Browsing: Software, Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes.

SUGGESTED READINGS:

1. Introduction to Computers, Peter Norton, McGrawHill , 2012.
2. Using Information Technology, Brian K williams, StaceyC.Sawyer, Tata McGrawHill.

Web Resources:

1. https://online.stanford.edu/courses/soe-ycscs101-sp-computer-science-101
2.https://www.extension.harvard.edu/open-learning-initiative/intensive-introduction- computer-science.

Paper DSC 101: FINANCIAL ACCOUNTING - I

Objective: *To acquire conceptual knowledge of basics of accounting and preparation of finalaccounts of sole trader.*

UNIT-I: ACCOUNTING PROCESS:
Financial Accounting: Introduction – Definition – Evolution – Functions-Advantages and Limitations –Users of Accounting Information- Branches of Accounting – Accounting Principles: Concepts and Conventions- Accounting Standards– Meaning – Importance – List of Accounting Standards issued by ASB -– Accounting System- Types of Accounts – Accounting Cycle- Journal- Ledger and Trial Balance. (Including problems)

UNIT-II: SUBSIDIARY BOOKS:
Meaning –Types - Purchases Book - Purchases Returns Book - Sales Book - - Sales Returns Book - Bills Receivable Book - Bills Payable Book – Cash Book - Single Column, Two Column, Three Column and Petty Cash Book - Journal Proper.(Including problems)

UNIT-III: BANK RECONCILIATION STATEMENT:
Meaning – Need - Reasons for differences between cash book and pass book balances – Favourable and over draft balances – Ascertainment of correct cash book balance (Amended Cash Book) - Preparation of Bank Reconciliation Statement. (Including problems)

UNIT-IV: RECTIFICATION OF ERRORS AND DEPRECIATION:
Capital and Revenue Expenditure – Capital and Revenue Receipts: Meaning and Differences - Differed Revenue Expenditure. Errors and their Rectification: Types of Errors - Suspense Account – Effect of Errors on Profit. (Including problems)

Depreciation (AS-6): Meaning – Causes – Difference between Depreciation, Amortization and Depletion - Objectives of providing for depreciation – Factors affecting depreciation – Accounting Treatment – Methods of depreciation: Straight Line Method - Diminishing Balance Method (Including problems)

UNIT-V: FINAL ACCOUNTS:
Final Accounts of Sole Trader: Meaning -Uses -Preparation of Manufacturing, Trading and Profit & Loss Account and Balance Sheet – Adjustments – Closing Entries.(Including problems)

SUGGESTED READINGS:

1. Accountancy-I: Haneef and Mukherjee, Tata McGraw Hill Company.
2. Principles & Practice of Accounting: R.L.Gupta&V.K.Gupta, Sultan Chand.
3. Accountancy-I: S.P. Jain & K.L Narang, Kalyani Publishers.
4. Accountancy–I: Tulasian, Tata McGraw Hill Co.
5. Introduction to Accountancy: T.S.Grewal, S.Chand and Co.
6. Advanced Accountancy-I: S.N.Maheshwari&V.L.Maheswari, Vikas.
7. Fundamentals of Financial Accounting: Deepak Sehgil, Tax Mann Publication.
8. Financial Accounting: JawaharLal, Himalaya Publishing House.

Paper DSC 102: BUSINESS ORGANISATION AND MANAGEMENT

Objective: *To acquaint the students with the basics of Commerce and Business concepts and functions, forms of Business Organization and functions of Management.*

UNIT-I: INTRODUCTION AND FORMS OF BUSINESS ORGANISATIONS:
Concepts of Business, Trade, Industry and Commerce - Objectives and functions of Business –Social Responsibility of a business - Forms of Business Organization - Meaning, Characteristics, Advantages and Disadvantages of Sole Proprietorship – Meaning, Characteristics, Advantages and Disadvantages of Partnership - Kinds of Partners - Partnership Deed -Concept of Limited liability partnership – Meaning, Characteristics, Advantages and Disadvantages of Hindu Undivided Family – Meaning, Advantages and Disadvantages of Co-Operative Organization.

UNIT-II: JOINT STOCK COMPANY:
Joint Stock Company - Meaning - Definition - Characteristics - Advantages and Disadvantages - Kinds of Companies - Promotion - Stages of Promotion - Promoter - Characteristics - Kinds - Preparation of Important Documents - Memorandum of Association - Clauses - Articles of Association - Contents – Prospectus - Contents – Red herring Prospectus- Statement in lieu of Prospectus (As per Companies Act. 2013).

UNIT-III: INTRODUCTION TO FUNCTIONS OF MANAGEMENT:
Management - Meaning - Characteristics - Functions of Management - Levels of Management – Skills of Management- Scientific Management - Meaning - Definition - Objectives - Criticism – Fayol's 14 Principles of Management .

UNIT-IV: PLANNING AND ORGANISING: Meaning - Definition - Characteristics - Types of Plans - Advantages and Disadvantages – Approaches to Planning - Management by Objectives (MBO) - Steps in MBO - Benefits –Weaknesses—Definition of Organizing-Organization-Process of Organizing - Principles of Organization - Formal and Informal Organizations - Line, Staff Organizations - Line and Staff Conflicts - Functional Organization - Span of Management - Meaning - Determining Span - Factors influencing the Span of Supervision.

UNIT-V: AUTHORITY, COORDINATION AND CONTROL:
Meaning of Authority, Power, responsibility and accountability - Delegation of Authority - Decentralization of Authority - Definition, importance, process, and principles of Coordination-techniques of Effective Coordination - Control - Meaning - Definition – Relationship between planning and control -Steps in Control – Types (post, current and pre-control) - Requirements for effective control.

SUGGESTED READINGS:

1. Business Organization & Management: Sharma Shashi K. Gupta, Kalyani Publishers
2. Business Organisation& Management: Patrick Anthony, Himalaya Publishing House
3. Business Organization & Management: Dr. Manish Gupta, PBP.
4. Organization & Management: R. D. Agarwal, McGraw Hill.
5. Modern Business Organization: S.A. Sherlekar, V.S. Sherlekar, Himalaya Publishing House
6. Business Organization & Management: C.R. Basu, Tata McGraw Hill
7. Business Organization & Management: M.C. Shukla S. Chand,
8. Business Organisation and Management: D.S. Vittal, S. Chand
9. Organizational Behaviour Text & Cases: V.S.P. Rao, Himalaya Publishing House
10. Business Organization & Management: Uma Shekaram, Tata McGraw Hill
11. Business Organization & Management: Niranjan Reddy & Surya Prakash, Vaagdevi publishers
12. Business Organisation and Management, Dr.NeeruVasihth, Tax Mann Publications.
13.

Paper DSC 103: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Hours Per Week: 6 (4T+2P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: To understand the basic concepts and terminology of informationtechnology and to identify issues related to informationsecurity.

UNIT-I: INTRODUCTION TO COMPUTERS:
Introduction,Definition,Characteristicsofcomputer,EvolutionofComputer,BlockDiagramOf a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations ofcomputer.
Role of I/O devices in a computer system.**Input Units:** Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, **Output Units:** Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards,Speakers.

UNIT -II: COMPUTER ARITHMETIC & STORAGE FUNDAMENTALS:
Binary,Binary Arithmetic, Number System: Positional & Non Positional, Binary,Octal, Decimal, Hexadecimal, Converting from one number system to another.
Primary Vs Secondary Storage, Data storage & retrieval methods.**Primary Storage:** RAM ROM, PROM, EPROM, EEPROM. **Secondary Storage:** Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.

UNIT-III: SOFTWARE:

Software and its needs, Types of S/W. **System Software**: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. **Application S/W** and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.

UNIT-IV: OPERATING SYSTEM:
Functions, Measuring System Performance, Assemblers, Compilers and Interpreters.
Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

UNIT-V: DATA COMMUNICATION:
Data, Communication, Basic Networking Devices, Communication Process, Data Transmission speed, Communication Types(modes), Data Transmission Medias, Modem and its working, characteristics, Typesof Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.

SUGGESTED READINGS:

Computer Fundamentals:P.K.Sinha

Paper DSC 201: FINANCIAL ACCOUNTING-II

Objective: *To acquire accounting knowledge of bills of exchange and other business accountingmethods.*

UNIT-I: BILLS OF EXCHANGE:
Bills of Exchange - Definition- Distinction between Promissory note and Bills of exchange- Accounting treatment of Trade bills: Books of Drawer and Acceptor- Honour and Dishonour of Bills- Renewal of bills- Retiring of bills under rebate- Accommodation bills.(Including problems)

UNIT-II: CONSIGNMENT ACCOUNTS:
Consignment – Meaning – Features– Proforma invoice - Account sales – Del crederecommission-Accounting treatment in the books of the consignor and the consignee - Valuation of consignment stock –Treatment of Normal and abnormal Loss - Invoice of goods at a price higher than the cost price. (Including problems)

UNIT-III: JOINT VENTURE ACCOUNTS:
Joint Venture – Meaning –Features-Difference between Joint Venture and Consignment-Accounting Procedure-Methods of Keeping Records for Joint Venture Accounts-Method of Recording in co-ventures books-Separate Set of Books Method- Joint Bank Account-Memorandum Joint Venture Account (Including problems)

UNIT-IV: ACCOUNTS FROM INCOMPLETE RECORDS:
Single Entry System – Meaning -Features–Difference between Single Entry and Double Entry systems -Defects in Single Entry System - Books and accounts maintained - Ascertainment of Profit - Statement of Affairs and Conversion method (Including problems)

UNIT-V: ACCOUNTING FOR NON-PROFIT ORGANIZATIONS:
Non- Profit Organization – Meaning – Features – Receipts and Payments Account – Income and Expenditure Account – Balance Sheet(Including problems)

SUGGESTED READINGS:

1. Accountancy-I: Haneef and Mukherjee, Tata McGraw Hill Co.
2. Principles and Practice of Accounting: R.L. Gupta & V.K. Gupta,Sultan Chand & Sons.
3. Accountancy–I: Tulasian, Tata McGraw Hill Co.
4. Accountancy–I: S.P. Jain & K.L Narang, Kalyani.
5. Advanced Accountancy-I: S.N.Maheshwari&V.L.Maheswari, Vikas.
6. Advanced Accountancy: M Shrinivas& K Sreelatha Reddy, Himalaya Publishers.
7. Financial Accounting: M.N Arora, Tax Mann Publications.

Paper DSC 202: BUSINESS LAWS

Objective: *To understand basics of contract act, sales of goods act, IPRs and legal provisions applicable for establishment, management and winding up of companies in India.*

UNIT–I: INDIAN CONTRACT ACT:

Agreement and contract - Essentials of a valid contract - Types of contracts - Offer and Acceptance - Essentials of valid offer and acceptance - Communication and revocation of offer and acceptance – Consideration definition - Essentials of valid consideration -Modes of Discharge of a contract - Performance of Contracts - Breach of Contract - Remedies for Breach - Significance of Information Technology Act.

UNIT–II: SALE OF GOODS ACT AND CONSUMER PROTECTION ACT:

Contract of Sale: Essentials of Valid Sale - Sale and Agreement to Sell – Definition and Types of Goods - Conditions and Warranties - Caveat Emptor - Exceptions - - Unpaid Seller - Rights of Unpaid Seller. Consumer Protection Act 1986: Definitions of Consumer – Person – Goods - Service -Consumer Dispute - Consumer Protection Councils - Consumer Dispute Redressal Agencies - Appeals.

UNIT–III: INTELLECTUAL PROPERTY RIGHTS:

Trade Marks: Definition - Registration of Trade Marks - Patents: Definition - Kinds of Patents - Transfer of the Patent Rights - Rights of the Patentee - Copy Rights: Definition -- Rights of the Copyright Owner - Terms of Copy Right - Copy Rights Infringement - Other Intellectual Property Rights: Trade Secrets - Geographical Indications.

UNIT–IV: MANAGEMENT OF COMPANIES AND MEETINGS:

Director: Qualification - Disqualification - Position - Appointment - Removal – Duties and Liabilities – Loans – Remuneration – Managing Director – Corporate Social Responsibility – Corporate Governance. Meeting: Meaning – Requisites - Notice – Proxy - Agenda – Quorum – Resolutions – Minutes – Kinds – Shareholder Meetings - Statutory Meeting - Annual General Body Meeting – Extraordinary General Body Meeting – Board Meetings.

UNIT–V: WINDING UP:

Meaning – Modes of Winding Up –Winding Up by tribunal – Voluntary Winding Up – Compulsory Winding Up – Consequences of Winding Up – Removal of name of the company from Registrar of Companies – Insolvency and Bankruptcy code - 2016.

SUGGESTED READINGS:

1) Company Law: ND Kapoor, Sultan Chand and Co.
2) Company Law: Rajashree. – HPH
3) Business Law - Kavitha Krishna, Himalaya Publishing House
4) Business Laws – Dr. B. K. Hussain, Nagalakshmi - PBP
5) Company Law: Prof. G. Krishna Murthy, G. Kavitha, PBP
6) Company Law and Practice: GK Kapoor& Sanjay Dhamija, Taxmann Publication.
7) Business Law –Dr. IndrakantiSekhar& Ms. TuljaBhavani, SIA Publishing & Distributors Pvt. Ltd.
8) Company Law: Revised as per Companies Act- 2013: KC Garg et al, Kalyani Publication.
9) Corporate Law: PPS Gogna, S Chand.
10) Business Law: D.S. Vital, S Chand
11) Company Law: Bagrial AK, Vikas Publishing House.

Paper DSC 203:PROGRAMMING WITH C & C++

Hours Per Week: 7 (3T+4P) Credits: 5
Exam Hours: 1 ½ Marks: 50U+35P+15I

Objective:To understand the fundamental concepts of programming in C and Object Oriented Programming using C++.

UNIT-I: **INTRODUCTION TO C LANGUAGE, VARIABLES, DATA TYPES AND OPERATORS**

Introduction: Types of Languages- History of C language – Basic Structure –Programming Rules – Flow charts-algorithms–Commonly used library functions - Executing the C Program - Pre-processors in "C"- Keywords & Identifiers – Constants – **Variables:** Rules for defining variables - Scope and Life of a Variable–- **Data types** - Type Conversion - Formatted Input and Output operations. **Operators:** Introduction – Arithmetic – Relational – Logical – Assignment - Conditional - Special - Bitwise - Increment / Decrement operator.

UNIT-II: WORKING WITH CONTROL STATEMENTS, LOOPS

Conditional statements: Introduction - If statements - If-else statements – nested if-else – break statement-continue statement-go to statement-Switch statements. **Looping statements:** Introduction-While statements – Do-while statements - For Statements-nested loop statements.

UNIT-III: FUNCTIONS, ARRAYS AND STRINGS

Functions: Definition and declaration of functions- Function proto type-return statement- types of functions-formatted and unformatted functions. **Built in functions:** Mathematical functions - String functions - Character functions - Date functions.**User defined functions:** Introduction - Need for user defined functions - Elements of functions – Function call – call by value and call by reference - Recursive functions.**Arrays:** Introduction - Defining an array - Initializing an array –characteristics of an array- One dimensional array – Two dimensional array – Multi dimensional array. **Strings:** Introduction - Declaring and initializing string - Reading and Writing strings - String standard functions.

UNIT-IV: POINTERS, STRUCTURES AND UNIONS

Pointers: Features of pointers- Declaration of Pointers-arithmetic operations with pointers

Structures: Features of Structures - Declaring and initialization of Structures –Structure within Structure-Array of Structures- Enumerated data type-**Unions**-Definition and advantages of Unions comparison between Structure & Unions.

UNIT-V: OBJECT ORIENTED CONCEPTS USING C++

Object Oriented Programming: Introduction to Object Oriented Programming - Structure of C++ – Simple programof C++– Storage Classes-Similarities and Differences between C & C++ - Data Members-Member Functions - Object Oriented Concepts-Class-Object-Inheritance-Polymorphism-Encapsulation-Abstraction.

SUGGESTED READINGS:

1. Programming with C& C++ :IndrakantiSekhar, V.V.R.Raman&V.N.Battu, Himalaya Publishers.
2. Programming in ANSI C: Balagurusamy, McGraw Hill.
3. Mastering C: K.R. Venugopal, McGraw Hill.
4. C: The Complete Reference: H.Schildt, McGraw Hill.
5. Let Us C: Y.Kanetkar, BPB.
6. Objected Oriented Programming with C++: E. Balagurusamy, McGraw Hill.
7. Mastering C++: KR.Venugopal&R.Buyya, McGraw Hill.
8. Schaum□s Outlines: Programming with C++: by John R Hubbard.
9. Let Us C++: Y.Kanetkar, BPB.

Paper SEC - 2 (a): PRINCIPLES OF INSURANCE

Objectives: To make Students to learn Principles of Insurance.

UNIT I: RISK MANAGEMENT AND INSURANCE & INSURANCE TERMINOLOGY:
Risk Management -Types of Risks - Actual and Consequential Losses - Management of Risks - Risk of Dying Early - Risk of Living too Long - Different Classes of Insurance - Importance of Insurance - Management of Risk by Individuals and Insurers - Fixing of Premiums – Reinsurance - Role of Insurance in Economic Development and Social Security - Constituents of Insurance Market - Operations of Insurance Companies - Operations of Intermediaries - Specialist Insurance Companies - Role of Regulators - Common and specific terms in Life and Non-Life Insurance - Understanding Insurance Customers - Customer Behavior at Purchase Point - Customer Behavior when Claim Occurs - Importance of Ethical Behavior

UNIT II: INSURANCE CONTRACT AND INSURANCE PRODUCTS:
Insurance Contract Terms - Principles of Insurance: Principle of Insurable Interest, Principle of Indemnity, Principle of Subrogation, Principle of Contribution, Relevant Information Disclosure, Principle of utmost Good Faith, Relevance of Proximate Cause - **Life Insurance Products**: Term Plans - Pure Endowment Plans - Combinations of Plans - Traditional Products - Linked Policies - Features of Annuities and Group Policies - **General Insurance Products**: Risks faced by Owner of Assets - Exposure to Perils - Features of Products Covering Fire and Allied Perils - Products covering Marine and Transit Risks - Products covering Financial Losses due to Accidents - Products covering Financial Losses due to Hospitalization - Products Covering Miscellaneous Risks

SUGGESTED READINGS:
1. Principles of Risk Management and Insurance: George E Rejda (13th Edition) 2. Risk Management and Insurance: Trieschman ,Gustavson and Hoyt . South Western College Publishing, 3. Principles of Insurance: A Publication of the Insurance Institute of India 4. Principles of Insurance: Telugu Academy, Hyderabad 5. Guide to Risk Management: SagarSanyal6. Principles of Insurance: Dr V Padmavathi,Dr V Jayalakshmi - PBP 7. Insurance and Risk Management : P.K. Gupta 8. Insurance Theory and Practice :Tripathi PHI 9. Principles of Insurance Management: Neelam C Gulati, Excel Books 10. Life and Health Insurance: Black, JR KENNETH & Harold Skipper, Pearson, Cincinnati,Ohio Suggested Websites: 1) www.irda.gov.in 2) www.polocyholder.gov.in 3) www.irdaindia.org.in

Paper SEC - 2 (b): FOUNDATION OF DIGITAL MARKETING & WEB DESIGN

Objective:

i. To make students to understand Foundation of digital marketing.
ii. To make students to understand the Fundamentals of Web design and Analytics.

UNIT I: DIGITAL MARKETING FOUNDATIONS& CONTNENT MARKETING: Digital Marketing Strategy - Exploring Digital Marketing - Starting with the Website - Foundations of Analytics - Search Engine Optimization - Search and Display Marketing - Social Media Marketing - Video Marketing.
Email marketing tools and setup - Email marketing segmentation, personalization and mobile friendly design
Content marketing foundations - Blogs for content marketing - Content marketing for staying relevant - Newsletters for content marketing - Mobile marketing foundations

UNIT II: WEB DESIGN AND GOOGLE ANLYTICS:
Exploring and learning web design – Understanding Conversion rate optimization (CRO) – Setting CRO – Understanding target audience – Optimization champion
Getting started with Google Analytics – Core concepts – Additional interface features – Using reports – Audience reports – Acquisition reports – Social reports – Behavior reports – Track events – Conversion reports – Additional features

SUGGESTED READINGS:
1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley
2. Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson
3. Digital Marketing by VandanaAhuja, Oxford 4. Digital Marketing by Seema Gupta, McGraw Hill
5. Digital Marketing For Dummies by Ryan Deiss and Russ Henneberry
6. Don‘t Make Me Think Revisited: A Common Sense Approach to Web Usability By Steve Krug
7. Web Analytics 2.0 – AvinashKaushik 8. Successful Analytics by Brian Clifton
9. Math and Stats for Web Analytics and Conversion Optimization by Himanshu Sharma

Paper DSC 301: ADVANCED ACCOUNTING

Objective: *To acquire accounting knowledge of partnership firms and joint stock companies*

UNIT-I: PARTNERSHIP ACCOUNTS-I:
Meaning – Partnership Deed - Capital Accounts (Fixed and Fluctuating) – Admission of a Partner – Retirement and Death of a Partner (Excluding Joint Life Policy)(Including problems)

UNIT-II: PARTNERSHIP ACCOUNTS–II:
Dissolution of Partnership – Insolvency of a Partner (excluding Insolvency of all partners) – Sale to a Company (Including problems)

UNIT-III: ISSUE OF SHARES, DEBENTURES, UNDERWRITING AND BONUS SHARES:
Issue of Shares at par, premium and discount – Pro-rata allotment – Forfeiture and Re-issue of Shares – Issue of Debentures with Conditions of Redemption – Underwriting: Meaning – Conditions- Bonus Shares: Meaning – SEBI Guidelines for Issue of Bonus Shares – Accounting of Bonus Shares(Including problems)

UNIT-IV: COMPANY FINAL ACCOUNTS AND PROFIT PRIOR TO INCORPORATION:
Companies Act 2013: Structure – General Instructions for preparation of Balance Sheet and Statement of Profit and Loss – Part-I: Form of Balance Sheet – Part-II: Statement of Profit and Loss – Preparation of Final Accounts of Companies - Profits Prior to Incorporation- Accounting treatment. (Including problems)

UNIT-V: VALUATION OF GOODWILL AND SHARES:
Valuation of Goodwill: Need – Methods: Average Profits, Super Profits and Capitalization Methods -Valuation of Shares: Need –Net Assets, Yield and Fair Value Methods. (Including problems)

SUGGESTED READINGS:

1. Principles and Practice of Accounting: R.L. Gupta & V.K. Gupta,Sultan Chand & Sons.
2. Advanced Accountancy: Shukla and Grewal, S.Chand& Co.
3. Advanced Accountancy: R.L.Gupta&Radhaswamy, Sultan Chand & Sons.
4. Advanced Accountancy (Vol-II): S.N.Maheshwari&V.L.Maheswari, Vikas.
5. Advanced Accountancy: Dr. G. Yogeshwaran, Julia Allen - PBP
6. Accountancy–III: Tulasian, Tata McGraw Hill Co.
7. Advanced Accountancy: Arulanandam; Himalaya.
8. Accountancy–III: S.P. Jain & K.L Narang, Kalyani Publishers.
9. Guidance Note on the Revised Schedule VI to the Companies Act, 1956, The Institute of Chartered Accounts of India.
10. Advanced Accounting (IPCC): D. G. Sharma, Tax Mann Publications.

Paper DSC 302: BUSINESS STATISTICS -I

Objective: *to inculcate analytical and computational ability among the students.*

UNIT-I: INTRODUCTION:
Origin and Development of Statistics – Definition - Importance and Scope - Limitations of Statistics - Distrust of Statistics.
Statistical Investigation: Planning of statistical investigation - Census and Sampling methods - Collection of primary and secondary data - Statistical errors and approximation - classification and Tabulation of data - Frequency distribution.

UNIT – II: DIAGRAMMATIC AND GRAPHIC PRESENTATION:
Diagrammatic presentation: One Dimensional and Two Dimensional Diagrams – Pictograms – Cartograms Graphic presentation: Technique of Construction of Graphs - Graphs of Frequency Distribution - Graphs of Time Series or Histograms.

UNIT-III: MEASURES OF CENTRAL TENDENCY:
Introduction –Significance -Arithmetic Mean- Geometric Mean - Harmonic Mean - Mode – Median - Quartiles and Percentiles - Simple and Weighted Averages - Uses and Limitations of different Averages.

UNIT-IV: MEASURES OF DISPERSION, SKEWNESS AND KURTOSIS:
Measures of Dispersion: Significance - Characteristics - Absolute and Relative Measures - Range - Quartile Deviation - Mean Deviation- Standard Deviation - Coefficient of Variation.
Measures of Skewness - Karl Pearson's Coefficient of Skewness - Bowley's Coefficient of Skewness - Kelly's Measure of Skewness – Kurtosis: Mesokurtosis, Platy kurtosis and Leptokurtosis.

UNIT-V: CORRELATION:
Meaning -Types - Correlation and Causation – Methods: Scatter Diagram - Karl Person's Coefficient of Correlation - Probable Error and Interpretation of Coefficient of Correlation - Rank Correlation - Concurrent Deviation Method.

SUGGESTED READINGS:

1. Statistics for Management: Levin & Rubin, Pearson
2. Fundamentals of Statistics: Gupta S.C, Himalaya
3. Statistics: E. Narayanan Nadar, PHI Learning
4. Business Statstics –I: Dr. Obul Reddy, Dr. D. Shridevi - PBP
5. Business Statistics: Dr. J. K. Thukral, Taxmann Publications
6. Business Statistics –I: Dr. PrashantaAthma, N. Rajyalaxmi – SIA Publishers & Distributors Pvt. Ltd.
7. Business Statistics: K. Alagar, Tata McGraw Hill
8. Fundamentals of Statistical: S. P Gupta, Sultan Chand
9. Business Statistics: J. K. Sharma, Vikas Publishers
10. Business Statistics: S. L Aggarwal, S. L. Bhardwaj, Kalyani Publications
11. Statistics-Problems and Solutions: Kapoor V.K, S. Chand
12. Statistics - Theory, Methods and Applications: Sancheti D.C. &Kapoor V.K
13. Business Statistics: S. K. Chakravarty, New Age International Publishers
14. Statistics: Andasn,Sweenly,Williams,Cingage.

Paper DSC 303: RELATIONAL DATABASE MANAGEMENT SYSTEM

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: *to acquire basic conceptual background necessary to design and develop simple database system,Relational database mode, ER model and distributed databases, and to write good queries using a standard query language called SQL.*

UNIT-I: BASIC CONCEPTS: Database Management System - File based system - Advantages ofDBMS over file based system - Database Approach - Logical DBMS Architecture - Three level architecture of DBMS or logical DBMS architecture - Need for three level architecture - Physical DBMS Architecture - Database Administrator (DBA) Functions & Role - Data files indices and Data Dictionary - Types of Database. Relational and ER Models**:** Data Models - Relational Model – Domains - Tuple and Relation - Super keys - Candidate keys - Primary keys and foreign key for the Relations - Relational Constraints - Domain Constraint - Key Constraint - Integrity Constraint - Update Operations and Dealing with Constraint Violations - Relational Operations - Entity Relationship (ER) Model – Entities – Attributes – Relationships - More about Entities and Relationships - Defining Relationship for College Database - E-R Diagram - Conversion of E-R Diagram to Relational Database.

UNIT-II: DATABASE INTEGRITY AND NORMALISATION: Relational Database Integrity - TheKeys - Referential Integrity - Entity Integrity - Redundancy and Associated Problems – Single Valued Dependencies – Normalisation - Rules of Data Normalisation - The First Normal Form -The Second Normal Form - The Third Normal Form - Boyce Codd Normal Form - Attribute Preservation - Lossless-join Decomposition - Dependency Preservation. File Organisation : Physical Database Design Issues - Storage of Database on Hard Disks - File Organisation and Its Types - Heap files (Unordered files) - Sequential File Organisation - Indexed (Indexed Sequential) File Organisation - Hashed File Organisation - Types of Indexes - Index and Tree Structure - Multi-key File Organisation - Need for Multiple Access Paths - Multi-list File Organisation - Inverted File Organisation.

UNIT-III: STRUCTURES QUERY LANGUAGE (SQL): Meaning–SQL commands - DataDefinition Language - Data Manipulation Language - Data Control Language - Transaction Control Language - Queries using Order by – Where - Group by - Nested Queries. Joins – Views – Sequences - Indexes and Synonyms - Table Handling.

UNIT-IV: TRANSACTIONS AND CONCURRENCY MANAGEMENT: Transactions - ConcurrentTransactions - Locking Protocol - Serialisable Schedules - Locks Two Phase Locking (2PL) - Deadlock and its Prevention - Optimistic Concurrency Control. Database Recovery and Security: Database Recovery meaning - Kinds of failures - Failure controlling methods - Database errors - Backup & Recovery Techniques - Security & Integrity - Database Security - Authorization.

UNIT-V: DISTRIBUTED AND CLIENT SERVER DATABASES: Need for Distributed DatabaseSystems - Structure of Distributed Database - Advantages and Disadvantages of DDBMS - Advantages of Data Distribution - Disadvantages of Data Distribution - Data Replication - Data Fragmentation. Client Server Databases: Emergence of Client Server Architecture - Need for Client Server Computing - Structure of Client Server Systems & its advantages.

ADVANCED TOPICS: Overview: Parallel Database - Multimedia Database - Mobile Database - Web Database - Multidimensional Database. Data Warehouse - OLTP Vs OLAP - NoSQL Database.

LAB: SQL QUERIES BASED ON VARIOUS COMMANDS.

SUGGESTED READINGS: 1)Database Systems: R.Elmasri& S.B. Navathe, Pearson.; 2) Introduction to Database Management System: ISRD Group, McGraw Hill.; 3) Database Management System: R.Ramakrishnan&J.Gehrke, McGraw Hill.; 4) Modern Database Management: J.A.Hoffer,V.Rames&H.Topi, Pearson.; 5) Database System Concepts: Silberschatz, Korth&Sudarshan, McGrawHill.6) Simplified Approach to DBMS: ParteekBhaiaKalyani Publishers.7)DatabaseManagement System: NirupmaPathak, Himalaya. 8) Database Management Systems: Pannerselvam, PHI.9) Relational DatabaseManagement System: Srivastava&Srivastava, New Age 10) PHPMySQL Spoken Tutorials by IIT Bombay. 11) OracleDatabase: A Beginner's Guide: I.Abramson, McGraw Hill.

Paper SEC - 4 (a): PRACTICE OF LIFE AND GENERALINSURANCE

Objective: To make students to learn Practice of Life and General Insurance

UNIT-I: PREMIUM CALCULATION AND POLICY DOCUMENTS:
Meaning of Premium, its calculation- Rebates – Mode of Rebates – Large sum assured Rebates – Premium Loading – Rider Premiums – Computation of Benefits – Surrender value – Paid up value -General Insurance Policy Documents and Forms - Rating and Premiums - concept of soft and hard markets

UNIT-II: SETTLEMENT OF CLAIMS RISK & UNDERWRITTINGS AND FINANCIAL PLANNING & TAX SAVING:
Life Insurance: Settlement of claims: Intimation Procedure, documents and settlement procedures - Underwriting: The need for underwriting – Guiding principles of Underwriting – Factors affecting Insurability – Methods of Life Classification – Laws affecting Underwriting - Financial Planning and taxation: Savings – Insurance vis-à-vis- Investment in the Units Mutual Funds, Capital Markets – Life Insurance in Individual Financial Planning – Implications in IT treatment.
General Insurance: Concept of Underwriting—Underwriting Process—Risk sharing and its methods—risk management and steps involved in it——Concept of Claim-understanding the process of claim management—claims fraud and fraud prevention—Insurance reserves and accounting—different types of reserves of insurance companies—reserving process followed by insurance companies—Insurance accounting.

SUGGESTED READINGS: 1. Practice of Life Insurance&General Insurance: Insurance Institute of India, Mumbai. 2. Insurance and Risk Management: P.K.Gupta, Himalaya Publishing House, Mumbai. 3. Fundamentals of Life Insurance Theories and Applications: Kanika Mishra, Prentice Hall 4. Principles of Life Insurance & Practice of General Insurance– Dr. V. Padmavathi, Dr. V. Jayalakshmi - PBP 5. Managing Life Insurance: Kutty, S.K., Prentice Hall of India: New Delhi 6. Life and Health Insurance: Black, Jr. Kenneth and Harold Skipper Jr., Prentice Hall, Inc., England. 7. Life Insurance: Principles and Practice: K.C. Mishra and C.S. Kumar, Cengage Learning, New Delhi. 8. Life Insurance in India: Sadhak, Respose Books, New Delhi. 9. Practice of General Insurance – D.S. Vittal-HPH, 10.Principles & Practice of Insurance- Dr. P. Periasamy – HPH. 11. Risk Management: A Publication of the Insurance Institute of India. 12.Insurance Theory and Practice: Tripathi PHI 13. Risk Management and Insurance: Trieschman, Gustavson and Hoyt 9. South Western College Publishing Cincinnati, Ohio.

Paper SEC - 4 (b): SOCIAL MEDIA MARKETING, SEARCH ENGINE OPTIMIZATION & ONLINE ADVERTISING

Objective:

I. To make students to understand the Social Media marketing.

II. To make students to understand the Search engine optimization and online advertising.

UNIT I: SOCIAL MEDIA MARKETING:

Building an online community – Understanding Social Media Marketing – Marketing and building presence on Facebook – Marketing and building presence on Twitter – Employer branding on LinkedIn

Facebook advertising overview – How Facebook ads work – How to create Facebook ads – Additional advertising options and best practices for Facebook advertising – Marketing and monetizing on YouTube – Customize your YouTube Channel – Video optimization on YouTube – YouTube Analytics

UNIT II: SEO FOUNDATION & STRATEGIES:

Understanding SEO — Content optimization – Long-term **c**ontent planning

Keyword strategy – Linkbuilding strategies – Measuring SEO effectiveness – SEO for Ecommerce – Local search – Mobile SEO UNIT

Pay-Per-Click Advertising – Getting started with Google Adwords – Advertising tracking – Key Google Adwords strategies – Remarketing with Google – Budget and ROI tips – B2B Remarketing Campaigns

SUGGESTED READINGS:

1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley
2. Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson
3. Digital Marketing by VandanaAhuja, Oxford
4. Tuten: Social Media Marketing, Sage
5. Digital Marketing by Seema Gupta, McGraw Hill
6. Social Media Marketing All-In-One for Dummies By Jan Zimmerman and Deborah Ng
7. Facebook Growth Hacking: How to Correctly Set Up and Maintain Your Facebook Presence and Gain Massive Amounts of Fans (Social Media Marketing) by Jeff Abston
8. Youtube Influencer: How To Become a Youtube Influencer, Why Influencer Marketing Matters, and How To Monetize Your Channel by Jeff Abston
9. SEO Fitness Workbook: 2018 Edition: The Seven Steps to Search Engine Optimization Success on Google By Jason McDonald
10. The Art of SEO: Mastering Search Engine Optimization By Eric Enge, Stephan Spencer and Jessie Stricchiola
11. Google Adwords for Beginners: A Do-It-Yourself Guide to PPC Advertising By Cory Rabazinsky, 2015

Paper DSC 401: INCOME TAX

Objective: *To acquire conceptual and legal knowledge about Income Tax provisions relating to computation of Income from different heads with reference to an Individual Assessee.*

UNIT–I: INTRODUCTION:

Direct and Indirect Taxes – Canons of Taxation - Features and History of Income Tax in India – Definitions and Basic Concepts of Income Tax: Assessee – Deemed Assessee – Assessee-in-default – Assessment Year – Previous Year - Person – Agricultural Income – Heads of Income – Gross Total Income – Total Income — Incomes Exempt from Tax. Residential Status and Scope of Total Income: Meaning of Residential Status – Conditions applicable to an Individual Assessee – Incidence of Tax – Types of Incomes. (Theory only)

UNIT–II: INCOME FROM SALARIES:

Definition of 'Salary' – Characteristics of Salary – Computation of Salary Income: Salary u/s 17(1) – Annual Accretion – Allowances – Perquisites – Profits in lieu of Salary – Deductions u/s. 16 – Problems on computation of Income from Salary.

UNIT–III: INCOME FROM HOUSE PROPERTY:

Definition of 'House Property' – Exempted House Property incomes– Annual Value – Determination of Annual Value for Let-out House and Self-occupied House – Deductions u/s.24 – Problems on computation of Income from House Property.

UNIT–IV: PROFITS AND GAINS OF BUSINESS OR PROFESSION:

Definition of 'Business and Profession' – Procedure for computation of Income from Business – Revenue and Capital nature of Incomes and Expenses – Allowable Expenses u/s. 30 to 37 – Expenses expressly disallowed – Deemed Profits – Miscellaneous provisions u/s 44. Depreciation: Meaning – Conditions for charge of depreciation – Problems on computation of Income from Business.Income from Profession: Rules– procedure – problems on computation of Income from Profession.

UNIT-V: CAPITAL GAINS AND INCOME FROM OTHER SOURCES:

Introduction - Meaning – Scope of charge – Basis of charge – Short term and Long term Capital Assets – Transfer of Capital Asset – Deemed Transfer –Determination of Cost of Acquisition – Procedure for computation of Long-term and Short-term Capital Gains/Losses – Exemptions in respect of certain Capital Gains u/s. 54 – Problems on computation of capital gains - General Incomes u/s. 56(1) – Specific Incomes u/s. 56(2) – Dividends u/s. 2(22) – Winnings from lotteries Puzzles, crown world puzzles, Races – Interest on Securities – Gifts received by an Individual – Casual Income – Family Pension – Rent received on let out of Furniture- Plant and Machinery with/without Building – Deductions u/s. 57. (Theory only)

SUGGESTED READINGS:

1. Income Tax Law and Practice: V.P. Gaur & D.B Narang, Kalyani Publishers.
2. Taxation: Dr. M.N. Ravi, PBP.
3. Direct Taxes Law & Practice: Dr.Vinod K. Singhania&Dr.KapilSinghania, Taxmann
4. Income Tax: B.B. Lal, Pearson Education.
5. Taxation: R.G. Saha, Himalaya Publishing House Pvt. Ltd.
6. Income Tax: Johar, McGrawHill Education.
7. Taxation Law and Practice: Balachandran&Thothadri, PHI Learning.
8. Direct Tax Law and Practice : AhujaGirish
9. Income Tax: Dr. P.V. RamanaRao&Dr. A. Sudhakar, National Publishing Co.

Paper DSC 402: BUSINESS STATISTICS - II

Objective: *To inculcate analytical and computational ability among the students.*

UNIT-I: REGRESSION:
Introduction - Linear and Non Linear Regression – Correlation Vs. Regression - Lines of Regression - Derivation of Line of Regression of Y on X - Line of Regression of X on Y - Using Regression Lines for Prediction.

UNIT-II: INDEX NUMBERS:
Introduction - Uses - Types - Problems in the Construction of Index Numbers - Methods of Constructing Index Numbers - Simple and Weighted Index Number (Laspeyre - Paasche, Marshall – Edgeworth) - Tests of Consistency of Index Number: Unit Test - Time Reversal Test - Factor Reversal Test - Circular Test - Base Shifting - Splicing and Deflating of Index Numbers.

UNIT-III: TIME SERIES:
Introduction - Components – Methods-Semi Averages - Moving Averages – Least Square Method - Deseasonalisation of Data – Uses and Limitations of Time Series.

UNIT-IV: PROBABILITY:
Probability – Meaning - Experiment – Event - Mutually Exclusive Events - Collectively Exhaustive Events - Independent Events - Simple and Compound Events - Basics of Set Theory – Permutation – Combination - Approaches to Probability: Classical – Empirical – Subjective - Axiomatic - Theorems of Probability: Addition – Multiplication - Baye's Theorem.

UNIT-V: THEORITECAL DISTRIBUTIONS:
Binomial Distribution: Importance – Conditions – Constants - Fitting of Binomial Distribution.
Poisson Distribution: – Importance – Conditions – Constants - Fitting of Poisson Distribution.
Normal Distribution: – Importance - Central Limit Theorem - Characteristics – Fitting a Normal Distribution (Areas Method Only).

SUGGESTED READINGS:

1. Statistics for Management: Levin & Rubin, Pearson,
2. Fundamentals of Statistics: Gupta S.C, Himalaya
3. Business Statistics: Theory & Application, P. N. Jani, PHI Learning
4. Business Statics – II: Dr. OBul Reddy, Dr. D. Shridevi - PBP
5. Business Statistics: Dr. J. K. Thukral, Taxmann Publications
6. Business Statistics –II: Dr. PrashantaAthma, N. Rajyalaxmi – SIA Publishers & Distributors Pvt. Ltd.
7. Business Statistics: K. Alagar, Tata McGraw Hill
8. Fundamentals of Statistical: S. P Gupta , Sultan Chand
9. Business Statistics: J. K. Sharma,Vikas Publishers
10. Business Statistics: Vora, Tata McGraw Hill
11. Statistics-Problems and Solutions: Kapoor V.K, S. Chand
12. Statistics-Teory, Methods and Applications: SanchetiD.C. &Kapoor V.K
13. Business Statistics: S. K. Chakravarty, New Age International Publishers
14. Business Statistics-G.Laxman,Vasudeva Reddy, K.Goud, TaxmannPublications,Hyderabad.

Paper DSC 403: WEB TECHNOLOGIES

Hours Per Week:7(3T+4P **Credits**: 5
Exam Hours:1½ **Marks:** 50U+35P+15I

Objective:*To gain skills of usage of Web Technologies to design Web pages.*

UNIT-I: INTRODUCTION:

Introduction to web technology – HTML – types of HTML tags-basic Structure of HTML – Web designprinciples – HTML attributes – styles – Hypertext - Formatting text – Forms & formulating instructions & formulation elements – Commenting code – Back grounds – Images-Hyperlinks – Lists –Tables – Frames

UNIT-II: AN OVER VIEW OF DYNAMIC WEB PAGES & DYNAMIC WEB PAGE:

An over view of dynamic web pages – technologies: Introduction to Dynamic HTML programing - Cascading style sheets (CSS) – types and advantages of CSS – CSS basic syntax and structure - Changing Text and Attributes - Dynamically changing style - Text Graphics and placements - Creating multimedia effects with filters and Transactions.

UNIT-III: JAVA SCRIPT&:

Java Script: Introduction - Client side Java script - Server side Java script - Core features - Data types and variables – Operators - Expressions and statements – Functions – Objects – Array - Date and math related objects - Document object model - Eventhandling.

UNIT-IV: EVENTS AND EVENT HANDLERS:

Events And Event Handlers: General information about Events – Event – OnAbort – OnClick - Ondbl click - Ondrag drop – Onerror - Onfocus - Onkey Press – Onkey Up – Onload - Onmouse Down – Onmouse Move - Onmouse Out – Onmouse Over - Onmove - Onrest – Onresize - Onselect - Onsubmit - Onunload.

UNIT-V: EXTENSIBLE MARKUP LANGUAGE (XML:

Extensible Markup Language (XML): Introduction - Creating XML Documents - XML style Sheet – Hyperlinks in XML Document Object Model - XML Query Language.

LAB WORK: CREATING A WEBSITE WITH DYNAMIC FUNCTIONALITY USING CLIENT- SIDE AND SERVER SIDE SCRIPTING.

SUGGESTED READINGS:

1. Web Technology: IndrakantiSekhar, V.N. Battu, Himalaya Publishers.
2. Internet & World Wide Web How to Program: Deitel&Deitel,Pearson.
3. Web programming: ChrisBates.
4. HTML & XML An Introduction NIIT,PHI.
5. HTML for the WWW with XHTML & CSS: Wlizabeth Castro,Pearson
6. Internet and Web Technologies: Raj Kamal, McGrawHill.
7. Web Technology: A Developer's Perspective: Gopalan&Sivaselvan,PHI.
8. Internet Technology and Web Page Design: R.Singh&M.Sonia,Kalyani.
9. Web Technology and Design by Xavier, New Age InternationalPub.

Paper GE: a) BUSINESS ECONOMICS

Objective:*Toacquire knowledge for application of economic principles and tools in businesspractices.*

UNIT-I: INTRODUCTION:
Business Economics: Meaning - Nature – Characteristics - Importance and Role - Micro & Macro Economics - Scope - Objectives - Law of Diminishing marginal utility - Law of Equi-marginal utility.

UNIT- II: DEMAND ANALYSIS:
Meaning – Function - Factors influencing Demand -Types of Demand -Demand Curve - Law of Demand –Exceptions to the law of demand-Elasticity of Demand: Concept - Types of elasticity of demand-price, income and cross Elasticity of Demand –measurement of elasticity—arc and point methods—Importance of various Elasticity of Demand

UNIT-III: SUPPLY ANALYSIS:
Law of Supply - Factors influencing Supply - Market Equilibrium- Consumer Surplus - Theory of Consumer behavior - Utility and indifference curve analysis.

UNIT–IV: PRODUCTION ANALYSIS:
Concept of Production –production function-Total Production - Marginal Production - Average Production –returns to a factor- Law of Variable Proportions - Law of Returns to Scale – Isocost – Isoquants - Economies and Dis-economies of Scale.

UNIT-V: COST AND REVENUEANALYSIS:
Theory of Cost - Concepts of Cost - Short run and Long run cost curves - Traditional and Modern Approaches -Revenue Curves–relationship between total marginal and average revenues- --Break Even Analysis—Meaning – Assumptions – Uses and Limitations.

SUGGESTED READINGS:

1. Business Economics: V. G. Mankar, Himalaya Publishing House
2. Managerial Economics: VanithAgrawal, Pearson Education
3. Business Economics: H. L. Ahuja, S. Chand & Co. Ltd.
4. Business Economics : R. K. Lekhi, Kalyani Publishers
5. Business Economics: D. M. Mithani, Himalaya Publishing House
6. Business Economics: P. N. Chopra, Kalyani Publishers
7. Essential of Business Economics: D. N. Dwivedi, Vikas Publishers
8. Managerial Economics: Varshney and Maheswari, Sultan Chand
9. Business Economics: P. K. Mehta, Tax Mann Publication.

Paper GE: b) ADVANCED ASPECTS OF INCOME TAX

Objective: *To acquire conceptual and legal knowledge about Income Tax provisions relating to computation of Income from certain heads and other provisions relating to clubbing, aggregation of income and assessment procedure.*

UNIT–I: PROFITS AND GAINS OF BUSINESS OR PROFESSION:
Valuation of Stock Depreciation: Meaning – Assets used for Business – Block of Assets – Rates of Depreciation – Miscellaneous Provisions about depreciation – Computation of Depreciation.

UNIT-II: INCOME FROM OTHER SOURCES:
Winnings from lotteries Puzzles, crown world puzzles, Races Problems on computation on Income from Other Sources. Treatment of Agricultural Income. Heads of income: Gross Total Income – Taxable Income – Income Tax Rates. Problems on computation of Total Income of an Individual based on Residential Status.

UNIT-III: CLUBBING AND AGGREGATION OF INCOME:
Income of other persons included in the total income of Assesse – Income from Firm and AOP – Clubbing Provisions – Deemed Incomes – Provisions of set-off and Carry forward of losses – computation of Gross Total Income – Deductions from GTI u/s 80C to 80U – Problems on Computation of Taxable Income.

UNIT-IV: ASSESSMENT OF INDIVIDUALS:
Computation of Tax Liability – Applicability of Alternate Minimum Tax on Individual u/s 115JC – Problems on Computation of tax liability.

UNIT–V: ASSESSMENT PROCEDURE:
Income tax returns – Types of returns – Filing of e-return – Assessment – Types of assessment: Self-assessment – Provisional assessment – Regular assessment – Best judgement assessment – Reassessment – Rectification of mistakes – Notice on demand.

SUGGESTED READINGS:
1. Income Tax Law and Practice: V.P. Gaur & D.B Narang, Kalyani Publishers.
2. Direct Taxes Law & Practice: Dr. Vinod K. Singhania& Dr. KapilSinghania, Taxmann
3. Income Tax: M. Jeevarathinam& C. Vijay Vishnu Kumar, SCITECH Publications.
4. Taxation: R.G. Saha, Himalaya Publishing House Pvt. Ltd.
5. Income Tax: B. Lal, Pearson Education.
6. Income Tax: Johar, McGrawHill Education.
7. Taxation Law and Practice: Balachandran&Thothadri, PHI Learnin

Paper DSE 501 (a) : COST ACCOUNTING

Objective: *To make the students acquire the knowledge of cost accounting methods.*

UNIT-I: INTRODUCTION:
Cost Accounting: Definition – Features – Objectives – Functions – Scope – Advantages and Limitations - Essentials of a good cost accounting system- Difference between Cost Accounting and Financial Accounting – Cost concepts – Cost Classification.

UNIT-II: MATERIAL:
Direct and Indirect Material cost – Inventory Control Techniques – Stock Levels – EOQ – ABC Analysis – JIT - VED - FSND - Issue of Materials to Production – Pricing methods: FIFO - LIFO with Base Stock and Simple and Weighted Average methods.

UNIT-III: LABOUR AND OVERHEADS:
Labour: Direct and Indirect Labour Cost – Methods of Payment of Wages (only Incentive Plans): Halsey, Rowan, Taylor Piece Rate and Merrick Multiple Piece Rate Methods.
Overheads: Classification - Methods of Allocation - Apportionment and Absorption of overheads.

UNIT-IV: UNIT AND JOB COSTING:
Unit Costing: Features - Cost Sheet – Tender and Estimated Cost Sheet.
Job Costing: Features - Objectives – Procedure - Preparation of Job Cost Sheet.

UNIT-V: CONTRACT AND PROCESS COSTING:
Contract Costing: Features – Advantages - Procedure of Contract Costing – Guidelines to Assess profit on incomplete Contracts.
Process Costing: Meaning – Features – Preparation of Process Account – Normal and Abnormal Losses.

SUGGESTED READINGS:

1. Cost Accounting: Jain and Narang, Kalyani
2. Cost Accounting: Srihari Krishna Rao, Himalaya
3. Cost and Management Accounting: PrashantaAthma, Himalaya
4. Cost Accounting: Dr. G. Yogeshweran, PBP.
4. Cost Accounting: Jawaharlal, Tata Mcgraw Hill
5. Cost Accounting: Theory and Practice: Banerjee, PHI
6. Introduction to Cost Accounting: Tulsian, S.Chand
7. Cost Accounting: Horngren, Pearson
8. Cost Accounting: Ravi M. Kishore, Tax Mann Publications.

Paper DSE 501 (b) : FINANCIAL PLANNING & PERFORMANCE

Objective:*To make students to understand the Financial planning & Performance.*

UNIT I: STRATEGIC PLANNING:

Strategic planning: Analysis of external and internal factors affecting strategy - Long-term mission and goals - Alignment of tactics with long-term strategic goals - Strategic planning models and analytical techniques - Characteristics of successful strategic planning process -

Annual profit plan and supporting schedules: Operational budgets - Financial budgets - Capital budgets - Top-level planning and analysis: Pro forma income - Financial statement projections - Cash flow projections.

UNIT II: BUDGETING AND FORECASTING:

Budgeting Concepts: Operations and performance goals - Characteristics of a successful budget process - Resource allocation - Forecasting techniques: Regression analysis - Learning curve analysis - Expected value - Budgeting Methodologies: Annual business plans (master budgets) - Project budgeting - Activity-based budgeting - Zero-based budgeting - Continuous (rolling) budgets - Flexible budgeting

UNIT III: COST AND VARIANCE ANALYSIS:

Cost and Variance Analysis: Comparison of actual to planned results - Use of flexible budgets to analyze performance - Management by exception - Standard Cost System: Use of standard cost systems - Analysis of variation from standard cost expectations

UNIT IV: PERFORMANCE MEASURES:

Performance Measures: Product profitability analysis - Business unit profitability analysis - Customer profitability analysis - Return on investment - Residual income - Investment base issues - Key performance indicators (KPIs) - Balanced scorecard - Responsibility Centers and Reporting Segments: Types of responsibility centers - Transfer pricing - Reporting of organizational segments

UNIT V: TECHNOLOGY AND ANALYTICS:

Information Systems: Accounting information systems - Enterprise resource planning systems - Enterprise performance management systems - Data Governance: Data policies and procedures - Life cycle of data - Controls against security breaches - Technology-enabled finance transformation: System Development Life Cycle - Process automation - Innovative applications

Data analytics: Business intelligence - Data mining - Analytic tools - Data visualization

SUGGESTED READINGS:

1. Wiley CMAexcel Learning System, Part 1: Planning, Performance & Analytics
2. Strategic Management and Business Policy: Globalization, Innovation and Sustainability, 15th edition; Wheelen, Thomas L., et. al.; Prentice Hall
3. Cost Management: A Strategic Emphasis, 6th edition; Blocher, Edward, J., Stout, David E., Juras, Paul E., and Cokins, Gary; McGraw Hill
4. Horngreen's Cost Accounting: A Managerial Emphasis, 16th edition; Charles T., Datar, Srikant, and Rajan, Madhav; Pearson
5. Quantitative Methods for Business, 13th Edition; Anderson, David, R., Sweeney, Dennis J., Williams, Thomas A., Camm, Jeff, and Martin, R. Kipp; Cengage Learning
6. Management Accounting: An Integrative Approach; McNair-Connolly, C.J., Merchant, Kenneth A.; IMA.

Paper DSE 501 (c): INTERNATIONAL FINANCIAL REPORTING -I

Objective:*To make students to understand the International Financial Reporting.*

UNIT I: GENERAL PURPOSE OF FINANCIAL ACCOUNTING AND REPORTING AS PER US GAAP AND IFRS:

Conceptual framework: Standard Setting Bodies & Hierarchy - Elements of F/S - Primary objectives of financial reporting - Qualitative Characteristics of F/S - Fundamental Assumptions & Principles - Accounting Cycle & Preparation of F/S - General-purpose financial statements: Balance sheet - Income statement - Statement of comprehensive income - Statement of changes in equity - Statement of changes cash flows - Public company reporting requirements: SEC Reporting Requirements - Interim Financial Reporting - Segment Reporting - Revenue recognition: 5-Step approach to Revenue Recognition - Certain Customer's Rights & Obligations - Specific Arrangements - Long Term Construction Contracts

UNIT II: CURRENT ASSETS AND CURRENT LIABILITIES (AS PER US GAAP AND IFRS):

Monetary Current Assets & Current Liabilities: Cash & Cash Equivalents - Accounts Receivable - Notes Receivable - Transfers & Servicing of Financial Assets - Accounts Payable - Employee-related Expenses Payable - Inventory: Determining Inventory & Cost of Goods Sold - Inventory Valuation - Inventory Estimation Methods

UNIT III: FINANCIAL INVESTMENTS AND FIXED ASSETS (AS PER US GAAP AND IFRS):

Financial Investments: Investments in Equity Securities - Investment in Debt Securities - Financial Instruments - Tangible Fixed Assets: Acquisition of Fixed Assets - Capitalization of Interest - Costs Incurred After Acquisition - Depreciation - Impairment - Asset Retirement Obligation - Disposal & Involuntary Conversions - Intangible Assets: Knowledge-based intangibles (R&D, software) - Legal rights based intangibles (patent, copyright, trademark, franchise, license, leasehold improvements) – Goodwill

UNIT IV: FINANCIAL LIABILITIES (AS PER US GAAP AND IFRS):

Bonds Payable: Types of Bonds - Convertible bonds vs. Bonds with detachable warrants - Bond Retirement - Fair Value Option & Fair Value Election - Debt Restructuring: Settlement - Modification of terms

UNIT V: SELECT TRANSACTIONS (AS PER US GAAP AND IFRS):

Fair value measurements: Valuation techniques - Fair value hierarchy - Fair value concepts -Accounting changes and error correction: Changes in accounting estimate - Changes in accounting principle - Changes in reporting entity - Correction of an error - Contingencies: Possibility of occurrence (remote, reasonably possible or probable) - Disclosure vs. Recognition

Derivatives and Hedge Accounting: Speculation (non-hedge) - Fair value hedge - Cash flow hedge - Non-monetary exchanges: Exchanges with commercial substance - Exchanges without commercial substance - Leases: Operating lease - Finance lease - Sale leaseback

SUGGESTED READINGS:

1. Miles CPA Review Concept Book: Financial Accounting & Reporting, Miles Education
2. Wiley CPA Excel Exam Review Course Study Guide: Financial Accounting and Reporting, Wiley
3. IFRS & US GAAP Best Practices in Accounting World: GAAP Analysis, Rajesh Dhawan
4. Transparency in Financial Reporting: A concise comparison of IFRS and US GAAP 1st Edition, Ruth Ann McEwen, Harriman House Ltd.
5. IFRS and US GAAP: A Comprehensive Comparison, Steven E. Shamrock, Wiley
6. Wiley GAAP: Interpretation and Application of Generally Accepted Principles, Barry J. Epstein and Ralph Nach, Wiley
7. IFRS Simplified with Practical Illustration Part 1 & 2, Mr RammohanBhave and Dr Mrs Anjali RammohanBhave, CNBC TV 18.

Paper DSE 502 (a) : COMPUTERIZED ACCOUNTING

Objective: *To make the students to acquire the knowledge of computer software*

UNIT I: MAINTAINING CHART OF ACCOUNTS IN ERP:
Introduction-Getting Started with ERP - Mouse/Keyboard Conventions-Company Creation-Shut a Company-Select a Company-Alter Company Details-Company Features and Configurations-F11: Company Features-F12: Configuration-Chart of Accounts-Ledger-Group-Ledger Creation-Single Ledger Creation-Multi Ledger Creation-Altering and Displaying Ledgers-Group Creation-Single Group Creation-Multiple Group Creation-Displaying Groups and Ledgers-Displaying Groups-Display of Ledgers-Deletion of Groups and Ledgers – P2P procure to page.

UNIT II: MAINTAINING STOCK KEEPING UNITS (SKU):
Introduction-Inventory Masters in ERP - Creating Inventory Masters-Creation of Stock Group-Creation of Units of Measure-Creation of Stock Item-Creation of Godown-Defining of Stock Opening Balance in ERP Stock Category-Reports.

UNIT III: RECORDING DAY-TO-DAY TRANSACTIONS IN ERP:
Introduction-Business Transactions-Source Document for Voucher-Recording Transactions in ERP - Accounting Vouchers-Receipt Voucher (F6)-Contra Voucher (F4)-Payment Voucher (F5)-Purchase Voucher (F9)-Sales Voucher (F8)-Debit Note Voucher-Credit Note (Ctrl+F8)-Journal Voucher (F7).

UNIT IV: ACCOUNTS RECEIVABLE AND PAYABLE MANAGEMENT:
Introduction-Accounts Payables and Receivables-Maintaining Bill-wise Details-Activation of Maintain Bill-wise Details Feature-New Reference-Against Reference-Advance-On Account-Stock Category Report-Changing the Financial Year in ERP.

UNIT V: MIS REPORTS:
Introduction-Advantages of Management Information Systems-MIS Reports in ERP - Trial Balance - Balance Sheet-Profit and Loss Account-Cash Flow Statement-Ratio Analysis-Books and Reports - Day Book-Receipts and Payments-Purchase Register-Sales Register-Bills Receivable and Bills Payable.

SUGGESTED READINGS:

1. Computerised Accounting: GarimaAgarwal, Himalaya
2. Computerised Accounting: A. Murali Krishna, Vaagdevi publications
3. Computerised Accounting: Dr. G. Yogeshweran, PBP.
4. Aakash Business Tools: Spoken Tutorial Project IIT Bombay
5. Mastering Tally: Dinesh Maidasani, Firewal Media
6. Implementing Tally ERP 9: A.K Nadhani and K.K Nadhani, BPB Publications
7. Computerised Accounting and Business Systems: Kalyani Publications
8. Manuals of Respective Accounting Packages
9. Tally ERP 9: J.S. Arora, Kalyani Publications.

Paper DSE 502 (b): FINANCIAL DECISION MAKING - I

Objective: *To make students to understand the Financial Decision Making.*

UNIT I: FINANCIAL STATEMENT ANALYSIS

Basic Financial Statement Analysis: Common size financial statements - Common base year financial statements - Financial Ratios: Liquidity - Leverage - Activity - Profitability - Market Profitability analysis: Income measurement analysis - Revenue analysis - Cost of sales analysis - Expense analysis - Variation analysis - Special issues: Impact of foreign operations - Effects of changing prices and inflation - Off-balance sheet financing - Impact of changes in accounting treatment - Accounting and economic concepts of value and income - Earnings quality

UNIT II: FINANCIAL MANAGEMENT

Risk & Return: Calculating return - Types of risk - Relationship between risk and return
Long-term Financial Management: Term structure of interest rates - Types of financial instruments - Cost of capital - Valuation of financial instruments

UNIT III: RAISING CAPITAL

Raising Capital:Financial markets and regulation - Market efficiency - Financial institutions - Initial and secondarypublic offerings - Dividend policy and share repurchases - Lease financing

UNIT IV: WORKING CAPITAL MANAGEMENT

Managing working capital: Cash management - Marketable securitiesmanagement - Accounts receivable management - Inventory management - Short-term Credit: Types of short-term credit - Short-term credit management

UNIT V: CORPORATE RESTRUCTURING AND INTERNATIONAL FINANCE

Corporate Restructuring: Mergers and acquisitions - Bankruptcy - Other forms of restructuring
International Finance: Fixed, flexible, and floating exchange rates - Managing transaction exposure - Financinginternational trade - Tax implications of transfer pricing

SUGGESTED READINGS:

1. Wiley CMAexcel Learning System, Part 2: Strategic Financial Management
2. Interpretation and Application of International Financial Reporting Standards; Mackenzie, Bruce, Coetsee, Danie, Njikizana, Tapiwa, Chamboko, Raymond, Colyvas, Blaise,andHanekom, Brandon; Wiley
3. Financial Reporting & Analysis, 13th edition; Gibson, Charles H.; South-Western Cengage Learning
4. Financial Statement Analysis, 10th edition; Subramanyam, K.R., and Wild, John L.; McGraw Hill
5. Principles of Corporate Finance, 11th edition; Brealey, Richard, A., Myers, Stewart C., and Allen, Franklin; McGraw Hill
6. Fundamentals of Financial Management, 13th edition; Van Horn, James, C., and Wachowicz, John M. Jr.; FT / Prentice Hall

Paper DSE 502 (c) : INTERNATIONAL TAX & REGULATION

Objective:*To make students to understand the International Tax & Regulation.*

UNIT I: TAXATION OF INDIVIDUALS:
Individual Income Tax Return: Filing Status - Cash basis and Accrual basis
Gross Income: Wages, Salaries, Bonus, Commission, Fees & Tips - Interest & Dividend Income - Business Income - Capital Gains & Losses - Passive Income - Farming Income - Deductions: Adjustments - Deductions from AGI - Calculating Tax: Tax Credits - Alternative Minimum Taxes - Other Taxes - Estimated Tax penalty

UNIT II: PROPERTY TRANSACTIONS & DEPRECIATION:
Capital Gains & Losses - Gains & Losses from Sale of Long-term Business Property - Depreciation & Amortization

UNIT III: TAXATION OF CORPORATIONS:
C-Corporations:Formation - Income Tax Return - Income - Deductions - Reconciliation of Taxable Income with books - Calculating Tax - Corporate Earnings & Distributions - Corporate Liquidation & Reorganizations - S-Corporations: Eligibility criteria - Income Tax Return - Shareholder basis - Earnings and Distribution - Termination of Election

UNIT IV: TAXATION OF OTHER ENTITIES:
Partnerships: Formation - Income Tax Return - Partner basis - Partnership Distributions - Sale of Partnership Interest by a Partner - Termination of Partnership - Estate, Trust & Gift Taxation: Estate and Trust Fiduciary Income Tax Return - Estate Tax Return - Gift Tax Return - Generation-skipping transfer Tax - Tax Exempt Organizations: Formation - Income Tax Return

UNIT V: STATUTORY REGULATIONS, ACCOUNTANT RESPONSIBILITIES, BUSINESS STRUCTURES:
Federal Security Regulations: Securities Act of 1933 - Securities Exchange Act of 1934 - Other federal security regulations - Professional & Legal Responsibilities: Accountant Common Law Liabilities - Accountant Statutory Liabilities - Accountant Liabilities for Privileged Information - Accountant Criminal Liabilities - Employment Regulations - Environmental Regulations - Antitrust Regulations - Business Structures: Sole Proprietorships - Partnerships - Corporations

SUGGESTED READINGS:

1. Miles CPA Review Concept Book: Regulation, Miles Education
2. Wiley CPA Excel Exam Review Course Study Guide: Regulation, Wiley
3. Internal Revenue Code: Income, Estate, Gift, Employment and Excise Taxes, CCH Tax Law Editors
4. Federal Income Tax: Code and Regulations--Selected Sections, Martin B. Dickinson, Wolters Kluwer
5. Federal Income Taxation by Katherine Pratt and Thomas D. Griffith, Wolters Kluwer
6. Federal Income Taxation (Concepts and Insights), Marvin Chirelstein and Lawrence Zelenak, Foundation Press

Paper DSE 503 (a) :MANAGEMENT INFORMATION SYSTEMS

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: *To equip the students with finer nuances of MIS.*

UNIT–I: INTRODUCTION TO MIS:
The Technical and Business Perspective, Organization Structure, Evaluation of MIS through Information System, The Decision Making Process , System Approach to Problem Solving, The Structure of Management Information System, MIS Organization within the Company.

UNIT-II: INFORMATION SYSTEMS FOR DECISION MAKING:
Evolution of an Information System, Basic Information Systems, Decision Making and MIS, Decision Assisting Information System, Concepts of Balanced MIS Effectiveness and Efficiency Criteria.

UNIT-III: DEVELOPMENT OF MIS:
Methodology and Tools/Techniques for Systematic Identification, Evaluation and Modification of MIS.*Enterprise Resource Planning:* Introduction, Basics of ERP, Evolution of ERP, Enterprise Systems in Large Organizations, Benefits and Challenges of Enterprise Systems, *E-Enterprise System :* Introduction: Managing the E-enterprise, Organisation of Business in an E-enterprise, E-business, E-commerce, E-communication, E-collaboration.

UNIT-IV: ADVANCED MIS:
Concepts, Needs and Problems in Achieving Advanced MIS, DSS., Business intelligence + process management, systems development, and security.

UNIT-V: COLLABORATION, IMPACT & PITFALLS IN MIS:
Collaboration processes and information systems, Impact of Web 2.0 and social media on business process, Pitfalls in MIS Development: Fundamental Weakness, Soft Spots in Planning and Design Problems.

SUGGESTED READINGS:

1.Murdic, Rose and Clagett- Information Systems for Modern Management, PHI, New Delhi.
2.Process, Systems, and Information, David M. Kroenke,
3. MIS Cases Decision Making with Application Software, 4th Edition, Lisa Miller
4.Laudon-Laudon- Management Information Systems, Pearson Education, New Delhi.

Paper DSE 503 (b) :E-COMMERCE

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: *to acquire conceptual and application knowledge of ecommerce.*

UNIT-I: INTRODUCTION:
E-Commerce: Meaning - Advantages & Limitations - E-Business: Traditional & Contemporary Model, Impact of E-Commerce on Business Models - Classification of E-Commerce: B2B - B2C - C2B - C2C - B2E - Applications of Ecommerce: E-Commerce Organization Applications - E-Marketing - E-Advertising - E-Banking - Mobile Commerce - E-Trading - E-Learning - E-Shopping.

UNIT-II:FRAMEWORK OF E-COMMERCE:
Framework of E-Commerce: Application Services - Interface Layers - Secure Messaging - Middleware Services and Network Infrastructure - Site Security - Firewalls & Network Security - TCP/IP – HTTP - Secured HTTP – SMTP - SSL.
Data Encryption: Cryptography – Encryption – Decryption - Public Key - Private Key - Digital Signatures - Digital Certificates.

UNIT-III:CONSUMER ORIENTED E-COMMERCE APPLICATIONS:
Introduction - Mercantile Process Model: Consumers Perspective and Merchant's Perspective - Electronic Payment Systems: Legal Issues & Digital Currency - E-Cash & E-Cheque - Electronic Fund Transfer (EFT) - Advantages and Risks - Digital Token-Based E-Payment System - Smart Cards.

UNIT-IV:ELECTRONIC DATA INTERCHANGE:
Introduction - EDI Standards - Types of EDI - EDI Applications in Business – Legal - Security and Privacy issues if EDI - EDI and E-Commerce - EDI Software Implementation.

UNIT-V: E-MARKETING TECHNIQUES:
Introduction - New Age of Information - Based Marketing - Influence on Marketing - Search Engines & Directory Services - Charting the On-Line Marketing Process - Chain Letters - Applications of 5P's (Product, Price, Place, Promotion, People) E-Advertisement - Virtual Reality & Consumer Experience - Role of Digital Marketing.
Lab work: *Using Microsoft Front Page Editor and HTML in Designing a Static Webpage/Website.*

SUGGESTED READINGS:

1. Frontiers of Electronic Commerce: Ravi Kalakota, Andrew B Whinston, Pearson
2. E-Commerce: Tulasi Ram Kandula, HPH.
3. E-Commerce: An Indian Perspective: P.T. Joseph, S.J, PHI
4. Electronic Commerce, Framework Technologies & Applications: Bharat Bhasker, McGraw Hill
5. Introduction To E-Commerce: Jeffrey F Rayport, Bernard J. Jaworski: Tata McGraw Hill
6. Electronic Commerce, A Managers' Guide: Ravi Kalakota, Andrew B Whinston
7. E-Commerce & Computerized Accounting: Rajinder Singh, Er. KaisarRasheed, Kalyani
8. E-Commerce & Mobile Commerce Technologies: Pandey, SaurabhShukla, S. Chand
9. E-Business 2.0, Roadmap For Success: Ravi Kalakota, Marcia Robinson, Pearson
10. Electronic Commerce: Pete Loshin / John Vacca, Firewall Media
11. E-Commerce, Strategy, Technologies And Applications : David Whiteley, Tata Mcgraw Hill

Paper DSE 503 (c) :MOBILE APPLICATIONS

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: *To understand and apply the mobile applicatios.*

UNIT-I: INTRODUCTION:
What is Android, Android versions and its feature set The various Android devices on the market, The Android Market application store ,Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs), the Android Software Stack, The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime – Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries, Application Framework, Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files,

UNIT-II: MOBILE SOFTWARE:
Understanding Java SE and the Dalvik Virtual Machine, The Directory Structure of an Android Project , Common Default Resources Folders, The Values Folder, Leveraging Android XML, Screen Sizes, Launching Your Application: The AndroidManifest.xml File,
Creating Your First Android Application, Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components.
Android Manifest XML: Declaring Your Components, Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool.

UNIT-III: MOBILE DISPLAY:
Displaying Text with TextView, Retrieving Data from Users, Using Buttons, Check Boxes and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with SeekBar, Working with Menus using views, Gallery, ImageSwitcher, GridView, and ImageView views to display images, Creating Animation, Saving and Loading Files, SQLite Databases, Android Database Design, Exposing Access to a Data Source through a Content Provider, Content Provider Registration, Native Content Providers

UNIT-IV: MOBILE APPLICATIONS:
Intent Overview, Implicit Intents, Creating the Implicit Intent Example Project, Explicit Intents, Creating the Explicit Intent Example Application, Intents with Activities, Intents with Broadcast Receivers, An Overview of Threads, The Application Main Thread, Thread Handlers, A Basic Threading Example, Creating a New Thread, Implementing a Thread Handler, Passing a Message to the Handler. Sending SMS Messages Programmatically, Getting Feedback after Sending the Message Sending SMS Messages Using Intent Receiving, sending email, Introduction to location-based service, configuring the Android Emulator for Location-Based Services, Geocoding and Map-Based Activities,Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT-V: MOBILE APP DEVELOPMENT & INSTALLATION:
Introduction to Windows Phone App Development, Installing the Windows Phone SDK, Creating Your First XAML for Windows Phone App. Understanding the Role of XAP Files, the Windows Phone Capabilities Model, the Threading Model for XAML-Based Graphics and Animation in Windows Phone, Understanding the Frame Rate Counter, The Windows Phone Application Analysis Tool, Reading Device Information, Applying the Model-View-ViewModel Pattern to a Windows Phone App, Property Change Notification, Using Commands

SUGGESTED READINGS:

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015
3. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
4. AnubhavPradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2

Web Resource :
Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals-course-concepts/details (Download pdf file from the above link)

Paper PR : RESEARCH METHODOLOGY & PROJECT REPORT

Objective: *To introduce the basics of conducting research in social sciences.*

UNIT-I: INTRODUCTION, MEASUREMENT AND HYPOTHESIS TESTING:
Meaning of Research-Steps involved- Identification of Problem- Steps involved in the selection of problem-Research Design-Meaning and Types- Measurement Levels/Scales - Scaling Techniques-Hypothesis-Meaning - Types – Testing Procedure.

UNIT-II:PARAMETRIC AND NON PARAMETRIC TESTS AND RESEARCH REPORT:
Introduction - t-Test - F-Test - Chi Square Test - Anova (One-Way Anova, Two-Way Anova).concepts only Contents of a Research Report.

SUGGESTED READINGS:

1. Research Methodology: Himalaya Publications.
2. Methodology of Research in Social Sciences: Krishna Swamy,
3. Research Methodology: Kothari &Garg, New Age Publication
4. Research Methodology: Paneerselvam R, PHI
5. Research Methodology: Dr Vijay Upagade& Dr ArvindShende, S. Chand Publications
6. Research Methodology: Ranjit Kumar, Pearson Publication
7. Reading in Research Methodology in Commerce & Business Management: Achalapathi KV,
8. Research Methodology: Sashi.K Gupta, PraneethRangi, Kalyani Publishers.
9. Research Methodology: Ms.TuljaBhavani, SIA Publishers & Distributors Pvt. Ltd.

GUIDELINES FOR PROJECT WORK

1) Project work is a part of the prescribed curriculum to B. Com students.
2) Project work is allotted to a group of 4 students.
3) During the IV semester, students are expected to undergo internship at a business firm/ Government Department /Software organization/Voluntary organization as per the guidance of teacher concerned.
4) Students should get a certificate from the organization.
5) At the end of Semester-VI, the project reports would be evaluated by the external examiner designated by the Controller of Examinations, from the panel submitted by the Board of Studies in Commerce. The Examiner would evaluate the project reports for a maximum of 35 marks and conduct Viva-Voce examination for 15 marks. The award lists duly signed would be sent the Controller of Examinations.
6) Examiners will examine the following in the project report: i) Survey/Analysis on the topic chosen; ii) Method of data collection; iii) Presentation: Style, Comprehensiveness, graphs, charts etc.; iv) Analysis and inference and implications of the study; v) Bibliography.
7) Students must ensure that they maintain **regular contact with their supervisor** and also that they provide the supervisor with drafts of their work at regular intervals.
8) Students are required to submit a project report on a topic related/connected with trade, industry & commerce. Project can be done by taking the information from the select

organization focusing on areas like marketing, finance, human resource, operations, general management etc.

9) Project should be a practical, in-depth study of a problem, issue, opportunity, technique or procedure or some combination of these aspects of business. The Students are required to define an area of investigation, assemble relevant data, analyse the data, draw conclusions and make recommendations.

ORGANISATION OF PROJECT REPORT

1) Project report should be presented in the following sequence:
i) Title page; ii) Student's declaration; iii) Supervisor's certificate; iv) Internship certificate; v) Abstract; vi) Acknowledgements; vii) Table of contents; viii) List of tables; ix) List of figures; x) List of appendices.

2) Chapter Design should be as follows:

Chapter-I: **Introduction**: this chapter includes the research problem, need for study/significance of the project, objectives, methodology (hypotheses, statistical tools, data source, scope, sample, chapter design).
Chapter-II:**Company Profile:** this chapter should contain a brief historical retrospect about the entity of your study.
Chapter-III: D**ata Analysis and interpretation:** this chapter should present the data analysis and inferences.
Chapter-IV: **Summary and Conclusions**: This Chapter should give an overview of the project, conclusions, implications, recommendations and scope for further research.
Bibliography: lists the books, articles, and websites that are referred and used for research on the topic of the specific project. Follow Harvard style of referencing.
Appendices: the data, used to prepare the tables for analysis, may not be feasible to incorporate as part of chapters, may given as appendices.

TECHNICAL SPECIFICATIONS OF THE PROJECT

1) Project should be typed on **A4 white paper**, and be **1.5 spaced.**
2) All pages should be **numbered**, and numbers should be placed at the centre of the bottom of the page.
3) All tables, figures and appendices should be consecutively numbered or lettered, and suitably labeled.
4) 3 bound copies&a soft-copy should be handed in to the **principal/director of your college/institute** at the time of submission.
5) bibliography and referencing: Referencing is necessary to avoid plagiarism, to verify quotations and to enable readers to follow-up and read more fully the cited author's arguments. Reference is given within the text of the project as well as at the end of the project. The basic difference between citation and a reference list (bibliography) is that the latter contains full details of all the in-text citations.

- **Citation** provides brief details of the author and date of publication for referencing the work in the body of the text.
- **Reference list** is given at the end of the text and is a list of all references used with additional details provided to help identify each source.

Proper referencing is as crucial aspect of your project. You are therefore strongly advised to talk

to your supervisor about this, in order to make sure that your project report follows the appropriate referencing system.

Paper DSE 601 (a) : COST CONTROL AND MANAGEMENT ACCOUNTING

Objective: *To be acquaint with Cost Control techniques, Managerial Accounting decision-making techniques and reporting methods.*

UNIT-I: INTRODUCTION TO MANAGEMENT ACCOUNTING &MARGINAL COSTING:

Meaning and Importance of Management Accounting – Marginal Cost Equation – Difference between Marginal Costing and Absorption Costing – Application of Marginal Costing – CVP Analysis – Break Even Analysis: Meaning – Assumptions – Importance - Limitations. Marginal Costing for Decision Making-Make or Buy – Add or Drop Products – Sell or Process Further – Operate or Shut-down – Special Order Pricing – Replace or Retain.

UNIT-II: BUDGETARY CONTROL AND STANDARD COSTING:

Budget: Meaning – Objectives – Advantages and Limitations – Essentials of Budgets - Budgetary Control - Classification of Budgets - Preparation of Fixed and Flexible Budgets. Standard Costing: Meaning – Importance – Standard Costing and Historical Costing - Steps involved in Standard Costing. Variance Analysis: Material variance - Labour variance - Overhead variance .

UNIT-III: TECHNIQUES OF FINANICAL STATEMENT ANALYSIS:

Meaning – Objectives - Techniques: Comparative Statement, Common Size Statement, Trend Analysis. Ratios- Meaning , Objectives and Classification—Computation of Activity, Liquidity, Solvency and Profitability Ratios.

UNIT-IV: FUNDS FLOW ANANLYSIS:

Concept of Funds – Meaning and Importance – Limitations – Statement of Changes in Working Capital – Statement of Sources and Application of Funds.

UNIT-V: CASH FLOW ANALYSIS (AS-3):

Meaning – Importance – Differences between Funds Flow and Cash Flow Statements – Procedure for preparation of Cash Flow Statement.

SUGGESTED READINGS:

1. Management Accounting- Principles & Practice: Sharma RK &Shashi K. Gupta, Kalyani
2. Advanced Managerial Accounting: Srihari Krishna Rao, Himalaya
3. Advanced Managerial Accounting: Dr. Sundaram, PBP
3. Advanced Management Accounting: Robert S. Kaplan & Anthony A. Atkinson, Prentice-Hall
4. Management Accounting: Rustagi R.P, Galgotia
5. Managerial Accounting: Ronald W. Hilton, TMH

Paper DSE 601 (b) : FINANCIAL CONTROL

Objective:*To make students to understand the Financial Control.*

UNIT I: EXTERNAL FINANCIAL REPORTING DECISIONS (AS PER US GAAP & IFRS):

Financial Statements: Balance sheet - Income statement - Statement of Comprehensive Income - Statement of changes in equity - Statement of cash flows - Integrated reporting

UNIT II: RECOGNITION, MEASUREMENT, VALUATION, AND DISCLOSURE (AS PER US GAAP & IFRS) :

Assets, Liabilities & Equity: Asset valuation - Valuation of liabilities - Equity transactions - Income: Revenue recognition - Income measurement - Major differences between U.S. GAAP and IFRS

UNIT III: COST MANAGEMENT:

Measurement concepts: Cost behavior and cost objects - Actual and normal costs - Standard costs - Absorption (full) costing - Variable (direct) costing - Joint and by-product costing - Costing Systems: Joint and by-product costing - Job order costing - Process costing - Activity-based costing - Life-cycle costing -Overhead costs: Fixed and variable overhead expenses - Plant-wide versus departmental overhead -Determination of allocation base - Allocation of service department costs

UNIT IV: SUPPLY CHAIN MANAGEMENT AND BUSINESS PROCESS IMPROVEMENT:

Supply chain management: Lean resource management techniques - Enterprise resource planning (ERP) - Theory of constraints - Capacity management and analysis - Business Process Improvement: Value chain analysis - Value-added concepts - Process analysis, redesign, and standardization - Activity-based management - Continuous improvement concepts - Best practice analysis - Cost of quality analysis - Efficient accounting processes

UNIT V: INTERNAL CONTROLS:

Governance, Risk & Compliance: Internal control structure and management philosophy - Internal control policies for safeguarding and assurance - Internal control risk - Corporate governance - External audit requirements - System Controls & Security Measures: General accounting system controls - Application and transactioncontrols - Network controls - Backup controls - Business continuity planning

SUGGESTED READINGS:

1. Wiley CMAexcel Learning System, Part 1: Planning, Performance & Analytics
2. Intermediate Accounting, 17th edition; Kieso, Donald E., Weygandt, Jerry J., and Warfield, Terry D.; Wiley
3. Intermediate Accounting, 11th edition; Nikolai, Loren A., Bazley John D., and Jones, Jefferson P., South-Western Cengage Learning
4. Cost Management: A Strategic Emphasis, 6th edition; Blocher, Edward, J., Stout, David E., Juras, Paul E., and Cokins, Gary; McGraw Hill
5. Horngreen's Cost Accounting: A Managerial Emphasis, 16th edition; Charles T., Datar, Srikant, and Rajan, Madhav; Pearson

6. Management Accounting: An Integrative Approach; McNair-Connolly, C.J., Merchant, Kenneth A.; IMA

Paper DSE 601(c) :INTERNATIONALFINANCIAL REPORTING - II

Objective:*To make students to understand the International Financial Reporting.*

UNIT I: PENSIONS & POST-EMPLOYMENT BENEFITS (AS PER US GAAP & IFRS):
Defined contribution pension plans - Defined benefit pension plans: Pension obligations - Pension plan assets - Net pension expense - Other Post-retirement benefits

UNIT II: INCOME TAXES (AS PER US GAAP & IFRS):
Income tax expense: Current income tax expense - Deferred income tax expense - Deferred taxes on balance sheet: Deferred tax assets - Deferred tax liabilities - Specific accounting - considerations: Net Operating Losses (NOL) - Investee's undistributed dividends

UNIT III: EQUITY (AS PER US GAAP & IFRS):
Equity accounts: Common Stock - Preferred Stock - Additional Paid-In Capital - Retained Earnings - Accumulated Other Comprehensive Income - Treasury Stock - Specific accounting considerations: Share-based Payments to Employees - Equity Securities Classified as Debt
Presentation of Equity: On Balance sheet - On Statement of Changes in Equity - Earnings per Share (EPS): Basic EPS - Diluted EPS

UNIT IV: SELECT TRANSACTIONS (AS PER US GAAP & IFRS):
Business Combinations and Consolidations: Acquisitions - Non-controlling Interest - Intercompany Transactions - Variable Interest Entities (VIE) - Foreign currency: Remeasurement - Translation

UNIT V: NOT-FOR-PROFIT AND GOVERNMENTAL ACCOUNTING AND REPORTING (AS PER US GAAP):
Not-for-Profit (NFP) Entities: NFP Financial Statements - Contribution Revenue - Specific Accounting Considerations - Colleges and Universities - Voluntary Health and Welfare Organizations - Health Care Organizations - Governmental Entities: Fund types (Governmental funds, Proprietary funds, Fiduciary funds) - Modified Accrual Accounting - Inter-fund transactions - Government Financial Reporting

SUGGESTED READINGS:

1. Miles CPA Review Concept Book: Financial Accounting & Reporting, Miles Education
2. Wiley CPA Excel Exam Review Course Study Guide: Financial Accounting and Reporting, Wiley
3. IFRS & US GAAP Best Practices in Accounting World: GAAP Analysis, Rajesh Dhawan
4. Transparency in Financial Reporting: A concise comparison of IFRS and US GAAP 1st Edition, Ruth Ann McEwen, Harriman House Ltd.
5. IFRS and US GAAP: A Comprehensive Comparison, Steven E. Shamrock, Wiley
6. Wiley GAAP: Interpretation and Application of Generally Accepted Principles, Barry J. Epstein and Ralph Nach, Wiley
7. IFRS Simplified with Practical Illustration Part 1 & 2, Mr RammohanBhave and Dr Mrs Anjali RammohanBhave, CNBC TV 18

Paper DSE 602(a) : THEORY AND PRACTICE OF GST

Objective: *To equip the students with the knowledge regarding Theory and Practice of GST.*

UNIT I: INTRODUCTION TO GST:
Introduction – GST - Taxes Subsumed under GST -Determination of Tax - Registration -Process of Registration - Cancellation and renovation of registration - Supply of Goods and Services - Transition to GST - Registered Business -Availed Input Tax Credit -Unavailed CENVAT credit and Input VAT on capital goods-Availing the input credit held in closing stock -Invoicing -Tax Invoice -Bill of Supply - Credit Note, Debit Note and Supplementary Invoice-Transportation of goods without issue of Invoice - Input Credit Mechanism - Input Tax - GST Returns - Payment of Tax.

UNIT II: GETTING STARTED WITH GST:
Introduction - Enabling GST and Defining Tax Details-Transferring Input Tax credit to GST -Intrastate Supply of Goods-Intrastate Inward Supply -Intrastate Outward Supply -Interstate -Interstate Outward Supply - Return of Goods -Purchase Returns -Sales Returns -Supplies Inclusive of Tax -Defining Tax Rates at Master and Transaction Levels - Defining GST Rates at Stock Group Level-Defining GST Rate at Transaction Level -Hierarchy of Applying Tax Rate Details –Reports.

UNIT III: RECORDING ADVANCED ENTRIES, GST ADJUSTMENT AND RETURN FILING:
Introduction -Accounting of GST Transactions -Purchases from Composition Dealer -Purchases from Unregistered Dealers-Exports -Imports -Exempted Goods -SEZ Sales -Advance Receipts and payments - Mixed Supply and Composite Supply under GST -Mixed Supply of Goods -Composite Supply of Goods -GST Reports - Generating GSTR- Report in ERP -Input Tax Credit Set Off -GST Tax Payment -Time line for payment of GST tax -Modes of Payment -Challan Reconciliation -Exporting GSTR- return and uploading in GST portal.

UNIT IV: GETTING STARTED WITH GST (SERVICES):
Introduction -Determination of supply of services -Determining the Place of Supply of Services -Enabling GST and Defining Tax Details-Transferring Input Tax credit to GST -Intrastate Supply of Goods - Intrastate Inward Supply-Intrastate Outward Supply -Interstate Supply -Interstate Outward Supply - Interstate Inward Supply -Interstate Outward Supply of Services -Cancellation of Services -Cancellation of Inward Supplies -Cancellation of Outward Supply of Services -Defining Tax Rates at Master and Transaction Levels.

UNIT V: RECORDING ADVANCED ENTRIES AND MIGRATION TO ERP:
Introduction - Accounting Multiple Services in a Single Supply - Recording Partial Payment to Suppliers -Outward Supplies - Recording Outward Supply with Additional Expenses - Supply of services -Business to consumers - Time of Supply of Services - Place of Supply of Services - Determining place of supply of services - Exempt Supply of Services under GST -Export Supply of Services - Reverse Charge on Services under GST - Advance Receipts from Customers under GST - Advance Receipt and issuing Invoice on same month -Advance Receipt and issuing Invoice on different month - Reversal of GST on account of cancellation of advance receipt - Generating GSTR- Report in ERP - Input Tax Credit Set Off - Migration to ERP - Activate Goods and Services Tax (GST) in ERP - Set up GST rates - Update Masters - Update party GSTIN/UIN - Creation of GST Duty ledgers.

SUGGESTED READINGS:

1. Taxmann's Basics of GST
2. Taxmann's GST: A practical Approach
3. Theory & Practice of GST, Srivathsala, HPH
4. Theory & Practice of GST: Dr. Ravi M.N, PBP.

5.Theory and Practice of GST: Prof. A. Sudhakar, Dr. O. Bhavani& Dr. N. Moses, National Publishing Co.

Paper DSE 602(b) : FINANCIAL DECISION MAKING - II

Objective:*To make students to understand the Financial Decision Making.*

UNIT I: DECISION ANALYSIS:
Cost/volume/profit analysis: Breakeven analysis - Profit performance and alternative operating levels - Analysis of multiple products - Marginal Analysis: Sunk costs, opportunity costs and other related concepts - Marginal costs and marginal revenue - Special orders and pricing - Make versus buy - Sell or process further - Add or drop a segment - Capacity considerations

UNIT II: PRICING:
Pricing decisions: Pricing methodologies - Target costing - Elasticity of demand - Product life cycle considerations - Marketstructure considerations

UNIT III: RISK MANAGEMENT:
Enterprise Risk: Types of risk - Risk identification and assessment - Risk mitigation strategies - Managing risk

UNIT IV: INVESTMENT DECISIONS:
Capital budgeting process: Stages of capital budgeting - Incremental cash flows - Income tax considerations - Evaluating uncertainty - Capital investment method analysis: Net present value - Internal rate of return - Payback - Comparison of investment analysis methods

UNIT V: PROFESSIONAL ETHICS:
Business ethics: Moral philosophies and values - Ethical decision making - Ethical considerations for management accounting and financial management professionals: IMA's Statement of Ethical Professional Practice - Fraud triangle - Evaluation and resolution of ethical issues - Ethical considerations for the organization: Organizational factors and ethical culture - IMA's Statement on Management Accounting, "Values and Ethics: From Inception to Practice" - Ethical leadership - Legal compliance - Responsibility for ethical conduct - Sustainability and social responsibility.

SUGGESTED READINGS:
1. Wiley CMAexcel Learning System, Part 2: Strategic Financial Management
2. Cost Management: A Strategic Emphasis, 6th edition; Blocher, Edward, J., Stout, David E., Juras, Paul E., and Cokins, Gary; McGraw Hill
3. Horngreen's Cost Accounting: A Managerial Emphasis, 16th edition; Charles T., Datar, Srikant, and Rajan, Madhav; Pearson
4. Principles of Corporate Finance, 11th edition; Brealey, Richard, A., Myers, Stewart C., and Allen, Franklin; McGraw Hill
5. Fundamentals of Financial Management, 13th edition; Van Horn, James, C., and Wachowicz, John M. Jr.; FT / Prentice Hall
6. Enterprise Risk Management - Integrated Framework; COSO, The Committee of Sponsoring Organizations of the Treadway Commission, 2017

Paper DSE 602 (c) : INTERNATIONAL AUDITING

Objective:*To make students to understand the International Auditing.*

UNIT I: ETHICS, PROFESSIONAL RESPONSIBILITIES AND GENERAL AUDITING PRINCIPLES:

Introduction to Auditing: Generally Accepted Auditing Standards (GAAS) - International Standards of Auditing (ISA) - Ethics, independence and professional conduct: AICPA Code of Professional Conduct - Sarbanes-Oxley Act (SOX), 2002 - Public Company Accounting Oversights Board (PCAOB) - Securities & Exchange Commission (SEC) - International Standards - Engagement Understanding and Acceptance: Pre-Engagement Acceptance Activities - Engagement Letter - Auditor's communication with those charged with governance

Quality Control: Statements on Quality Control Standards (SQCS) - Elements of a System of Quality control

UNIT II: ASSESSING AUDIT RISK AND DEVELOPING A PLANNED RESPONSE:

Audit Risk: Inherent Risk - Control Risk - Detection Risk - Fraud Risk: Fraudulent financial reporting - Misappropriation of assets - Fraud risk factors - Auditor's consideration of fraud

Planning the Audit: Audit Strategy - Audit Plan - Internal Controls: Auditor's Consideration of Internal Control - Operating Cycles - Internal Control Reports and Communications

UNIT III: PERFORMING FURTHER PROCEDURES AND OBTAINING AUDIT EVIDENCE:

Audit Evidence: Management's Assertions - Sufficient & Appropriate Audit Evidence - Audit Evidence determined by Risk of Material Misstatement (RMM) - Substantive Procedures: Revenue cycle - Expenditure cycle - Production cycle - Payroll cycle - Investing cycle - Financing cycle - Opening Balances - Illegal Acts - Related Parties - Contingencies - Estimates & Fair Value Measurements - Subsequent Events - Omitted Procedures & Subsequent Discovery of Facts - Using the Work of Others - Evaluating Audit Findings - Audit Documentation - Management Representation Letter - Audit Sampling: Sampling Risks - Attributes Sampling - Classical Variables Sampling - Probability Proportional to Size (PPS) Sampling

UNIT IV: AUDIT REPORTING:

Audit Reports: Unmodified opinion - Unmodified Opinion with Emphasis-of-matter and/or Other-matter paragraph - Qualified Opinion - Adverse Opinion - Disclaimer of Opinion - Audit Reporting Considerations: Audit of Comparative financial statements - Supplementary Information - Audit of Group financial statements - Audit of Single financial statements & Specific financial statement elements, accounts or items - Audit of Special Purpose financial statements - Audit of financial statements prepared using financial reporting framework of another country

UNIT V: OTHER ENGAGEMENTS:

Accounting & Review Services: Preparation of financial statements - Compilation engagement - Review engagement - Attestation Engagements: Examination - Review - Agreed-upon Procedures - Governmental Auditing: Governmental Auditing Standards - Single Audit Act

SUGGESTED READINGS:

1. Miles CPA Review Concept Book: Auditing and Attestation, Miles Education
2. Wiley CPA Excel Exam Review Course Study Guide: Auditing and Attestation, Wiley
3. Wiley Practitioner's Guide to GAAS: Covering all SAS, SSAE's , SSARS, PCAOB, Auditing Standards, and Interpretations, Joanne M. Flood, Wiley
4. Auditing: A Risk Based-Approach to Conducting a Quality Audit, Karla M Johnstone, Audrey A. Gramling and Larry E. Rittenberg, Cengage Learning
5. Principles of Auditing & Other Assurance Services, Ray Whittington and Kurt Pany, McGraw Hill

6. Auditing & Assurance Services: A Systematic Approach, William F Messier Jr, Steven M. Glover and Douglas F. Prawitt, McGraw Hill.

Paper DSE 603(a) :**MULTIMEDIA SYSTEMS**

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective:*To acquire the knowledge of multimedia systems.*

UNIT-I: MEDIA AND DATA STREAMS:
Properties of multimedia systems, Data streams characteristics: Digital representation of audio, numeric instruments digital interface Bark concepts, Devices, Messages, Timing Standards Speech generation, analysis and transmission.

UNIT-II: DIGITAL IMAGE&ANIMATIONS:
Digital Image: Analysis, recognition, transmission, **Video**: Representation, Digitalization, transmission.
Animations: Basic concepts, animation languages, animations control transmission.

UNIT-III: DATA COMPRESSION STANDARDS&STORAGE:
Data Compression Standards: JPEG, H-261, MPEG DVI
Optical storage devices and Standards: WORHS, CDDA, CDROM, CDWO, CDMO.
Real Time Multimedia, Multimedia file System.

UNIT-IV: MULTIMEDIA COMMUNICATION SYSTEM, DATABASES&SYNCHRONIZATION:
Multimedia Communication System: Collaborative computing session management, transport subsystem, QOS, resource management.
Multimedia Databases: Characteristics, data structures, operation, integration in a database model.
Synchronization: Issues, presentation requirements, reference to multimedia synchronization, MHEG.

UNIT-V: MULTIMEDIA APPLICATION:
Media preparation, Composition, integration communication, consumption, entertainment.

SUGGESTED READINGS:

1. Ralf Steninmetz, KlaraHahrstedt, *Multimedia: Computing, Communication and Applications,* PHI PTR Innovative Technology Series.
2. John F.KoegelBufford, *Multimedia System*, Addison Wesley, 1994.
3. Mark Elsom – Cook, *Principles of Interactive Multimedia* , Tata Mc-Graw Hill, 2001.
4. Judith Jefcoate, *Multimedia in Practice: Technology and Application* , PHI 1998.

Paper DSE 603(b) :**CYBER SECURITY**

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective:*to understand the cyber security, detection, network security, the law and cyber forensic.*

UNIT-I: INTRODUCTION TO CYBER SECURITY, CYBER SECURITY VULNERABILITIES AND CYBER SECURITY SAFEGUARDS:

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

Cyber Security Vulnerabilities: Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness.

Cyber Security Safeguards: Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT-II: SECURING WEB APPLICATION, SERVICES AND SERVERS:

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

UNIT-III: INTRUSION DETECTION AND PREVENTION:

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

UNIT-IV: CRYPTOGRAPHY AND NETWORK SECURITY:

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT-V: CYBERSPACE AND THE LAW, CYBER FORENSICS:

Cyberspace and The Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

Cyber Forensics: Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

SUGGESTED READINGS:

1. Ramandeepkaurnagra, Cyber laws and Intellectual Property Rights, Kalyani Publishers, 7e,
2. Nina Godbole&SunitBelapureCyber Security, Wiley India Pvt Ltd, 2012.
3. Gerald. R. Ferrera, Reder and linchtenstein, Cyber laws – Text and Cases,3e, Cengage learning
4. FaiyazAhamed, Cyber Law and Information Security, DreamTech Press, 2013
5. PankajAgarwal, Information Security and Cyber Laws, Acme Learning, 2013
6. Manjotkaur, Essentials of E-Business and Cyber laws, Kalyani Publishers.

Paper DSE 603(c) :**DATA ANALYTICS**

Hours Per Week: 7 (3T+4P) **Credits**: 5
Exam Hours: 1 ½ **Marks:** 50U+35P+15I

Objective: *To l*earn the different ways of data Analysis, data streams, mining and clustering and visualization.

UNIT-I: INTRODUCTION TO BIG DATA:
Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT-II: DATA ANALYSIS:
Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT-III: MINING DATA STREAMS:
Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

UNIT-IV: FREQUENT ITEMSETS AND CLUSTERING:
Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT-V: FRAMEWORKS AND VISUALIZATION:
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

SUGGESTED READINGS:

1) Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2) AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets,Cambridge University Press, 2012.
3) Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics, John Wiley & sons, 2012.
4) Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O□Reilly, 2011.
5) Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

Telangana State Council of Higher Education, Govt. of Telangana B.Sc., CBCS Common Core Syllabi for all Universities in Telangana

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc., Chemistry from 2019-2020

CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
FIRST YEAR- SEMESTER I				
BS 101	Ability Enhancement Compulsory Course AECC-1	ES	2	2
BS 102	English	CC-1A	4	4
BS 103	Second language	CC-2A	4	4
BS 104	Optional I	DSC-1A	4T+3P=7	4+1=5
BS 105	Optional II	DSC-2A	4T+3P=7	4+1=5
BS 106	**Optional III- Chemistry - I**	**DSC-3A**	**4T** } **= 7** **3P**	**4** } **=5** **1**
	Laboratory Course – I (Qualitative Analysis - Semi Micro Analysis of Mixtures)			
	Total Credits		**31**	**25**
FIRST YEAR- SEMSTER II				
BS 201	Ability Enhancement Compulsory Course AECC-2	BCS	2	2
BS 202	English	CC-1B	4	4
BS 203	Second language	CC-2B	4	4
BS 204	Optional I	DSC-1B	4T+3P=7	4+1=5
BS 205	Optional II	DSC-2B	4T+3P=7	4+1=5
BS 206	**Optional III- Chemistry - II**	**DSC-3B**	**4T** } **= 7** **3P**	**4** } **=5** **1**
	Laboratory Course - II (Quantitative Analysis – Titrations)			
	Total Credits		**31**	**25**
SECOND YEAR- SEMSTER III				
BS 301	i) Safety Rules in Chemistry Laboratory and Lab Reagents ii) Remedial methods for pollution, drinking water and Soil fertility	**SEC-1** **SEC-2**	**2** **2**	**2** **2**
BS 302	English	CC-1C	3	3
BS 303	Second language	CC-2C	3	3
BS 304	Optional I	DSC-1C	4T+3P=7	4+1=5
BS 305	Optional II	DSC-2C	4T+3P=7	4+1=5
BS 306	**Optional III- Chemistry - III**			
	Laboratory Course - III (Synthesis of Organic compounds)	**DSC-3C**	**4T** } **= 7** **3P**	**4** } **=5** **1**
	Total Credits		31	**25**
SECOND YEAR- SEMSTER IV				
BS 401	i) Materials and their Applications ii) Chemistry of Cosmetics and Food Processing	**SEC-3** **SEC-4**	**2** **2**	**2** **2**
BS 402	English	CC-1D	3	3
BS 403	Second language	CC-2D	3	3
BS 404	Optional I	DSC-1D	4T+3P=7	4+1=5
BS 405	Optional II	DSC-2D	4T+3P=7	4+1=5
BS 406	**Optional III- Chemistry - IV**	**DSC-3D**	**4T** } **= 7** **3P**	**4** } **= 5** **1**
	Laboratory Course - IV (Qualitative Analysis of Organic Compounds)			
	Total Credits		31	**25**

* AECC: Ability Enhancement Compulsory Course, SEC: Skill Enhancement Course, DSC: Discipline Specific Course, GE: Generic Elective, ES: Environmental Science , BCS : Basic computer skills.

B.Sc. I Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER I
Paper – I
Chemistry - I

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S1- I-1. Chemical Bonding 8 h

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions. VSPER Theory - Common hybridization-sp, sp^2, sp^3 , sp^3d, sp^3d^2 and sp^3d^3, shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. π and σoverlapping. Concept of Types of molecular orbitals- bonding, antibonding and non bonding. MOED of homonuclear diatomics - H_2, N_2, O_2^-, O_2^{2-}, F_2 (unhybridized diagrams only) and heteronuclear diatomics CO, CN^-, NO, NO^+ and HF. Bond order, stability and magnetic properties.

S1-I-2. P-Block Elements 1 7 h

Group–13: Structure of diborane and higher Boranes (B_4H_{10} and B_5H_9), Boron nitrogen compounds ($B_3N_3H_6$ and BN), Lewis acid nature of BX_3.
Group – 14: Carbides-Classification – ionic, covalent, interstitial – .Structures and reactivity. Industrial applications. Silicones – Classification – straight chain, cyclic and cross-linked.
Group – 15: Nitrides – Classification – ionic, covalent and interstitial. Reactivity – hydrolysis. Reactions of hydrazine, hydroxyl amine, phosphazenes.

Unit - II (Organic Chemistry) 15h(1 hr/week)

S1-O-1: Structural Theory in Organic Chemistry 5 h

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 - Mesomeric effect, application to (a) acidity of phenol. (b) acidity of carboxylic acids and basicity of anilines. Stability of carbo cations, carbanions and free radicals. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

S1-O-2: Acyclic Hydrocarbons 6 h

Alkanes– Methods of preparation: From Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (with mechanism) (a) by dehydration of alcohols
(b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. Properties: Anti-addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition). Oxidation (cis – additions) – hydroxylation by $KMnO_4$, OsO_4,

anti addition- peracids (via epoxidation), hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes– Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Chemical reactivity – electrophilic addition of X_2, HX, H_2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

Aromatic Hydrocarbons **4h**

Introduction to aromaticity: Huckel's rule – Benzene, Naphthalene and Anthracene. Reactions - General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, 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. Orientation – (i) activating groups: Amino, methoxy and alkyl groups. (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

Unit – III (Physical Chemistry) 15h(1 hr/week)

S1-P-1: Atomic structure and elementary quantum mechanics **3 h**

Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck's radiation law, photoelectric effect, Limitations of classical mechanics, Compton effect, de Broglie's hypothesis. Heisenberg's uncertainty principle.

S1-P-2: Gaseous State **5 h**

Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO_2. The van der Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquifaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

S1-P-3: Liquid State and Solutions **4 h**

Liquid State

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solutions **3 h**

Liquid - liquid mixtures, ideal liquid mixtures**,** Raoult's and Henry's laws. Non ideal systems. Azeotropes: HCl-H_2O and C_2H_5OH - H_2O systems. Fractional distillation. Partially miscible liquids: Phenol – Water, Trimethyl amine – Water and Nicotine – Water systems.

Unit - IV (General Chemistry) 15h(1 hr/week)

S1-G-1. General Principles of Inorganic Qualitative Analysis 6 h

Anion analysis: Theory of sodium carbonate extract,classification and reactions of anions- CO_3^{2-}, Cl^-, Br^-, SO_4^{2-}, PO_4^{3-}, BO_3^{3-}, CH_3COO^-, NO_3^-. Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations (Hg_2^{2+}, Ag^+, Pb^{2+}) with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II (Hg^{2+}, Pb^{2+}, Bi^{3+}, Cd^{2+},Sb^{3+}), III (Al^{3+}, Fe^{3+}), IV (Mn^{2+}, Zn^{2+}) individual cations with flow chart and chemical equations. General discussion for the separation and identification of group V individual cations (Ba^{2+}, Sr^{2+}, Ca^{2+}) with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations (Mg^{2+}, NH_4^+).

S1-G-2. Isomerism 5 h

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers – definitions and examples. Representation of stereoisomers – Wedge, Fischer projection, Sawhorse, Newmann formulae.

Conformational analysis : Classification of stereoisomers based on energy. Definition and examples Conformational and configurational isomers. Conformational analysis of ethane, n-butane, 1,2- dichloroethane,2-chloroethanol .Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane

Cis-trans isomerism: E-Z-Nomenclature

S1-G-3: Solid state Chemistry 4 h

Laws of Crystallography: (i) Law of Constancy of interfacial angles (ii) Law of Symmetry-Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems (a brief review). X-ray diffraction by crystals; Derivation of Bragg's equation. Determination of structure of NaCl, KCl and CsCl (Bragg's method and Powder method).

References

General reference: B.Sc I Year Chemistry : Semester I, Telugu Academy publication, Hyd

Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001. Chem.

5. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn.
6. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press 1989.
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
9. Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Principles of physical chemistry by Prutton and Marron.
2. Text Book of Physical Chemistry by Soni and Dharmahara..
3. Text Book of Physical Chemistry by Puri and Sharma.
4. Text Book of Physical Chemistry by K. L. Kapoor.
5. Physical Chemistry through problems by S.K. Dogra.
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry byLewis Glasstone.

Unit IV

1. Qualitative analysis by Welcher and Hahn.
2. Vogel's Qualitative Inorganic Analysis by Svehla.
3. Text Book of Organic Chemistry by Morrison And Boyd.
4. Text Book of Organic Chemistry by Graham Solomons.
5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
6. Text Book of Organic Chemistry by Soni.
7.Text Book of Physical Chemistry by Soni And Dharmahara..
8. Text Book of Physical Chemistry by Puri And Sharma.
9. Text Book of Physical Chemistry by K. L. Kapoor.

Laboratory Course 45h (3 h / week)

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: $CO_3^{2-}, SO_3^{2-}, S^{2-}, \ Cl^-, \ Br^-, I^-, \ CH_3COO^-, NO_3^-, \ PO_4^{3-}, BO_3^{3-}, SO_4^{2-}$. .

Cations: Hg_2^{2+}, Ag^+, Pb^{2+}

$Hg^{2+}, Pb^{2+}, \ Bi^{3+}, Cd^{2+}, Cu^{2+}, \ As^{3+/5+}, Sb^{3+/5+}, Sn^{2+/4+}$

$Al^{3+}, \ Cr^{3+}, Fe^{3+}$

$Zn^{2+}, Ni^{2+}, Co^{2+}, Mn^{2+}$

$Ba^{2+}, \ Sr^{2+}, Ca^{2+}$

$Mg^{2+}, \ NH_4^+$

B.Sc I Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER II
Paper – II
Chemistry – II

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S2-I-1 P-block Elements -II 7 h

Oxides: Types of oxides (a) Normal- acidic, basic amphoteric and neutral (b) Mixed (c) sub oxide d) peroxide e) superoxide. Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

Oxy acids: Structure and acidic nature of oxyacids of B, C, N, P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO_2 (reaction with $FeSO_4$, $KMnO_4$, $K_2Cr_2O_7$), HNO_3 (reaction with H_2S, Cu), HNO_4 (reaction with KBr, Aniline), $H_2N_2O_2$ (reaction with $KMnO_4$). Redox properties of oxyacids of Phosphorus: H_3PO_2 (reaction with $HgCl_2$), H_3PO_3 (reaction with $AgNO_3$, $CuSO_4$) . Redox properties of oxyacids of Sulphur: H_2SO_3 (reaction with $KMnO_4$, $K_2Cr_2O_7$), H_2SO_4 (reaction with Zn, Fe, Cu), $H_2S_2O_3$ (reaction with Cu, Au), H_2SO_5 (reaction with KI, $FeSO_4$), $H_2S_2O_8$ (reaction with $FeSO_4$, KI). Redox properties of oxy acids of Chlorine.

Interhalogens- Classification- general preparation- structures of AB, AB_3, AB_5 and AB_7 type and reactivity.

Poly halides- Definition and structure of ICl_2^-, ICl_4^- and I_3.

Pseudohalogens: Comparision with halogens.

S2-I-2: Chemistry of Zero group elements 2 h

Isolation of noble gases, Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clatherate compounds and Anomalous behavior of He (II)

S2-I-3: Chemistry of d-block elements 6 h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, ability to form complexes, magnetic properties &catalytic properties. Stability of various oxidation states and standard reduction potentials. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu traids. Titanium triad – electronic configuration and reactivity of +3 and +4 states – oxides and halides. Chromium triad – reactivity of +3 and +6 states. Copper triad – reactivity of +1, +2 and +3 states.

Unit - II (Organic Chemistry) 15h(1 hr/week)

S2-O-1: Halogen compounds 4 h

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl. Chemical reactivity - reduction, formation of RMgX, Nucleophilic substitution reactions – classification into S_N1 and S_N2. Mechanism and energy profile diagrams of S_N1 and S_N2 reactions. Stereochemistry of S_N2 (Walden Inversion) 2-bromobutane, S_N1 (Racemisation) 1-bromo-1-phenylpropane Structure and reactivity – Ease of hydrolysis - comparison of alkyl, vinyl, allyl, aryl, and benzyl halides.

S2-O-2: Hydroxy compounds and ethers **6 h**

Alcohols: Preaparation: 1°, 2° and 3° alcohols using Griganard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/$ZnCl_2$ (Lucas reagent), esterification, oxidation with PCC, alk. $KMnO_4$, acidic dichromates, conc. HNO_3 and Oppenauer oxidation (Mechanism).

Phenols: Preapartion: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide .

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Riemer Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azo-coupling reaction, Schotton-Boumann raction, Houben-Hoesch condensation, .

Ethers: Nomenclature, preparation by (a) Williamson's synthesis (b) from alkenes by the action of conc. H_2SO_4. Physical properties – Absence of Hydrogen bonding, insoluble in water, low boiling point. Chemical properties – inert nature, action of conc. H_2SO_4 and HI.

S2-O-3 Carbonyl compounds **5 h**

Preparation of aldehydes & ketones from acid chloride,1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes (b) Hydrolysis of benzal halides Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) $NaHSO_3$ (b) HCN (c) RMgX (d) NH_3 (e) RNH_2 (f) NH_2OH (g) $PhNHNH_2$ (h) 2,4-DNP (Schiff bases). Addition of H_2O to form hydrate , chloral hydrate (stable), addition of alcohols - hemi acetal and acetal formation. Cannizaro reaction. Oxidation reactions – $KMnO_4$ oxidation and auto oxidation, reduction – catalytic hydrogenation, mechanism of Clemmenson's reduction, Wolf-kishner reduction, Meerwein Pondoff Verly reduction. Reduction with LAH, $NaBH_4$.

Unit - III (Physical Chemistry) 15h(1 hr/week)

S2-P-1: Electrochemistry **15 h**

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kholrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law - its uses and limitations. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Computation of EMF. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble

salt and redox electrodes. Electrode reactions, Nernst equation, cell EMF and Single electrode potential, Standard Hydrogen electrode – reference electrodes (calomel electrode) – standard electrode potential, sign conventions, electrochemical series and its significance.
Applications of EMF measurements. Calculation of thermodynamic quantities of cell reactions (Gibbs free energy G, Helmholtz free energy and Equilibrium constant K). Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode. Solubility product of AgCl. Potentiometric titrations.

Unit – IV (General Chemistry) 15 h (1 hr/week)

S2-G-1: Theory of Quantitative Analysis 6 h

Volumetric Analysis: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid –weak base, weak acid-strong base and weak acid –weak base. Theory of redox titrations - internal(KMnO4) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

Gravimetric analysis- Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, coprecipitation and post precipitation. Determination of Ni^{2+}

S2-G-2: Stereoisomerism 5 h

Optical activity: Definition, wave nature of light, plane polarised light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans-1,2-dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog rules, examples for asymmetric and disymmetric molecules.

S2-G-3: Dilute Solutions & Colligative Properties 4 h

Dilute Solutions, Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. 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.

References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd

Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
7. Textbook of inorganic chemistry by R Gopalan.

Unit II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H.Jeffery, J.Bassett, J.Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and AdarshGulati.

Laboratory Course 45hrs (3 h / week)

Paper II- Quantitative Analysis

Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

4. Estimation of Alkali content in Antacid using HCl.
5. Estimation of NH_4^+ by back titration

Redox Titrations

1. Determination of Fe(II) using $K_2Cr_2O_7$
2. Determination of Fe(II) using $KMnO_4$ with sodium oxalate as primary standard.
3. Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard

Complexometric Titrations

1. Estimation of Mg^{2+}
2. Estimation of Cu^{2+}

B.Sc II Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER III
Paper-III
Chemistry - III

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S3-I-1: Chemistry of f-block elements: 5 h

Chemistry of Lanthanides**:** Position in periodic table,Electronic structure, oxidation state, ionic and atomic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation- type of donor ligands preferred. Magnetic properties-paramagnetism. Colour and spectra, f-f transitions –occurrence and separation– ion exchange method, solvent extraction.

Chemistry of actinides- general features – electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

S3-I-2: Coordination Compounds-I 6 h

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules, 1. Coordination number, coordination geometries of metal ions, types of ligands. 2.Brief review of Werner's theory,Sidgwick's electronic interpretation and EAN rule and their limitations. (Valence bond theory (VBT) – postulates and application to (a) tetrahedral complexes $[Ni(NH_3)_4]^{2+}$, $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ **(**b) Square planar complexes $[Ni(CN)_4]^{2-}$, $[Cu(NH_3)_4]^{2+}$, $[PtCl_4]^{2-}$ (c) Octahedral complexes $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$, $[FeF_6]^{4-}$, $[Co(NH_3)_6]^{3+}$, $[CoF_6]^{3-}$. Limitations of VBT. 3. Isomerism in coordination compounds, stereo isomerism – (a)geometrical isomerism in (i) square planar meta l complexes of the type$[MA_2B_2]$, $[MA_2BC]$, $[M(AB)_2]$, [MABCD]. (ii) Octahedral metal complexes of the type $[MA_4B_2]$, $[M(AA)_2B_2]$, $[MA_3B_3]$ using suitable examples, (b) Optical isomerism in (i). tetrahedral complexes [MABCD], (ii). Octahedral complexes $[M(AA)_2B_2]$, $[M(AA)_3]$ using suitable examples. Structural isomerism: ionization, linkage, coordination ligand isomerism using suitable examples.

S3-I-3: Metal carbonyls and Organometallic Chemistry 4 h

Metal carbonyls: Preparation and properties of $Ni(CO)_4$. Structural features of $Ni(CO)_4$, $Fe(CO)_5$, $Fe_2(CO)_9$, $Fe_3(CO)_{12}$ and $Cr(CO)_6$ -18 valence electron rule.

Definition, nomenclature and classification of organometallic compounds. Methods of preparation, properties and applications of alkyl and aryl compounds of Li, Mg & Al.

Unit - II (Organic Chemistry) 15h(1 hr/week)

S3-O-1: Carboxylic acids and derivatives 5 h

Preparation: a) Hydrolysis of Nitriles, amides and esters. b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties- hydrogen bonding, dimeric association,. Chemical properties – Reactions involving H, OH and COOH groups -salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol - via ester or acid chloride. Degradation of carboxylic acids by Huns Diecker reaction, Schmidt reaction (Decarboxylation). Arndt – Eistert synthesis, Halogenation by Hell – Volhard - Zelensky reaction. Carboxylic acid Derivatives – Hydrolysis nand Amonolysis of acid halides, Acid anhydrides and esters (mechanism of ester hydrolysis by base and acid). Hydrolysis and dehydration of amides.

S3-O-2: Nitrohydrocarbons 3 h

Preparation of Nitroalkanes. Reactivity - halogenation, reaction with HNO_2 (Nitrous acid), Nef reaction, reduction. Aromatic Nitrohydrocarbons: Preparation of Nitrobenzene by Nitration. Physical properties, chemical reactivity –Reduction of Nitrobenzenes in different media.

S3-O-3: Amines, Cyanides and Isocyanides 7 h

Amines: classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods – Ammonolysis of alkyl halides, Gabriel synthesis, Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties. Use of amine salts as phase transfer catalysts. Chemical Properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation. Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electophilic substitutions of Aromatic amines – Bromination and Nitration, oxidation of aryl and 3° Amines, diazotisation. Diazonium salts: Preparation with mechanism. Synthetic importance – a) Replacement of diazonium group by – OH, X (Cl)- Sandmeyer and Gatterman reaction, by fluorine (Schiemann's reaction), by iodine, CN, NO_2, H and aryl groups. Coupling Reaction of diazonium salts. i) with phenols ii) with anilines. Reduction to phenyl hydrazines.

Cyanides and isocyanides: 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.

Unit III (Physical Chemistry) 15 h (1 hr/week)

S3-P-1:Thermodynamics –I 10 h

A brief review of - Energy, work and heat units, mechanical equivalent of heat, definition of system, surroundings. First law of thermodynamics statement- various forms mathematical expression. Thermodynamic quantities- extensive properties and intensive properties, state function and path functions. Energy as a state function and exact differential. Work of expansion and heat absorbed as path function.

Expression for work of expansion, sign convention problems on first law. Heat changes at constant pressure and heat changes at constant volume. Enthalpy. Heat capacities at constant pressure and constant volume. Derivation of Cp-Cv = R. Isothermal adiabatic processes. Reversible and irreversible processes. Reversible change and maximum work. Derivation of expression for maximum work for isothermal reversible process. Problems. Internal energy of an ideal gas. Joules experiment. Joule-Thompson coefficient. Adiabatic changes in ideal gas, derivation of equation, PV^{γ}= constant. P-V curves for isothermal and adiabatic processes. Heat of a reaction at constant volume and at constant pressure, relation between ΔH and ΔV.

Variation of heat of reaction with temperature. Kirchhoff's equation and problems. Limitations of first law and need for second law. Statement of second law of thermodynamics. Cyclic process. Heat engine, Carnot's theorem, Carnot's cycle. Derivation of efficiency of heat engine. Problems. Thermodynamic scale of temperature.

S3-P-2: Thermodynamics-II 5 h

Entropy: Definition from Carnot's cycle. Entropy as a state function. Entropy as a measure of disorder. Sign of entropy change for spontaneous and non- spontaneous processes &equilibrium processes. Entropy changes in i). Reversible isothermal process, ii). Reversible adiabatic process, iii). Phase change, iv). Reversible change of state of an ideal gas. Problems. Entropy of mixing of ideal gases. Free energy Gibb's function (G) and Helmholtz'sfunction (A) as thermodynamic quantities. Concept of maximum work and network ΔG as Criteria for spontaneity. Derivation of equation $\Delta G = \Delta H - T\Delta S$. Significance of the equation. Gibbs equations and Maxwell relations. Variation of G with P, V and T.

Unit – IV (General Chemistry) 15 h (1 hr/week)

S3-G-1 Evaluation of analytical data 4 h

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors. Problems based on mean, median, range, standard deviation

S3-G-2: Carbanions-I 5 h

Introduction, acidic nature of α-hydrogens and tautomerism in carbonyl compounds, nitro hydrocarbons, ethyl acetoacetate, diethyl malonate. Terminal alkynes. Stabilty of carbanions Reactions : Aldol reaction, Perkin reaction, Benzoin condensation, haloform reaction, conversion of smaller alkynes to higher alkynes.

S3-G-3: Phase Rule **6 h**

Statement and meaning of the terms – Phase, Component and Degrees of freedom, Gibb's Phase rule, phase equilibria of one component system – water system. Phase equilibria of two-component system – Solid-Liquid equilibria, simple eutectic –Pb-Ag system, desilverisation of lead. Solid solutions – compound with congruent melting point – Mg-Zn system and incongruent melting point – NaCl-H_2O system.

References

General reference: B.Sc II Year Chemistry : Semester III, Telugu Academy publication, Hyd

Unit- I

1. Analytical chemistry by G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasada Rao, K.L.N. Reddy and C. Sudhakar

2. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications(1996).
3. Concise Inorganic Chemistry by J.D. Lee 3rd edn Van Nostrand Reinhold Company(1977)
4. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
5. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
6. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press(1989).
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
8. Textbook of Inorganic Chemistry by R Gopalan(Universities Press(2012)
9. College Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati Universities Press (India) Limited(2012)

Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008).
3. Text book of organic chemistry by Morrison and Boyd. Person(2009)
4. Text book of organic chemistry by Graham Solomons. Wiley(2015)
5. Text book of organic chemistry by Bruice Yuranis Powla. (2012)
6. Text book of organic chemistry by C N pillai CRC Press (2012)
7. Organic Chemistry by L. G. Wade Jr.
8. Organic Chemistry by M. Jones, Jr
9. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton and Marron. The MacmillanCompany; 4th Edn.(1970)

2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)

3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Colloidal and surface chemistry , M. Satake, Y. Hayashi, Y.Mido, S.A.Iqbal and
6. M.S.sethi, Discovery Publishing Pvt.Ltd (2014)
7. Material science by Kakani & Kakani, New Age International(2016)
8. Physical Chemistry by Ira Levine (Author) McGraw-Hill Education; 6 edition (May 9, 2008)

Unit IV

1. Text book of organic chemistry by Morrison and Boyd, Person(2009)

2. Text book of organic chemistry by Graham solomons, Wiley(2015)
3. Text book of organic chemistry by Sony, Sultan Chand & Sons; 29th edition (2012)
4. Text book of organic chemistry by Bruice yuranis Powla, (2012)
5. General Organic chemistry by Sachin kumar Ghosh, New Age Publishers Pvt Ltd (2008)

Laboratory Course

Paper III (Organic Synthesis) 45 h (3h/week)

1. **Synthesis of Organic compounds:**

   Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.

   Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.

   Halogenation: Preparation of p-bromo acetanilide, Preparation of 2,4,6-tribromo phenol

   Oxidation: Preparation of benzoic acid from benzyl chloride.

   Esterification: Preparation of n-butyl acetate from acetic acid.

   Methylation: Preparation of - naphthyl methyl ether.

   Condensation: Preparation of benzilidine aniline and Benzaldehyde and aniline.

   Diazotisation: Azocoupling of β-Naphthol.

2. **Microwave assisted synthesis of Asprin – DEMO (demonstration only)**

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B.Sc. II yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER IV
Paper-IV
Chemistry - IV

Unit-I (Inorganic Chemistry) 15h (1 h/week)

S4-I-1: Coordination Compounds –II **11 h**

Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in ctahedral, tetrahedral, square planer with suitable examples. Crystalfield stabilization energies and its calculations for various dn configurations in octahedral complexes. High Spin Low Spin complexes. Colour and Magnetic properties of transition metal complexes. Calculations of magnetic moments spin only formula. Detection of complex formation - basic principles of various methods- change in chemical properties, solubility, colour, pH, conductivity, magnetic susceptibility.

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 reaction. Thermodynamic and kinetic stability of transition of metal complexes. Stability of metal complexes –stepwise and overall stability constant and their relationship and chelate effect determination of composition of complex by Job's method and mole ratio method.

Applications of coordination compounds: Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization – Ziegler Natta catalyst d) water softening.

S4-I-2:Bioinorganic Chemistry **4 h**

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl-). Toxic metal ions As, Hg & Pb Oxygen transport and storage – structure of hemoglobin, binding and transport of oxygen. Fixation of CO2 in photosynthesis- overview of light and dark reactions in photosynthesis. Structure of chlorophyll and coordination of magnesium. Electron transport in light reactions from water to NADP+ (Z – scheme).

Semester-IV

Unit - II (Organic Chemistry) 15h(1 hr/week)

S4-O-1: Carbohydrates **6 h**

Introduction: Classification and nomenclature. Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure. 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 (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – ketohexose structure. Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure,Haworth formula).

Inter Conversion of Monosaccharides: : Arabinose to D-glucose, D- mannose (kiliani – Fischer method). Epimers, Epimerisation- Lobry de bruyn van Ekenstein rearrangement. D-glucose to D-arabinose by Ruff's degradation. Aldohexose(+) (glucose) to ketohexose (–) (fructose) and Ketohexose(Fructose) to aldohexose (Glucose).

S4-O-2: Amino acids and proteins **5 h**

Classification. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples – Glycine, Alanine, Valine and Leucine) 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. Zwitter ion structure – salt like 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. Primary structure of proteins, di peptide synthesis

S4-O-3: Heterocyclic Compounds **4 h**

Introduction and definition: 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems –Numbering. Aromatic character

Resonance structures: Explanation of feebly acidic character of pyrrole, electrophillic substitution, Halogenation, Nitration and Sulphonation. 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 Paul-Knorr synthesis. Structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – preparation by Hantsch method and properties – Reactivity towards Nucleophilic substitution reaction – chichibabin reaction.

Unit III (Physical Chemistry) 15h (1 hr/week)

S4-P-1: Chemical Kinetics **11 h**

Introduction to chemical kinetics, rate of reaction, variation of concentration with time, rate laws and rate constant. Specific reaction rate. Factors influencing reaction rates: effect of concentration of reactants, effect of temperature, effect of pressure, effect of reaction medium, effect of radiation, effect of catalyst with simple examples. Order of a reaction.

First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Examples- Decomposition of H_2O_2 and decomposition of oxalic acid, Problems.

Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, examples-

Saponification of ester, $2O_3 \rightarrow 3O_2$, $C_2H_4+H_2 \rightarrow C_2H_6$. Characteristics of second order reaction, units for rate constants, half- life period and second order plots. Problems

S4-P-2: Photochemistry **4 h**

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry- Grotthus Draper law, Stark–Einstein's Law of photochemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2–$Cl_2$and H_2–Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency. Consequences of light absorption. Singlet and triplet states. Jablonski diagram. Explanation of internal conversion, inter- system crossing, phosphorescence, fluorescence.

Unit III (General Chemistry) 15h (1 hr/week)

S4-G-1: Theories of bonding in metals **4 h**

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 n-type and p-type, extrinsic & intrinsic semiconductors, and insulators**.**

S4-G-2: Carbanions-II **5 h**

Mannich reaction , Michael addition and Knoevengeal condensation Synthetic applications of Aceto acetic ester. Acid hydrolysis and ketonic hydrolysis: Preparation of ketones, monocarboxylic acids and dicarboxylic acids Malonic ester– synthetic applications. Preparation of (i) substituted mono carboxylic acids and (ii) substituted dicarboxylic acids.

S4-G-3: Colloids & Surface Chemistry **6 h**

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy–Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids.

Adsorption: Types of adsorption. Factors influencing adsorption. Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

References

General reference: B.Sc II Year Chemistry : Semester IV, Telugu Academy publication, Hyd

Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand ReinholdCompany(1977)
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press(1989).
6. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
7. Textbook of Inorganic Chemistry by R Gopalan, Universities Press,(2012)

Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninthedition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008)
3. Text book of organic chemistry by Morrison and Boyd. Person(2009)
4. Text book of organic chemistry by Graham Solomons. Wiley(2015)
5. Text book of organic chemistry by Bruice Yuranis Powla. **(2012)**
6. Text book of organic chemistry by C N pillai CRC Press (2012)
8. Organic Chemistry by L. G. Wade Jr.
9. Organic Chemistry by M. Jones, Jr
10. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton and Marron. The MacmillanCompany; 4th edn. (1970)
2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand &sons.(2011)
3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Physical Chemistry through problems by S.K. Dogra. (2015)
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry byLewis Glasstone. Macmillan (1966)
8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990

Unit IV

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications(1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Text book of organic chemistry by Morrison and Boyd, Person (2009)
6. Text book of organic chemistry by Graham solomons, Wiley (2015)
7. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, CBA,(2014)
8. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
7. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
8. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
9. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities, Press 2014

Laboratory Course

Paper IV-

Qualitative Analysis of Organic Compounds: 45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

B.Sc. Chemistry II Year Semester-III
Skill Enhancement Course- I (SEC-I) (2 Credits)
Rules in Chemistry Laboratory and Lab Reagents

Unit I: Laboratory Safety Rules and Regulations 15 h (1 hr/week)

General rules and regulations for lab safety: Minimizing Risks of Hazards, Personal Protective Equipment (PPE) - Hair, Dressing for the Laboratory, Eye Protection, Eyewash fountain, Gloves, Laboratory Protocols, Labeling Chemicals, Careful reading of labels Prevention of Inhaling Harmful Chemicals, Guide to Chemical Hazards, Chemical Spills etc,. Accidents use of fire extinguisher and first aid kit in the laboratory, safety symbols- Preparation of the charts by the students and display of chats in chemistry labs. Calibration of fractional weights, calibration of glass ware - burette, pipette, standard flask, Normality/Molarity and specific gravity of concentrated acids – Preparation of dilute solutions (Numerical problems). Precautions to be taken in the preparation of dilute acids and bases and bases. Preparation of stock solutions of salts with specific examples. Properties of primary standard salt and preparation of standard solution. Good laboratory practices-maintenance of observation book record.

UNIT 2: Preparation of Lab Reagents 15 h (1 hr/week)

Preparation of indicators and use of indicators in volumetric analysis- acid base titrations, redox titrations, precipitation titrations and complexometric titrations. Role of an indicator in detecting end point (Phenolphthalein, Methyl orange, Methyl-red, Potassium Chromate, Diphenylamine, EBT, Murexide, etc). Preparation of buffers – pH 10 ammonical buffer and acetate buffer solutions. Preparation of commonly used reagents : Ammonium hydroxide solution, Ammonium molybdate reagent, Ammonium hydrogen phosphate solution, Bayer's reagent, Benedict's solution, Bromine water, Dimethyl glyoxime reagent, 2,4-Dinitrophenyl hydrazine reagent, Eriochrome black-T reagent Fehling solution, Ferric chloride solution, Ferrous sulphate solution, Iodine solution, Molisch's reagent, Nessler's reagent, Neutral $FeCl_3$, Schiff's reagent, Silver nitrate solution, Sodium carbonate solution , Sodium hydroxide (Caustic soda) solution, Starch solution, Tollen's reagent. (reference work and submission of assignments). Charts preparation depicting course content.

RECOMMENDED BOOKS

1. Vogel's Text Book of Quantitative Chemical Analysis, 5th edition.
2. Vogel's Text Book of macro and semimicro qualitative inorganic analysis. G. Svehla, 5th edition.
3. Chemistry Reagent Manual Prepared by Chemistry Department, SGTB Khalsa College under DBT's Star College Scheme, University of Delhi (Available: online)
4. American Chemical Society Safety in Academic Chemistry Laboratories 8th edition.

[Course objectives (CO)]: To improve the skills of students in the application of theory and practical knowledge. To fill the gap between theory and practicals. To train the students in understanding laboratory safety rules and to improve the skills in preparation of laboratory reagents]

B.Sc. Chemistry II Year
Semester III
Skill Enhancement Course- II (SEC –II) (2 Credits)
REMEDIAL METHODS FOR POLLUTION, DRINKING WATER AND SOIL FERTILITY STANDARDS

UNIT I: Remedial Methods for Pollution Prevention and control of air pollution 15 h (1 hr/week)

Ozone hole-causes and harm due to ozone depletion. The effect of CFC's in Ozone depletion and their replacements. Global Warming and Greenhouse Effect Precautions to control global warming. Deleterious effect of pollutants - Endangered Monuments- acid rain. Precautions to protect monuments. Sources of Radiation pollution - Chernobyl accident and its Consequences. Radiation effect by the usage of cell phones and protection tips. Deleterious effects of cell phone towers and health hazards.

Sources of water pollution-(i). Pollution due to pesticides and inorganic chemicals, (ii). Thermal pollution (iii). Ground water pollution (iv). Eutrophication.

Methods for control of water pollution and water recycling. Dumping of plastics in rivers & oceans and their effect on aquatic life. Determination of (i) Dissolved Oxygen and (ii) Chemical Oxygen Demand in polluted water - Illustration through charts (or) demonstration of experiments. Sources of soil pollution (i). Plastic bags, (ii). Industrial and (iii). Agricultural sources. Control of soil pollution. Environmental laws in India. Environmental benefits of planting trees.

UNIT II: Drinking Water and Soil Fertility Standards and Analysis 15 h (1 hr/week)

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards : Inorganics, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards-Inorganics and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemical oxidation and (iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry- Basic Concepts. Effect of pH on nutrient availability. Macronutrients and their effect on plants -Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus other macronutrients-Calcium, Magnesium and Sulfur. Micronutrients and their effect on plants. Boron ($B_4O_7^{2-}$), Copper (Cu^{2+}), Iron (Fe^{2+}, Fe^{3+}) Manganese (Mn^{2+}) Molybdenum (MoO_4^{2-}) Zinc (Zn^{2+}) Cobalt (Co^{2+}) Chlorine (Cl^-) and Others. Determination of soil nitrogen by Kjeldahl method- Illustration through charts (Or) demonstration of experiment. Visit to nearby agricultural forms and interaction with farmers. Discussion with farmers on the use of Soil Analysis Kits.

References

1. A Text book for 'Remedial methods for pollution, drinking water and soil fertility standards', First Edition, Authors: Dr Mudvath Ravi, Gopu Srinivas, Putta Venkat Reddy, Vuradi Ravi Kumar, Battini Ushaiah, ISBN No. 978-93-5311-183-0.
2. Remedial methods for pollution, drinking water and soil fertility standards, Author: Dr G. Vanjatha.
3. Remedial methods for pollution, drinking water and soil fertility standards, Telugu version, Authors: Dr N. Yogi Babu, Dr. G. Vanajatha, M. Srilatha.
4. Environmental Pollution, download.nos.org/333courseE/10.pdf
5. CFC Replacements, butane.chem.uiuc.edu/pshapley/Environmental/L21/3.html
6. Effects of Acid Rain on Buildings www.air-quality.org.uk/12.php
7. Acid Rain Effects - Buildings - Chemistry
chemistry.elmhurst.edu/vchembook/196buildings.html 8. How to protect national heritage - ways to protect monuments www.youthkiawaaz.com/2011/03/how-to-protect-national-heritage/.
9. Chernobyl nuclear power plant accident - NRC www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.pdf
10. Side-effects of harmful radiation from mobile phones and towers
pib.nic.in/newsite/printrelease.aspx?relid=116304
11. Cell Phone Radiation Protection - Highly Effective Tips https:
www.electricsense.com/775/how-to-protect-yourself-from-cell-phone-radiation/
12. Chemical Waste That Impact on Aquatic Life or Water Quality
blog.idrenvironmental.com/chemical-waste-that-impact-on-aquatic-life-or-waterquality
13. Trees and Your Environment - Clean Air Gardening
www.cleanairgardening.com/plantingtrees 14.water quality and common treatments for private drinking water . extension.uga.edu/publications/detail.html?number=b939
15. Soil chemistry https://casfs.ucsc.edu/about/publications/Teaching-Organic-Farming/PDFdownloads/2.2-soil-chemistry.pdf
16. Soil Analysis-Determination of Available Nitrogen ... - Amrita Virtual Lab
vlab.amrita.edu/?sub=2&brch=294&sim=1551&cnt=1
17. Determination of dissolved oxygen (DO)
www.cutm.ac.in/pdf/env%20engg%20lab%20manual.pdf 18. Determination of chemical oxygen demand of wastewater www.pharmaguideline.com › quality control › test

B.Sc. Chemistry II Year
Semester - IV
Skill Enhancement Course- III (SEC - III) (2 Credits)
Materials and their Applications

Unit – I: Types of Materials 15 h (1 hr/week)

Introduction: Materials and their importance. Classification of Materials, Advanced materials and their need. Types of Materials: Metals, ceramics, polymers and composites; Nature of bonding (Type of bond present). Types and applications of metal alloys: Classification- ferrous and non-ferrous alloys. Ferrous alloys -types and their applications. Non-ferrous alloys – Cu, Al, Ti alloys, their applications and super alloys.
Field Work- Collection of Metal Alloy Samples.

Types and Applications of Ceramics: Classification of Ceramics based on their application- glasses, clay products, refractories, abrasives, cements, and advanced ceramics. Glasses: Compositions and Characteristics of Some of the Common Commercial Glasses; Properties and applications of glass ceramics - preparation of charts depicting various types of glass and their use. Clay products: Structural clay products and the white wares. Refractories: Compositions of four Common Ceramic Refractory Materials, fireclay, silica, basic refractories ex. MgO and special refractories ex. Alumina and Zirconia Cements: Classification, preparation of cement and the setting process; quick setting cements; applications.
Field Work-Visit to industries and collection of samples of materials

Unit – II: Types of Polymers and Applications 15 h (1 hr/week)

Classification of Polymeric materials based on application: Coatings, adhesives, films, foams with examples Polymer Additives: Fillers, Plasticizers, Stabilizers, Colorants, Flame Retardants with examples.
Advanced Materials: Types of advanced materials - semiconductors, bio-compatible materials, smart materials, advanced polymeric materials and nano-engineered materials. Biocompatible materials: Definition. Materials used as biomaterials and their properties. Metals and alloys used in bone and joint replacement. Filling and restoration materials – dental cements, dental amalgams, dental adhesives.
Field Work- Visit to Dental Clinics and interaction with Doctors regarding materials used in Dental treatments.
Smart materials: Shape memory alloys- definition and examples (Ni-Ti alloys, Cu based alloys), applications. Conducting polymers: - Introduction, Electrically conducting polymers and their uses (polyaniline, polypyrrole, polyacetylene and polythiophene).

References

1.William D. Callister Materials Science and Engineering An Introduction, John Wiley & Sons, Inc, 2006.
2. Material science by Kakani and Kakani.
3.Sujata V., Bhat., ―Biomaterials‖, Narosa Publication House, New Delhi, 2002.
4.M. V. Gandhi and B. S. Thompson, ―Smart Materials and Structures‖, Chapman and Hall, London, First Edition, 1992.
5 Duerig,T. W., Melton, K. N, Stockel, D. and Wayman, C.M., ―Engineering aspects of Shapememory Alloys‖, Butterworth – Heinemann, 1990.
6. Conducting Polymers, Fundamentals and Applications A Practical Approach Authors: Chandrasekhar, Prasanna Ashwin-Ushas Corp., Inc. Kluwer Academic Publishers. Boston

B.Sc. Chemistry II Year Semester IV
Skill Enhancement Course- IV (SEC - IV) (2 Credits)
Chemistry of Cosmetics and Food Processing

Unit-I: Chemistry of Cosmetics and Perfumes

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol. Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition, analysis of calcium in milk by complexometric titration, spectrophotometric analysis of iron in foods, Spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks. Field Work -Visit to Food Industries. Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce. Field Work-Collection of adulterated food samples, demonstration of a minimum of five experiments for testing adulterants in food items.

References

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci., AugSep 2015; 2(4A):304-311.
5. W.A. Poucher, Perfumes, Cosmetics and Soaps (1993).
6. Srilakshmi, Food Science. Edition: 3rd (2004). 7. Lillian Hoagland Meyer, Food chemistry (2008).
8. Handbook of Analysis and Quality Control for Fruit and Vegetable Products,S. Ranganna, Tata McGraw-Hill Education, 1986 – Food.
9. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
10. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.

B.Sc. CBCS CHEMISTRY

Theory Model Question Paper

For

Semester I, II, III, IV

Time : 3 Hrs. **Max.Marks : 80**

Note: Answer eight questions from Part-A and all questions from Part-B. Each question carries 4 marks in Part-A and 12 marks in Part-B.

Part-A **(8 x 4 = 32 Marks)**

(Short Answer Type)

I. Write any **Eight** questions of the following

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Part-B **(4 x 12 = 48 Marks)**

(Essay Answer Type)

II. Answer **all** Questions

1 a)

(OR)

b)

2 a)

(OR)

b)

3 a)

(OR)

b)

4 a)

(OR)

b)

B.Sc. CBCS CHEMISTRY

Practical Model Question Paper

For

Semester I, II, III, IV

Time : 3 Hrs. **Max.Marks : 50**

SEMESTER	External (Marks)	Internal (Marks)	Total (Marks)
I	40	10	50
II	40	10	50
III	40	10	50
IV	40	10	50

Telangana State Council of Higher Education, Govt. of Telangana B.Sc, CBCS Common Core Syllabi for all Universities in Telangana

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc., Chemistry (for the batch admitted in 2019-2020)

CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
THIRD YEAR- SEMESTER V				
BS 501	**Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals**	**GE**	4	4
BS 502	English	CC-1E	3	3
BS 503	Second language	CC-2E	3	3
BS 504	Optional- I **A/B**	DSE -1E	------	4+1=5
BS 505	Optional- II **A/B**	DSE -2E	------	4+1=5
BS 506	Optional- III **A/B** **A. Spectroscopy and Chromatography** **(or)** **B. Metallurgy, Dyes and Catalysis**	**DSE -3E**	**4T** } = 7	**4** } = 5
	Laboratory Course -V **Experiments in Physical Chemistry-I**		**3P** }	**1** }
	TOTAL			**25**
THIRD YEAR- SEMESTER VI				
BS 601	**Project in Chemistry/ Advanced Chemistry**			4
BS 602	English	CC-1F	3	3
BS 603	Second language	CC-2F	3	3
BS 604	Optional- I **A/B**	DSE-1F	--------	4+1=5
BS 605	Optional- II **A/B**	DSE -2F	--------	4+1=5
BS 606	Optional- III **A/B** **A. Medicinal Chemistry** **(or)** **B. Agricultural and Fuel Chemistry**	DSE -3F	**4T** } = 7	**4** } = 5
	Laboratory Course -VI **Experiments in Physical Chemistry-II**		**3P** }	**1** }
	TOTAL			**25**
	TOTAL Credits			**150**

Semester V
Generic Elective (GE) Course - I (4 Credits)
(for B.Sc. Non Chemistry/B.A/B.Com Students)
Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals 60Hrs

Unit-I: Chemistry of Cosmetics and Perfumes 15 Hrs

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol.

Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Chemistry and Applications of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration 15 Hrs

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition,

Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce.

Food Packaging: Definition and function of packaging-Classification of packaging materials- different types of packaging materials such as glass, wood, metal, paper, wood, plastic etc., - advantages and disadvantages of each packaging material. Packaging materials and systems: corrugated fibre board boxes, shrink bundles and reusable packages. Effect of packaging materials on nutritive values of food.

Food labelling: Introduction, need and importance.

Unit – III: General Characteristics of Drugs 15Hrs

Introduction: Diseases – causes of diseases, Drug – definition and sources.

ADME of drugs (brief) – Absorption, distribution, drug metabolism (in liver), elimination (brief). Toxicity.

Examples (i) Zintac (Ranitidine, antacid) (ii) Paracetamol (antipyretic) (iii) Benadryl (Cough syrup). Characteristics of an ideal drug.

Nomenclature of Drugs: chemical name – generic name – trade name. Trade names for the given generic names – (i) Aspirin (ii) Amoxycillin (iii) Ciprofloxacin (iv) Paracetamol (v) Mebendazole

Drug formulations: Definition – need for conversion of drug into pharmaceutical (drug formulations) – Additives – diluents, binders, lubricants, antioxidants, flavourants, sweeteners, colourants, coating agents. Classification of Drug formulations: oral, parenterals and topical dosage forms –

advantages and disadvantages.

(i) Oral Dosage forms: Tablets (Aspirin – analgesic; Ciprofloxacin - antibacterial). Capsules (Amoxycillin – antibiotic; Omeprazole-antacid). Syrups (B-complex syrup; Benadryl- Cough syrup).

(ii) Parenterals (Injection forms): Propranolol (antihypertensive), Heparin (anticoagulant)
(iii) Topical dosage forms: Creams and Ointments
(iv) Antiallergic: Aclometasone (Aclovate), Betamethasone valerate(2%) Multiple purposes,
(v) Anti-itching: Doxepin Zonalon), Antifungal: Miconozole (Dactarin, Neomicol), Ketoconazole, (Nizoral Cream), Fluconazole, Anesthetic- Lidocaine, (Lidocaine ointment) and Antiseptic: Boro Plus Cream, For burns -Iodine ointment

Unit – IV: Classification of Drugs **15Hrs**

Classification of drugs based on therapeutic action-Chemotherapeutic agents, Pharmacodynamic agents and drugs acting on metabolic processes.
Brief explanation for the following:
(i) Chemotherapeutic agents: Antimalarials – Chloroquine; Antibiotic – Amoxicillin; Antitubercular drugs – isoniazide; Antiprotozoals – metronidazole.
(ii) Pharmacodynamic agents
(a) Drugs acting on CNS: Diazepam (CNS depressant), General anesthetic (thiopental sodium), antipyretic and analgesic (Iburofen)
(b) Drugs acting on PNS: local anaesthetics (Benzocaine)
(c) Drugs acting on cardiovascular system: Metoprolol (antihypertensive agents), Nefidipine antianginal and antihypertensive agent)
(d) Drugs acting on renal system: Diuretics (Acetazolamide)
(iii) Drugs acting on metabolic processes
(a) Vitamins: Common name, source, deficiency, vitamin A, B2, B6, C, D, E and K – remedy
(b) Hormones: Function (brief) - deficiency of hormones (Insulin, Testosterone and Osterone)

Recommended Text Books and Reference Books

1. Industrial Chemistry, Vol -I, E. Stocchi, Ellis Horwood Ltd. UK.
2. Engineering Chemistry, P.C. Jain, M. Jain, Dhanpat Rai & Sons, Delhi.
3. Industrial Chemistry, Sharma, B.K. & Gaur, H. , Goel Publishing House, Meerut (1996).
4. Food Processing and Impact on Nutrition, Rameen Devi, Sc J Agric Vet Sci., Aug-Sep 2015; 2(4A):304-311.
5. Perfumes, Cosmetics and Soaps , W.A. Poucher, (1993).
6. A first course in food analysis by A Y Sathe
7. Food Science by N.Potter, CBS publishers
8. Food chemistry, Lillian Hoagland Meyer, (2008).
9. A Handbook of food packaging by F. A. Paine and H.Y. Paine.
10. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
11. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.
12. Drugs by G.L.David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K.L.N.Reddy, C.Sudhakar , Universities Press (India) Limited 2007.
13. An Introduction to Medicinal Chemistry by Graham L. Patrick, Oxford University Press, New York. 1995

B.Sc. Chemistry III Year
Semester-V, Paper-V
Discipline Specific Elective- A (4 Credits)
Spectroscopy and Chromatography **60Hrs**

Unit I: Molecular spectroscopy **15Hrs**

S5-E-A-I: Introduction to electromagnetic radiation, interaction of electromagnetic radiations with molecules, various types of molecular spectra.

Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules (No derivation), Determination of bond length of rigid diatomic molecules eg. HCl.

Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant (Problems). Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

Electronic spectroscopy

Bonding and antibonding molecular orbitals,electronic energy levels of molecules (σ, π, n), types of electronic transitions:σ-σ^*, n-σ^*, n-π^*, π-π^* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Absorption of characteristics of chromophones: diene, enone and aromatic chromophores. Representation of UV-visible spectra. General features of absorption – spectroscopy, transmittance, absorbance, and molar absorptivity. Beer Lambert's law and its limitations.

Unit II: NMR and Mass Spectrometry **15Hrs**

S5-E-A-II: Proton Magnetic Resonance Spectroscopy

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, factors affecting chemical shifts, NMR splitting of signals – spin-spin coupling, representation of proton NMR spectrum – Integrations. ^{1}H NMR spectrum of – ethyl bromide, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate and acetophenone.

Mass Spectrometry

Electron Impact Mass: Basic principles, Nitrogen rule, types of ions: Molecular ion and fragment ions. Representation of mass spectrum, types of peaks (molecular ion peak, base peak and isotopic ion peaks). Determination of molecular formula. Mass spectrum of ethyl chloride, ethyl bromide and acetophenone.

Unit III: Separation techniques - I **15Hrs**

S5-E-A-III: Solvent Extraction- Principle, Methods of extraction: Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron(III).

Chromatography: Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

Thin layer Chromatography (TLC): Advantages, preparation of plates, Solid phase and mobile phase used in TLC, eluotopic series, development of the chromatogram, Detection of the spots, visualizing agents, factors effecting Rf values and applications of TLC.

Paper Chromatography: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two dimensional chromatography, detection of spots, and applications of paper chromatography.

15Hrs

Unit IV: Separation techniques - II

S5-E-A-IV: Column Chromatography- Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase solvents for eluting polar, non-polar compounds and its applications.

Ion exchange chromatography: Principle, cation and anion exchange resins, its application in separation of ions, de-ionized water.

Gas Chromatography: Principle, theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase), applications of GC.

High performance liquid chromatography: Principle, theory and instrumentation, stationary phases and mobile phases. Applications of HPLC, Analysis of paracetamol.

Recommended Text Books and Reference Books

1. Fundamentals of Molecular Spectroscopy, Banwell & McCash
2. Organic spectroscopy, William Kemp, Palgrave Macmillan; 2nd Revised edition
3. Spectroscopy, B K Sharma Krishna Prakashan Media, 1981
4. Elements of Organic Spectroscopy, Y R Sharma.
5. Applications of Absorption Spectroscopy of Organic Compounds (English, Paperback, Dyer R. John)
6. Organic Chemistry, Morrison and Boyd, Pearson Publications.
7. Introduction to Spectroscopy by Donald Pavia, Gary Lampman and George Kriz. Saunders College Division,2001
8. Chemistry text book for B.Sc., published by Telugu Academy, Govt. of Telangana.
9. Analytical Chemistry by David Krupadanam, Universities Press (India) Limited.
10. Principles of Instrumental Analysis, D.A. Skoog, F.J. Holler, T.A. Nieman, Engage earning India Ed.
11. Fundamentals of Analytical Chemistry 6 th Ed., D. A. Skoog, D.M. West, F.J. Holler, Saunders College Publishing, Fort worth (1992).
12. Instrumental Methods of Analysis. 7th Ed. Willard, H.H., Merritt, L.L., Dean, J. & Settle, F.A. Wordsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
13. A Textbook of Quantiitative Inorganic Analysis 7th Ed., Vogel, A. I. Prentice Hall.
14. Analytical Chemistry 7 th edition by Gary D. Christian (2004).
15. Separation Methods, M.N Sastry, Himalaya Publication (2004).

B.Sc. Chemistry III Year
Semester-V, Paper- V
Discipline Specific Elective-B (4 Credits)
Metallurgy, Dyes and Catalysis **60 Hrs**

Unit I: General Principles of Metallurgy and Production of Non Ferrous Metals **15 Hrs**

S5-E-B-I: Pyrometallurgy: Drying and calcination, roasting, smelting, products of smelting.
Hydrometallurgy: Leaching methods, leaching agents, leaching of metals, oxides and sulphides.
Separation of liquid and solid phases and processing of aqueous solutions
Electrometallurgy: Electrolysis, Refining electrolysis, electrolysis from aqueous solutions, fused-salt electrolysis
Refining processes: Chemical and physical refining processes
Production of selected non-ferrous metals (Copper, Nickel, Zinc): Properties, raw materials, production (flow charts presentations and chemical reactions involved) and uses.

Unit II: Natural and Synthetic Dyes **15Hrs**

S5-E-B-II: Dyes: Definition, Classification of dyes- Natural dyes, synthetic dyes; based on chemical constitution of dyes; Chemical nature of dyes; Applications of dyes.
Stuctures of natural dyes: Indigo, Tyrian purple, Alizarin, Indigotin.
Structures of Synthetic Dyes: Nitrodyes, Nitrosodyes, Azodyes (Mono azodyes, bisazodyes), diaryl methane dyes, triaryl methane dyes, Xanthene dyes, Phenolphthalein, Fluorocein, Acridine dyes.
Synthesis of dyes: Mono azodyes, bisazodyes (Congo red), Auromine O, Malachite Green, Crystal Violet, Rhodamine B, Acridine Yellow, Indigotin .
Binding of dyes to fabric. Applications of dyes.

Unit III: Catalysis I **15Hrs**

S5-E-B-III: Homogeneous and heterogeneous catalysis -
Definition of a catalyst and catalysis. Comparison of homogeneous and heterogeneous catalysis with specific examples. General characteristics of catalytic reactions.
Acid-base catalysis- Examples of acid and base catalysed reactions, hydrolysis of esters.
Kinetics of acid catalysed reactions. Specific acid and general acid catalysis, Kinetics of base catalysed reactions. Specific base and general base catalysis. Examples-Aldol condensation and decomposition of nitramide, base catalysed conversion of acetone to di acetone alcohol. Mutarotation of glucose. Effect of pH on reaction rate of acid and base catalysed reactions.
Phase transfer catalysis: Principle of phase transfer catalysis, classification of phase transfer catalysts. Factors influencing the rate of PTC reactions.

Unit IV: Catalysis II **15Hrs**

S5-E-B-IV: Enzyme catalysis- Characteristics of enzyme catalysis, Examples: (i) Invertase in inversion of cane sugar (ii) Maltase in conversion of maltose to glucose (iii) Urease in decomposition of urea (iv) Zymase in conversion of glucose to ethanol (v) working of carbonic anhydrase and (vi) Mechanism of oxidation of ethanol by alcohol dehydrogenase Factors affecting enzyme catalysis. Effect of temperature, pH, concentration and effect of inhibitor on enzyme catalysed reactions, Catalytic efficiency.

Kinetics of enzyme catalysed reactions: Michaelis-Menton Equation. Mechanism of enzyme catalysed reactions. Significance of Michaelis constant (Km) and maximum velocity (Vmax), Lineweaver-Burk plot. Types of enzyme inhibitors

Recommended Text Books and Reference Books

1. Industrial Chemistry, B K Sharma
2. Engineering Chemistry, Jain and Jain
3. Industrial Chemistry E. Stocchi, Vol-I, Ellis Horwood Ltd. UK.
4. Handbook of Industrial Chemistry, J. A. Kent: Riegel's, CBS Publishers, New Delhi.
5. Theory of production of non- ferrous metals and alloys Study. Kateřina Skotnicová, Monika Losertová, Miroslav Kursa
6. The Chemistry of Synthetic Dyes, Volume 4, K Venkataraman Elsevier
7. Organic Chemistry Vol-I by I.L. Finar.
8. Organic Chemistry by Jennice, Gorzinski Smith
9. Natural Dyes: Sources, Chemistry, Application and Sustainability Issues by Sujata Saxena and A. S. M. Raja.
10. Physical Chemistry by Atkins and De Paula, 8 th Edn.
11. Physical Chemistry by Puri, Sharma and Pattania, 2017.
12. Kinetics and mechanism of chemical transformations by Rajarajm and Kuraiacose, Published by Macmillan India Ltd.
13. Text book of Physical Chemistry, K.L. Kapoor, Macmillan, 1999.
14. Catalysis, J.C. Kuriacose, Macmillan Macmillan Publishers India Limited, 1980.
15. Phase Transfer Catalysis, Fundamentals, Applications and Industrial perspective, C. M. Stark, C. Liotta & M. Halpern, Academic Press
16. Phase Transfer Catalysis, E. V. Dehmlow & S. S. Dehmlow, Verlag Chemie, Weinheim

Semester - V
Laboratory Course
Paper V Experiments in Physical Chemistry-I

45 h (3 h / w)

1. Distribution law
   a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
   b) Determination of distribution coefficient of acetic acid between n-butanol and water.

2. Electrochemistry
   a) Determination of cell constant of a conductivity cell.
   b) Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.

3. Colorimetry
   a) Verification of Beer's law using $KMnO_4$
   b) Determination of the concentration of the given $KMnO_4$ solution.

4. Adsorption
   b) Adsorption of acetic acid on animal charcoal - Verification of Freundlich adsorption isotherm.

5. Physical constants
   a) Surface tension and b) viscosity of liquids. (Demonstration Experiment)

Reference books:

1. Senior practical physical chemistry. B. D. Khosla, V.C. Garg, Adarsh Gulati Published by R. Chand & Co.
2. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan. Viva Books
3. Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5 / 1403929165 ISBN-13: 978-1-4039-2916-7 / 9781403929167

B.Sc. Chemistry III Year
Semester –VI
Optional for Chemistry Stream
Advanced Chemistry **60Hrs**

Unit-I (Inorganic Chemistry) **15 Hrs**

S6-O-I-1:Inorganic reaction mechanisms **4h**

Labile and inert complexes, Thermodynamic and kinetic stability based on VBT & CFT: ligand substitution reactions $-S_{N^1}$ and S_{N^2} in Octahedral complexes; substitution reactions of square planar complexes – Trans effect and applications of trans effect. Reactions of tetrahedral complexes - Hydrolysis of silicon halides and phosphorous oxides.

S6-O-I-2: Boranes and Carboranes **2 h**

Definition of clusters. Structures of boranes and carboranes- Wade's rules, closo, nido, arachno boranes and carboranes

S6-O-I-3: Symmetry of molecules **5 h**

Symmetry operations and symmetry elements in molecules. definition of axis of symmetry types of c_n, plane of symmetry (σ_h, σ_v, σ_d), center of symmetry and improper rotational axis of symmetry (S_n). Explanation with examples.

S6-O-I-4: Non – aqueous solvents **4 h**

Classification and characteristics of a solvent. Reactions in liquid ammonia – physical properties, auto-ionisation, examples of ammono acids and ammono bases. Reactions in liquid ammonia – precipitation, neutralization, solvolysis, solvation - solutions of metals in ammonia, complex formation, redox reactions. Reactions in HF – autoionisation, reactions in HF – precipitation, acid – base reactions, protonation.

Unit-II (Organic Chemistry) **15 Hrs**

S6-O-O-1: Pericyclic Reactions **5 h**

Concerted reactions, Molecular orbitals of ethene, 1,3-butadiene and allyl radical. Symmetry properties, HOMO, LUMO, thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each and their explanation by FMO theory.

S6-O-O-2: Synthetic Strategies **5 h**

Terminology – Target molecule (TM), Disconnection approach – Retrosynthesis, Synthon, Synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent synthesis. Retrosynthetic analysis of the following molecules: 1) acetophenone 2) cyclohexene and 3) 2-phenylethanol.

S6-O-O-3: Asymmetric synthesis **5 h**

Definition and classification of stereoslective reactions: substrate, product stereoselective reactions, enantio and diastereo selective reactions. Stereospecific reaction – definition –example – dehalogenation of 1,2-dibromides induced by iodide ion. Enantoselective reactions – definition – example –Reduction of Ethylacetoacetate by Yeast. Diastereoselective reaction- definition-

example:Acid catalysed dehydration of 1-phenylproponal and Grignard addition to 2-phenyl propanal. Definition and explanation of enantiomeric excess and diastereomeric excess.

Unit III (Physical Chemistry) **15 Hrs**

S6-O-P--1: Polymers

Definition of polymers – natural polymers and synthetic polymers examples classification as plastics, fibers, elastomers.

Thermosetting, thermoplastic polymers. Branched, cross-linked and co-polymers.

Definition of polymerization-addition and condensation polymerization with examples. Explanation :chain polymerization, step polymerization, co-polymerization and co-ordination polymerization. Kinetics of free radical polymerization. Tacticity, atacticity, stereo specific synthesis- Zeigler- Natta catalyst.

Molecular weight definitions- number average, weight average molecular weight. Determination of molecular weight of polymers using viscosity method, Osmometric method. Problems.

Preparation and industrial applications of polyethylene, poly vinyl chloride (PVC), nylon –66, teflon, polyacrylonitrile and terelene.

Introduction to biodegradability and examples of biodegradable polymers.

Unit IV: (General Chemistry) **15 Hrs**

S6-O-G--1:: Electroanalytical methods

Types of Electroanalytical Methods.

I) Interfacial methods – a) Potentiometry: Principle, Electrochemical cell, Electrodes- (i) Indicator and (ii) Reference electrodes – Normal Hydrogen Electrode, Quinhydrone Electrode, Saturated Calomel Electrode. Numerical Problems. Application of Potentiometry – Assay of Sulphanilamide

b) Voltametry – three electrode assembly; Intoduction to types of voltametric techniques, micro electrodes, Over potential and Polarization.

II) Bulk methods – Conductometry, Conductivity Cell, Specific Conductivity, Equivalent Conductivity. Numerical Problems. Applications of conductometry. Estimation of Cl – using $AgNO_3$. Determination of Aspirin with KOH.

Recommended Text Books and Reference books

1. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3 rd edn Wiley Publishers (2001).
2. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4 th edn. (2006)
3. Inorganic Chemistry by Shriver and Atkins 3 rd edn Oxford Press (1999).
4. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
5. Symmetry and Spectroscopy of Molecules, K. Veera Reddy, Second Edition, New Age International (P) Limited Publishers
6. Textbook of Inorganic Chemistry by R Gopalan, Universities Press,(2012)
7. Text book of organic chemistry by Morrison and Boyd, Pearson Publishers (2009)
8. Text book of organic chemistry by Graham Solomons, Wiley(2015)

9. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, NCBA,(2014)
10. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
11. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
12. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
13. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities Press(2014)
14. Polymer Chemistry, M G Arora and M Singh
15. Introductory Polymer Chemistry by G S Misra
16. Textbook of Polymer Science, F. W. Billmeyer Jr, John Wiley & sons
17. Polymer Science, V. R. Gowarikar, N. V. Viswanathan & J. Sreedhar, Wiley Eastern
18. Contemporary Polymer Chemistry, H. R. Alcock & F. W. Lambe, Prentice Hall
19. Materials Science and Engineering An Introduction by William D. Callister, Jr. John Wiley & Sons, Inc.
20. Principles of Instrumental Analysis, D.A. Skoog, F.J. Holler, T.A. Nieman, Engage earning India Ed.
21. Fundamentals of Analytical Chemistry 6 th Ed., D. A. Skoog, D.M. West, F.J. Holler, Saunders College Publishing, Fort worth (1992).
22. Physical Chemistry by Atkins and De Paula, 8 th Edn.
23. Physical Chemistry by Puri, Sharma and Pattania, 2017

B.Sc. Chemistry III Year
Semester-VI, Paper-VI
Discipline Specific Elective-A (4 Credits)
Medicinal Chemistry **60Hrs**

15Hrs

Unit- I:Introduction and Terminology

S6-E-A-I: Diseases: Common diseases, infective diseases–insect borne, air-borne, water-borne and hereditary diseases.

Terminology in Medicinal Chemistry: Drug, Active Pharmaceutical Ingredient (API), Pharmaceuticals, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, anti metabolites and therapeutic index.

Drugs: Nomenclature: Chemical name, Generic name and Trade names with examples; Classification: Classification based on structures and therapeutic activity with examples.

ADMET: a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions.
d) Elimination: definition and renal elimination. Toxicity.

15Hrs

Unit-II: Enzymes and Receptors

S6-E-A-II: Enzymes: Introduction. Mechanism and factors affecting enzyme action, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance. Types of inhibition - reversible, irreversible and their subtypes with examples.

Receptors: Introduction, Drug action-receptor theory, Mechanism of drug action, concept of agonists and antagonists with examples. Drug receptor interactions involved in drug receptor complex. binding role of –OH group, $-NH_2$ group, quaternary ammonium salts and double bond. Structure – activity relationships of drug molecules, explanation with sulfonamides.

Unit- III: Synthesis and Therapeutic Activity of Drugs **15Hrs**

S6-E-A-III: Introduction, synthesis and therapeutic activity of
Chemotherapeutics: Sulphanilamide, dapsone, Pencillin-G (semi synthesis), Chloroquin, Isoniazid, Cisplatin and AZT.

Drugs to treat metabolic disorders: Anti diabetic - Tolbutamide; Antiinflammatory – Ibuprofen; Cardiovascular- Glyceryl trinitrate; Antipyretic (paracetamol, aspirin) and Antacid- Omeprazole.

Drugs acting on nervous system: Anesthetics-definition, Classification-local and general. Volatile- Nitrous oxide, chloroform uses and disadvantages. Local anaesthetics – benzocaine.

Unit- IV: Molecular Messengers, Vitamins and Micronutrients **15Hrs**

S6-E-A-IV: Molecular Messengers: Introduction to hormones and neurotransmitters, Thyroid hormones, Antithyroid drug-Carbimazol. Adrenaline: Adrenergic drugs- salbutamol, atenelol. Serotonin: SSRIs- fluoxetine. Dopamine: Antiparkinson drug- Levodopa .

Vitamins and Micronutrients: Introduction, vitamin sources, Deficiency disorders and remedy of Vitamins A,B, C, D, E K and micronutrients – Na, K, Ca, Cu, Zn and I .

Recommended Text Books and Reference books

1. Introduction to Medicinal Chemistry, G.L. Patrick, Oxford University Press, New York. 2013.
2. Medicinal Chemistry, Thomas Nogrady, Oxford Univ. Press, New York.2005.
3. Foye's Principles of Medicinal Chemistry, David William and Thomas Lemke, Lippincott Williams & Wilkins, 2008.
4. Medicinal Chemistry, Ashutosh Kar , New Age International, 2005.
5. Synthetic Drugs, O.D.Tyagi & M.Yadav, Anmol Publications,1998.
6. Medicinal Chemistry, Alka L. Gupta, Pragati Prakashan.
7. Drugs, G. L. David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Universities Press (India) Ltd. 2012.

B.Sc. Chemistry III Year
Semester –VI, Paper-VI
Discipline Specific Elective-B (4 Credits)
Agricultural and Fuel Chemistry **60 Hrs**

Unit I: – Pesticides **15Hrs**

S6-E-B-I: Introduction, Definition, classification of pesticides based on use (target). Toxicity and chemical structure with examples. Adverse effects of pesticides and its impact on environmental pollution.

Synthesis, manufacture and uses of representative pesticides: Organochlorines (Cypermethrin); Organophosphates (Parathion); Carbamates (Carbaryl); Quinones(Chloranil), Anilides(Alachlor).

Pesticide formulations: Dusts, Granules, Wettable powders, Emulsions and Aerosols.

Biopestcides : Introduction: Potential pesticidal plants of India, Role of Neem in plant protection-constituents, Azadirachtin and its role in pest control, Structure and mode of action of Pyrethrins(pyrethrin-1) and Pyrethroids (permethrin) and nicotinoids (Imidacloprid).

Unit II: – Fertilizers **15Hrs**

S6-E-B-II: Introduction: (need of fertilizers), functions of essential plant nutrients (N, P, K), Classification formula and uses of fertilizers:

Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride and their uses.

Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate and their uses.

Potassium fertilizers: Potassium chloride, potassium nitrate, potassium sulphate and uses. Complex fertilizers: Diammonium Phosphate and mixed fertilizers their uses. Manufacture of urea and Super phosphate of lime and their reactions in the soil.

Biofertilizers – Introduction, definition, classification, Rhizobium, Azatobactor, Azospirillium, Azolla, Blue Green Algae, Vermicomposting and uses.

Organic farming: The principal methods, crop rotation, green manures and compost, biological pest control, and mechanical cultivation and uses.

Unit III: Energy Sources and Coal **15Hrs.**

S6-E-B-III: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar based chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Unit IV: Petroleum and its products, petrochemicals and non petroleum fuels **15Hrs.**

S6-E-B-IV:

Petroleum and its products

Petroleum: Origin, Composition of crude petroleum and classification. Properties- flash point and its determination, Knocking and antiknocking compounds; Octane number. and Cetane number. Distillation of crude petroleum, Fractional Distillation - Principle and process, refining, Fractions and uses. Cracking -Thermal and catalytic cracking, Reforming

Petroleum products – Petrol, Diesel, LPG, Kerosene, Tar and their applications.
Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene and their uses.
Lubricants: Classification of lubricants- Solid, semisolid and liquids; Properties (viscosity, flash point, fire point, cloud point, pour point) and their determination. Functions of lubricants. Mechanism of lubrication.
Non-petroleum fuels: Natural Gas-CNG, LNG, Clean Fuels-H_2 gas, ethanol, Fuel from waste - bio-gas, Fuel from biomass –bio-ethanol, biodiesel, Synthetic fuels- syngas based.

Recommended Text Books and Reference books

1. Chemistry of pesticides, N. N. Melnikov, Springer-Verlag- Technology & Engineering (2012).
2. Pesticide Synthesis Handbook, Thomas A. Unger, Elsevier, (2000).
3. Pesticides, R. Cremlyn, John Wiley, 1980.
4. Manures and Fertilisers, K. Kolay, Published by Atlantic (2007).
5. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
6. A Text Book of Engineering Chemistry Paperback – 2017 by Shashi Chawla
7. Industrial Chemistry, Vol-I, Stocchi, E, Ellis Horwood Ltd. UK (1990).
8. Jain, P.C. and Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.
9. Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Sons, Delhi.

Semester - VI
Laboratory course
Paper VI Experiments in Physical Chemistry-II

45h (3 h/w)

1. Kinetics

a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
b) Determination of rate of decomposition of hydrogen peroxide catalyzed by $FeCl_3$.

2. Electrochemistry

A. Potentiometry:

a) Determination of redox potential of Fe^{2+}/Fe^{3+} by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
b) Precipitation titration of KCl vs. $AgNO_3$ -Determination of given concentration of silver nitrate.

B. pH metry:

a) pH metric titration of strong acid (HCl) vs. strong base- Determination of the concentration of the given acid.
b) pH metric titration of weak acid(acetic acid) with strong base(NaOH).- Determination of acid dissociation constant (K_a) of weak acid.

3. Conductometry:

a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurements.

Reference books:

1. Senior practical physical chemistry. B. D. Khosla, V.C. Garg, Adarsh Gulati
2. Advanced Practical Physical chemistry: J.B.Yadav
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu

Proposed
B.Sc. Botany Syllabus

Under Choice Based Credit System

2019-20

Meeting held with Heads & Chairperson, BOS of Six Conventional Universities on 15th June, 2019 at TSCHE-Hyderabad.

Annexure – I (Credits)
Proposed CBCS Scheme for B.Sc.
w.e.f 2019-20

Courses		Papers	Total Credits	Credits for each paper / Semester B.Sc.					
				I	II	III	IV	V	VI
Core Courses DSC	Optional-1	4	20	5	5	5	5	-	-
	Optional-2	4	20	5	5	5	5	-	-
	Optional-3	4	20	5	5	5	5	-	-
Elective Courses DSE	Optional-1	2	10	-	-	-	-	5	5
	Optional-2	2	10	-	-	-	-	5	5
	Optional-3	2	10	-	-	-	-	5	5
Language	English(First Language)	5	20	4	4	3	3	3	3
	Second Language	5	20	4	4	3	3	3	3
Ability Enhancement Compulsory Course AECC	Environmental Science / Basic Computer Skills	1	2	2	-	-	-	-	-
	Basic Computer Skills / Environmental Science	1	2	-	2	-	-	-	-
Skill Enhancement Course SEC	SEC1	1	2	-	-	2	-	-	-
	SEC2	1	2	-	-	2	-	-	-
	SEC3	1	2	-	-	-	2	-	-
	SEC4	1	2	-	-	-	2	-	-
Generic Elective GE	Open Stream	1	4	-	-	-	-	4	-
Project Work/Optionals		1	4	-	-	-	-	-	4
Total Credits in each semester				25	25	25	25	25	25
Total Credits in UG				150					
Credits under Non-CGPA		NSS /NCC /sports / Extra curricular	6	Upto 6 (2 in each year)					
		Summer Internship	4	Upto 4 (2 in each, after I & II years)					

Annexure II

Proposed New Grading System

SGPA (SEMESTER GRADE POINT AVERAGE)			
S. No.	Grade Point	Range of marks	Grade Letter
1	10	Equal to and above 90 Marks	A+
2	9	More than or equal to 80 and less than 90 Marks	A
3	8	More than or equal to 70 and less than 80 Marks	B+
4	7	More than or equal to 60 and less than 70 Marks	B
5	6	More than or equal to 55 and less than 60 Marks	C+
6	5	More than or equal to 50 and less than 55 Marks	C
7	4	More than or equal to 40 and less than 50 Marks	D
8	0	Below 40 Marks	F

TELANGANA STATE COUNCIL OF HIGHER EDUCATION
PROPOSED CBCS COMMON CORE SCHEME FOR B.SC. COURSE
OPTIONAL -1: BOTANY

CODE	PAPER TITTLE	Course Type	HPW	Credits
	FIRST YEAR SEMSTER - I			
BS 104	PAPER-I : Microbial Diversity and Lower Plants	DSC-1A	4T+3P=7	4+1=5
	FIRST YEAR SEMSTER – II			
BS 204	PAPER-II: Gymnosperms, Taxonomy of Angiosperms and Ecology	DSC-1B	4T+3P=7	4+1=5
	SECOND YEAR SEMSTER – III			
BS 301	SEC-1: UGC Specified	SEC-1	2	2
BS 302	SEC-2: Biofertilizers and Organic Farming	SEC-2	2	2
BS 304	PAPER-III: Plant Anatomy and Embryology	DSC-1C	4T+3P=7	4+1=5
	SECOND YEAR SEMSTER – IV			
BS 401	SEC-3: UGC Specified	SEC-3	2	2
BS 402	SEC-4: Mushroom Culture Technology	SEC-4	2	2
BS 404	PAPER-IV : Cell Biology, Genetics & Plant Physiology	DSC-1D	4T+3P=7	4+1=5
	THIRD YEAR SEMESTER - V			
BS 501	GE-1: Industrial Microbiology	GE-1	4T	4
BS 502	DSE -1A: Biodiversity & Conservation/ DSE -1B: Economic Botany/ DSE -1C: Seed Technology	DSE-1A / DSE-1B / DSE-1C	4T+3P=7	4+1
	THIRD YEAR SEMESTER – VI			
BS 601	DSE-3: Project/ Optional Paper- Horticulture	PROJECT/ Optional	4T	4
BS 602	DSE -2A: Plant Molecular Biology/ DSE -2B: Tissue Culture and Biotechnology/ DSE -2C: Analytical Techniques in Plant Sciences	DSE-2A / DSE-2B / DSE-5E	4T+3P=7	4+1=5

AECC: Ability Enhancement Compulsory Course, **SEC**: Skill Enhancement Course, **GE**: Generic Elective, **DSC**: Discipline Specific Core, **DSE**: Discipline Specific Elective.

K. Shailaja B. Ramachandram M. Durga Prasad

B.Sc. BOTANY

First Year: I -Semester

Paper-I

Microbial Diversity and Lower Plants

DSC - 1A (4 hrs./week) **Credits- 4**

Theory Syllabus **(60 hours)**

UNIT – I **(15 hours)**

1) **Bacteria**: Structure, nutrition, reproduction and economic importance. Brief account of Archaebacteria, Actinomycetes and Mycoplasma with reference to little leaf of Brinjal and Papaya leaf curl

2) **Viruses**: Structure, replication and transmission; plant diseases caused by viruses and their control with reference to Tobacco Mosaic and Rice Tungro.

3) An outline of plant diseases of important crop plants caused by bacteria and their control with reference to Angular leaf spot of cotton and Bacterial blight of Rice.

UNIT-II **(15 hours)**

1) General characters, structure, reproduction and classification of algae (Fritsch)
2) **Cyanobacteria**: General characters, cell structure their significance as biofertilizers with special reference to Oscillatoria, Nostoc and Anabaena.
3) Structure and reproduction of the following:
   Chlorophyceae- Volvox, Oedogonium and Chara.
   Phaeophyceae- Ectocarpus
   Rhodophyceae- Polysiphonia.

UNIT-III **(15 hours)**

1) General characters and classification of fungi (Ainsworth).
2) Structure and reproduction of the following:
   (a) Mastigimycotina- Albugo
   (b) Zygomycotina- Mucor
   (c) Ascomycotina- Saccharomyces and Penicillium.
   (d) Basidiomycotina- Puccinia
   (e) Deuteromycotina- Cercospora.
3) Economic importance of lichens

UNIT-IV **(15 hours)**

1) **Bryophytes:** Structure, reproduction, life cycle and systematic position of Marchantia, Anthoceros and Polytrichum, Evolution of Sporophyte in Bryophytes.
2) **Pteridophytes**: Structure, reproduction, life cycle and systematic position of Rhynia, Lycopodium, Equisetum and Marsilea.
3) Stelar evolution, heterospory and seed habit in Pteridophytes.

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References:

1) Alexopolous, 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.
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5) Sambamurthy, A. V. S. S. 2006. A Textbook of Plant Pathology. I. K. International Pvt. Ltd., New Delhi.
6) Sambamurthy, A. V. S. S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.
7) Sharma, O. P. 1992. Textbook of Thallophyta. McGraw Hill Publishing Co., New Delhi.
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9) Vashishta, B. R., A. K. Sinha and V. P. Singh. 2008. Botany for Degree Students: Algae. S. Chand& Company Ltd, New Delhi.
10) Vashishta, B. R. 1990. Botany for Degree Students: Fungi, S. Chand & Company Ltd, New Delhi.
11) Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
12) Watson, E. V. 1974. The structure and life of Bryophytes, B. I. Publications, New Delhi.
13) Pandey, B. P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.
14) Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany - Pteridophyta (Vascular Cryptogams). . Chand & Company Ltd, New Delhi.
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16) Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
17) Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
18) Vashishta, B. R., A. K. Sinha and Adarsha Kumar. 2008. Botany for Degree Students: Bryophyta. S. Chand & Company Ltd, New Delhi.

Practical Syllabus

(45 hours)

1. Study of viruses and bacteria using electron micrographs (photographs).
2. Gram staining of Bacteria.
3. Study of symptoms of plant diseases caused by viruses, bacteria, Mycoplasma and fungi:

   Viruses: Tobacco mosaic

   Bacteria: Angular leaf spot of cotton and Rice tungro.

   Mycoplasma: Little leaf of Brinjal and Leaf curl of papaya

   Fungi: White rust on Crucifers, Rust on wheat & Tikka disease of Groundnut.
4. Vegetative and reproductive structures of the following taxa:

   Algae: Oscillatoria, Nostoc, Volvox, Oedogonium,Chara ,Ectocarpus and Polysiphonia.

   Fungi: Albugo, Mucor,Saccharomyces, Penicillium, Puccinia and Cercospora
5. Section cutting of diseased material infected by Fungi and identification of pathogens as per theory syllabus. White rust of Crucifers, Rust on wheat & Tikka disease of Groundnut.
6. Lichens: Different types of thalli and their external morphology
7. Examination of important microbial, fungal and algal products:

   Biofertilizers, protein capsules, antibiotics, mushrooms, Agar-agar etc.
8. Field visits to places of algal / microbial / fungal interest (e.g. Mushroom cultivation, water bodies).
9. Study of Morphology (vegetative and reproductive structures) and anatomy of the following

   Bryophytes: Marchantia, Anthoceros and Polytrichum.
10. Study of Morphology (vegetative and reproductive structures) and anatomy of the following

    Pteridophytes: Lycopodium, Equisetum and Marsilea.
11. Study of Anatomical features of Lycopodium stem, Equisetum stem and Marsilea petiole & rhizome by preparing double stained permanent mounts.

Practical Model Paper

Max. Marks: 50

Time : 3 hrs

1. Identify the given components '**A**'&'**B**' in the algal mixture .
   Describe with neat labeled diagrams & give reasons for the classifications. — 2 X 4 = 8M
2. Classify the given bacterial culture '**D**' using Gram – staining technique. — 6M
3. Take a thin transverse section of given diseased material '**E**'.
   Identify & describe the symptoms caused by the pathogen. — 8M
4. Identify the given specimens **'F'**, '**G**' & '**H**' by giving reasons .
   (Fungal-1, Bacteria-1 & Viral-1) — 3 X 2 = 6M
5. Comment on the given slides '**I**' & '**J**' (Algae-1, Fungi-1) — 2 X 4 = 8M
6. Identify the given specimen '**K**' **&** slide **'L'** (Bryophytes & Pteridophytes) — 2 X 4 = 8M
7. Record & Viva — 6M

B.Sc., BOTANY

First Year, II -Semester

Paper-II
Gymnosperms, Taxonomy of Angiosperms and Ecology

DSC-1B **Credits-4**

Theory Syllabus **(60 hours)**

UNIT-I **(15 hours)**

1) Gymnosperms: General characters, structure, reproduction and classification (Sporne's). Distribution and economic importance of Gymnosperms.
2) Morphology of vegetative and reproductive parts, systematic position and life cycle of Pinus and Gnetum,
3) Geological time scale Introduction to Palaeobotany, Types of fossils and fossilization, Importance of fossils.

UNIT-II (15 hours)

1) Introduction: Principles of plant 4ystematic, Types of classification: Artificial, Natural and Phylogenetic; Systems of classification: Salient features and comparative account of Bentham & Hooker and Engler & Prantl classification systems. An introduction to Angiosperm Phylogeny Group (APG).
2) Current concepts in Angiosperm Taxonomy: Embryology in relation to taxonomy Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy.
3) Nomenclature and Taxonomic resources: An introduction to ICN, Shenzhen code – a brief account. Herbarium: Concept, techniques and applications.

UNIT-III (15 hours)

1) Systematic study and economic importance of plants belonging to the following families: Polypetalae Annonaceae, Capparidaceae, Rutaceae, Fabaceae (Faboideae/Papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae
2) Gamopetalae: Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae, Monochalmydeae: Amaranthaceae, Euphorbiaceae
3) Monocotyledons: Orchidaceae, Poaceae and Zingeberaceae.

UNIT-IV (15 hours)

1. Component of eco system, energy flow, food chain and food webs.
2. Plants and environment, ecological adaptations of plants, Hydrophytes, Xerophytes and Mesophytes
3. Plant Succession serial stages, modification of environment, climax formation with reference to Hydrosere and Xerosere.

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References:

1. Watson, E. V. 1974. The structure and life of Bryophytes, B. I. Publications, New Delhi.
2. Pandey, B. P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.
3. Sporne, K. R. 1965. Morphology of Gymnosperms. Hutchinson Co., Ltd., London.
4. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany - Pteridophyta (Vascular Cryptogams). . Chand & Company Ltd, New Delhi.
5. 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.
6. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
7. Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
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9. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany for Degree Students: Gymnosperms. Chand & Company Ltd, New Delhi.
10. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
11. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd, New Delhi
12. Stace, C. A. 1989. Plant Taxonomy and Biostatistics (2nd Ed.). Edward Arnold, London.
13. Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH, New Delhi.
14. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
15. Davis, P. H. and V. H. Heywood. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
16. Heywood, V. H. 1965 . Plant Taxonomy. ELBS , London.
17. Heywood, V. H. and D. M. Moore (Eds). 1984. Current Concepts in Plant Taxonomy. Academic Press, London.
18. Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge. London.
19. Michael, S. 1996, Ecology, Oxford University Press, London
20. Odum, E.P. 1983. Basics of Ecology, Saunder's International Students Edition, Philadelphia.
21. Sharma P.D. 1989. Elements of Ecology, Rastogi Publications, Meerut

Practical Syllabus (45 hours)

1. Study of Morphology (vegetative and reproductive structures) of the following taxa:
   Gymnosperms - Pinus and Gnetum.
2. Study of Anatomical features of Pinus needle and Gnetum stem by preparing double stained permanent mounts.
3. Fossil forms using permanent slides / photographs: Cycadeoidea.
   Systematic study of locally available plants belonging to the families prescribed in theory Syllabus (Minimum of one plant representative for each family)
4. Study of morphological and anatomical characteristics of locally available plant species (Eichhorinia, Hydrilla, Pistia, Nymphaea, Asparagus, Opuntia, Euphorbia melii)
5. Demonstration of herbarium techniques.
6. Candidate has to submit at least 30 herbarium sheets.

Practical Model Paper

Time : 3 hrs **Max. Marks: 50**

1. Prepare a mount of the given material ' **A** ' (Hydrophytes /Xerophytes)
   Draw diagram & give reasons for identification. 8M
2. Prepare a double stained permanent mount of the given material ' **B** ' (Gymnosperms)
   Draw diagram & give reasons for identification. 10M
3. Identify the given specimens **C & D** (Gymnosperms /Xerophytes) 2 X 4 =8M
4. Identify the given slides **E&F** (Gymnosperms /Xerophytes) 2 X 4 =8M
5. Technical description of the given plant twig ' A ' 10M
6. Herbarium 3M
7. Record 3M

B.Sc. CBCS Botany

Theory Model Question Paper
For
DSC & DSE

Time :3 hrs

Max. Marks: 80

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 8 X 4 = 32M

a.

b.

c.

d.

e.

f.

g.

h.

II. Essay Questions: 4X 12 = 48M

1. a.

(OR)

b.

2. a.

(OR)

b.

3. a.

(OR)

b.

4. a.

(OR)

b.

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B.Sc. Botany
II Year: Semester-III
Skill Enhancement Course

SEC-2 **(Credits - 2)**

Biofertilizers and Organic Farming (30h)

UNIT - I: **(15h)**

1. Manures and Biofertilizers: Types of fertilizers, manures. Manure composition. Manures for crop productivity.
2. Differences between fertilizers and biofertilizers: pH changes and water contamination.
3. Bacterial Biofertilizers: General account on the microbes used as biofertilizer.
4. Algal Biofertilizers: Associative effect of different microorganisms. *Azolla* and *Anabaena-azollae* association, nitrogen fixation, factors affecting growth, *Azolla* in rice cultivation.

UNIT - II: **(15h)**

5. Fungal Biofertilizers: Mycorrhizal association, types of mycorrhizal association, occurrence and distribution, phosphorus nutrition, growth and yield, colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.
6. Organic Farming: Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and industrial wastes, Biocompost making- types, method of vermicomposting, Panchakavya. Biological pest control (neem).

Suggested Readings

1. Dubey R.C. 2005. A Text book of Biotechnology. S.Chand & Co. New Delhi.
2. Kumaresan V. 2005. Biotechnology. Saras Publications. New Delhi.
3. John Jothi Prakash E. 2004. Outlines of Plant Biotechnology. Emkay Publication. New Delhi.
4. Sathe T.V. 2004. Vermiculture and Organic Farming. Daya Publishers. New Delhi.
5. Subha Rao N.S. 2000. Soil Microbiology, Oxford & IBH Publishers. New Delhi.
6. Vayas S.C, Vayas S. and Modi H.A. 1998.Bio-fertilizers and organic Farming Akta Prakashan. Nadiad.

B.Sc. BOTANY
II Year: Semester-III

Paper – III: Plant Anatomy and Embryology

DSC - 1C **Credits- 4**

Theory Syllabus **(60 hours)**

UNIT – I **(18h)**

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. General account of adaptations in xerophytes and hydrophytes.

UNIT - II **(16h)**

5. Stem and root anatomy: Vascular cambium - Formation and function.
6. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Bignonia*, *Dracaena*; Root– *Beta vulgaris*
7. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*), Rosewood (*Dalbergia latifolia*), Red sanders (*Pterocarpus santalinus*), Nallamaddi (*Terminalia tomentosa*) and Neem (*Azadirachta indica*).

UNIT – III **(10h)**

8. History and importance of Embryology.
9. Anther structure, Microsporogenesis and development of male gametophyte.
10. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.

UNIT-IV **(16h)**

11. Pollen morphology, pollination and fertilization, Pollination Types, Pollen – pistil interaction, Double fertilization.
12. Seed – structure appendages and dispersal mechanisms
13. Endosperm – Development and types. Embryo development and types; Polyembryony and Apomixis - an outline.

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References:

1. Bhattacharya et. al. 2007. A textbook of Palynology, Central, New Delhi.
2. Bhojwani, S. S. and S. P. Bhatnagar. 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House, Delhi.
3. M.R.Saxena- A textbook of Palynology.
4. Vashista- A textbook of Anatomy.
5. P.K.K.Nair- A textbook of Palynology.
6. Esau, K. 1971. Anatomy of Seed Plants. John Wiley and Son, USA.
7. Johri, B. M. 1984. Embryology of Angiosperms. Springer-Verleg, Berlin.
8. Kapil, R. P. 1986. Pollination Biology. Inter India Publishers, New Delhi.
9. Maheswari, P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
10. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

B.Sc. BOTANY
II Year: Semester-III

Paper – III: Plant Anatomy and Embryology

DSC - 1C **Credits- 1**

Practical syllabus (45 hours)

1. Demonstration of double staining technique.
2. Tissue organization in root and shoot apices using permanent slides
3. Preparation of double stained Permanent slides
   Primary structure: Root - *Cicer, Canna; Stem – Tridax, Sorghu*m
   Secondary structure: Root – *Tridax* sp.; Stem –*Pongamia*
   Anomalous secondary structure: Examples as given in theory syllabus.
4. Anatomy of Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
5. Stomatal types using epidermal peels.
6. Structure of anther and microsporogenesis using permanent slides.
7. Structure of pollen grains using whole mounts - *Hibiscus, Acacia* and Grass).
8. Pollen viability test using Evans Blue – *Hibiscus*
9. Study of ovule types and developmental stages of embryo sac.
10. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocot embryos using permanent slides.

Practical Model Paper

Time: 3 hrs **Max. marks: 50**

1. Identify the given material "**A**", Prepare a double stained permanent mount of transverse section of given the given material. 15M
2. Prepare a temporary mount of epidermal peel of the given leaf material " **B** " and identify the stomatal type . 7M
3. Conduct the pollen viability test "**C**" (OR) Isolate the embryo from the given material . 6M
4. Identify and describe the specimens / slides with well labeled diagrams
   (a) Embryology – **D** (b) Palynology – **E** (c) Anatomy – **F** 3 X 4 = 12M
5. Record 5M
6. Viva 5M

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B.Sc. BOTANY
II Year: Semester-IV
Skill Enhancement Course

SEC-4 **(Credits 2)**

Mushroom Culture Technology

Lectures: 30

UNIT-I
(15h)

1. Introduction & history. Medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus*.
2. Cultivation Technology: Infrastructure; substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag.
3. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves.
4. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.

UNIT-II
(15h)

5. Storage: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions.
6. Nutritional value of Mushrooms: Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.
7. Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

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B.Sc. BOTANY
II YEAR: Semester-IV

Paper IV: Cell Biology, Genetics and Plant Physiology

DSC-1D **Credits-4**

Theory Syllabus (60 hours)

UNIT I: (15h)

1. Plant cell envelops: Ultra structure of cell wall, Models of membrane structure, structure and functions of Semi permeable Plasma membrane.
2. Cell Organelles: Structure and semiautonomous nature of Mitochondria and Chloroplast.
3. Nucleus: Ultra structure, types and functions of DNA & RNA. Mitochondrial DNA & Plastid DNA and Plasmids.
4. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. Special types of chromosomes: Lampbrush and Polytene chromosomes.
5. Cell division: Cell and its regulation; mitosis, meiosis and their significance

UNIT – II: (15 hours)

6. Mendelism: History, Principles of inheritance, Chromosome theory of inheritance, Autosomes and sex chromosomes, Incomplete dominance and Co-dominance. Multiple alleles, Lethal alleles, Epistasis, Recessive and Dominant traits, Polygenic inheritance.
7. Linkage and crossing over, Recombination frequency, two factor and three factor crosses; Interference and coincidence. Numericals based on gene mapping; Sex Linkage.
8. Variation in chromosome number and structure: Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy
9. Gene mutations: Types of mutations; Molecular basis of Mutations; Mutagens-physical and chemical (Base analogs, deaminating, alkylating and intercalating agents);

Unit-III (15h)

10. Plant -water Relations: Water potential, osmosis, osmotic and pressure potential, absorption and transport of water.
11. Mineral Nutrition: Essential micro & macro nutrients and symptoms of mineral deficiency.
12. Transpiration: Stomatal structure and movement.
13. Mechanism of phloem transport.
14. Enzymes: Nomenclature, properties, Classification and factors regulating enzyme activity.

UNIT- IV (15h)

15. Photosynthesis: Photosynthetic pigments, Cyclic and Non-cyclic Photophosphorylation. Carbon assimilation pathways: C3, C4 and CAM.
16. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle and oxidative phosphorylation.
17. Nitrogen Metabolism: Biological nitrogen fixation.
18. Physiological role of Phytohormones: Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids

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Reference:

1. Sharma, A. K. and A. Sharma. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
2. Shukla, R. S. and P. S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
3. Verma, P. S. and V. K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi. 1. Hopkins, W. G. 1995.
4. Introduction to Plant Physiology. John Wiley & Sons Inc., New York, USA
5. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th edition.
6. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
7. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. Benjamin Cummings, U.S.A. 10th edition.
8. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
9. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
10. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
11. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
12. Russell, P. J. (2010). iGenetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
13. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
14. Jain, J.L., S. Jain and Nitin Jain. 2008. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
15. Pandey, B. P. 2007. Botany for Degree Students: Plant Physiology, Biochemistry, Biotechnology, Ecology and Utilization of Plants. S. Chand & Company Ltd., New Delhi.
16. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc.,USA.
17. Taiz, L. and E. Zeiger. 1998. Plant Physiology (2nd Ed.). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
18. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

B.Sc. BOTANY
II YEAR: Semester-IV

Paper IV: Cell Biology, Genetics and Plant Physiology

DSC-1D **Credits-1**

Practical Syllabus (60 hours)

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 preparation of Onion root tips.
3. Study of ultra structure of cell organelles using photographs. Chloroplast, Mitochondria, Nucleus,
4. Study of Special types of Chromosomes (Polytene chromosome and Lampbrush chromosomes- Permanent slide)
5. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square analysis.
6. Chromosome mapping using test cross data.
7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4)
8. Determination of osmotic potential of vascular sap by Plasmolytic method using leaves of *Rheodiscolor / Tradescantia.*
9. Determination of rate of transpiration using Cobalt chloride method
10. Determination of stomatal frequency using leaf epidermal peelings / impressions
11. Determination of amylase activity using potato tubers by titration method
12. Separation of chloroplast pigments using paper chromatography technique
13. Estimation of protein by Biurette method
14. Mineral deficiency symptoms of Micro and Macro nutrients

Practical Model Question Paper

Time: 3 hrs **Max. marks: 50**

1. Prepare a cytological slide of given material "A" and identify & describe any two stages with well labeled diagrams. (12M)
2. Genetics problem (10M)
3. Physiology Experiment (12M)
4. Identify and Comment on A & B (2x3 =6M)
   A. Micronutrient / Macronutrients Deficiency symptoms
   B. Cell organelles / Special type of Chromosomes
5. Record (5M)
6. Viva (5M)

B.Sc. BOTANY

Skill Enhancement Course (SEC)

Time : 2 hrs **Max. Marks: 40**

Theory - Model Question Paper

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 6 X 4 = 24M

1. Unit-I
2. Unit-I
3. Unit-I
4. Unit-II
5. Unit-II
6. Unit-II

II. Essay Questions: 2 X 8 = 16M

7. a. Unit-I

   (OR)

   b. Unit-I
8. a. Unit-II

   (OR)

   b. Unit-II

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*** Internal Exam carries 10 Marks**

B.Sc. BOTANY

Discipline Specific Core (DSC)

Time :3 hrs **Max. Marks: 80**

Theory - Model Question Paper

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 8 X 4 = 32M

1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-III
7. Unit-IV
8. Unit-IV

II. Essay Questions: 4X 12 = 48M

9. a. Unit-I

   (OR)

   b. Unit-I
10. a. Unit-II

    (OR)

    b. Unit-II
11. a. Unit-III

    (OR)

    b. Unit-III
12. a. Unit-IV

    (OR)

    b. Unit-IV

***

*** Internal Exam carries 20 Marks**

B.Sc. BOTANY
III YEAR: Semester-V
Generic Elective (GE)

GE-1 **(Credits: 4)**

Industrial Microbiology

Lectures: 60

Unit I **(15h)**

1. Scope of microbes in industry and environment
2. Bioreactors/Fermenters and fermentation processes
3. Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations.
4. Components of a typical bioreactor, Types of bioreactors-laboratory, pilot scale and production fermenters.

Unit II **(15h)**

5. Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.
6. Microbial production of industrial products: Microorganisms involved, media, fermentation conditions, downstream processing and uses;
7. Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying.
8. Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin).

Unit III **(15h)**

9. Microbial enzymes of industrial interest and enzyme immobilization
10. Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis.
11. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acetylase).
12. Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.

Unit IV: **(15h)**

13. Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems.
14. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.
15. Microbes in agriculture and remediation of contaminated soils.
16. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.

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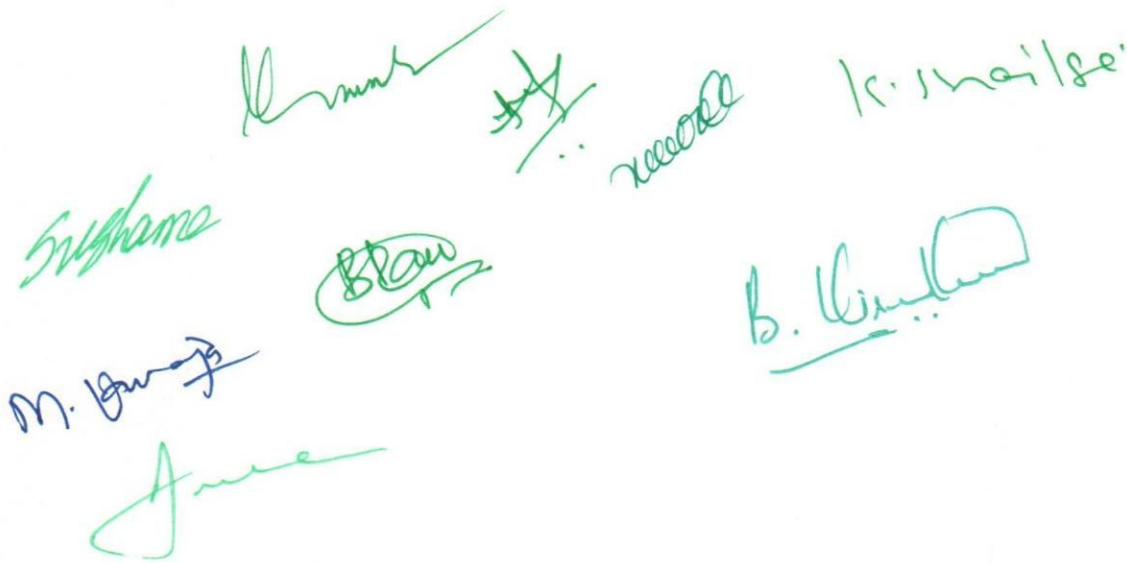
Suggested Readings

1. Pelzar, M.J. Jr., Chen E.C. S., Krieg, N.R. (2010). Microbiology: An application based approach. Tata McGraw Hill Education Pvt. Ltd., Delhi.
2. Tortora, G.J., Funke, B.R., Case. C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition.



B.Sc. BOTANY

III Year: Semester-V

Paper-1A: Biodiversity & Conservation

DSE-1A **Credits-4**

Theory Syllabus (60 hours)

Unit - I: (15h)

1. Plant diversity and its scope: Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodiversity and cultivated plant taxa, wild taxa.
2. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.

Unit-II: (15h)

3. Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss.
4. Management of Plant Biodiversity: Organizations associated with biodiversity, management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR.
5. Biodiversity legislation and conservation, Biodiversity information management and communication.

Unit-III: (15h)

6. Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem Diversity
7. Principles of conservation - *Insitu* and *Exsitu* conservation. Sacred groove, Botanical garden, Biosphere reserves, Sanctuaries, National parks (*Insitu*) and Tissue culture, Gene / seed / pollen banks and Cryopreservation (*Exsitu*).

Unit-IV: (15h)

8. Role of plants in relation to Human Welfare; Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India.
9. Alcoholic beverages through ages. Fruits and nuts, Important fruit crops and their commercial importance. Wood and its uses.

References:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
2. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.
3. Odum, E. P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.
4. Sharma, P. D. 1989. Elements of Ecology. Rastogi Publications, Meerut.

B.Sc. BOTANY

III Year: Semester-V

Paper-1A: Biodiversity & Conservation

DSE-1A **Credits-1**

Practical Syllabus (30 hours)

1. Study on local biodiversity: Herbs, shrubs and trees; Seasonal, Annual, biennial and perennial plants.
2. Study of morphological characteristics of plant communities: Hydrophytes (*Eichhornia, Hydrilla, Pistia, Nymphaea, Vallisneria*), Xerophytes: (*Asparagus, Opuntia, Euphorbia milii, Casuarina, Calotropis*).
3. Assessment of biodiversity
   - i) Avenue trees: *Pongamia pinnata, Butea monosperma, Spathodea* sp., *Delonix regia, Jacaranda mimosifolia, Cassia fistula, Mimusops elengi, Acacia leucophloea*, and *Albizia lebbeck.*
   - ii) Ornamental Plants: Any five locally available ornamental plants.
   - iii) Timber Value: *Acacia nilotica, Tectona grandis* and *Azardirachta indica*
   - iv) Fruits: *Mangifera indica* (Mango), *Ziziphus mauritiana, Psidium guajava* (Guava), *Annona squamosa*
   - v) Nuts: *Anacardium occidentale* (Cashew), *Terminalia catappa* (Badam)
   - vi) Beverages: *Madhuca indica, Camellia sinensis* (Tea),*Coffea arabica* (Coffee), *Borassus flabellifer* (Toddy palm) and *Caryota urens*
   - vii) Medicinal value: *Catharanthus roseus, Tinospora cordifolia* and *Phyllanthus emblica, Ocimum sp.*, and *Azardirachta indica*
4. Field trip: Collection of plants from the field, identification and preparation of Herbarium.

Practical Model Question Paper — 3 Hours

50 Marks

1. Identify and describe Biodiversity value of a) Medicinal b) Timber c) Fruit.	3x4=12M
2. Any two available ornamental plants and their uses.	2x3=06M
3. Comment on the specimens A, B & C	3x3=09M
4. Identify and describe Biodiversity value of the given slides D & E (Hydrophytes & Xerophytes)	2x4=08M
5. Field trip Herbarium.	05M
6. Record	05M
7. Viva	05M

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B.Sc. Botany
III Year: Semester-V
Paper-IB : Economic Botany

DSE-1B **Credits-4**

Theory Syllabus

60 hours

UNIT - I

1. Origin of Cultivated Plants: Major plants introduction, Crop domestication and examples of crops / varieties
2. Vegetables: Nutritional and Commercial values of root crops, leafy and fruit vegetables.
3. Millets: Nutrient significance of Sorghum, Finger millet, Pearl millet, Foxtail millet.
4. Cereals: Rice, Wheat and maize - Origin, morphology and uses.

UNIT – II

5. Legumes: General account, importance to man and ecosystem.
6. Fruits and nuts: Commercial and nutritional value of South Indian fruits. Cashew nut, Almond and Walnut.
7. Sugars & Starches: Morphology and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.
8. Spices: Listing of important spices, part used, economic importance with special reference to fennel, saffron, clove and black pepper

UNIT - III

9. Beverages: Tea, Coffee (morphology, processing & uses)
10. Edible oils & Fats: General description, extraction, uses and health implications of groundnut, sunflower, coconut, linseed, and mustard.
11. Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.
12. Natural Rubber: Para-rubber - tapping, processing and uses.

UNIT - IV

13. Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis.
14. Tobacco processing, uses and health hazards
15. Timber plants: General account with special reference to teak and pine
16. Fibres: Classification based on the origin of fibres, extraction methods and uses of Cotton and Jute.

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels, M.J. and Sadava, D.E. (2003). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. B.P. Pandey (2007). Economic Botany, S. Chand & Company Ltd. New Delhi. 17/e.

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B.Sc. Botany
III Year: Semester-V
Paper-I B: Economic Botany

DSE-I B **Credits-1**

Practical Syllabus

30 hours

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove Tea and Cotton through specimens, sections and microchemical tests.
2. Identification and study on nutrient values of locally available vegetables, millets and cereals.
3. Study on nutrient values and commercial status of Cashew nut, Almond and Walnut.
4. Uses and health implications of groundnut, sunflower, coconut, linseed and Brassica.
5. Identification of starch granules.
6. Quantitative estimation and comparative study of proteins in millets and cereals.
7. Collection of economically important plants / vegetable plants and preparation of Herbarium.

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments	
A) Protein test (Major Experiment)	12M
B) Starch granules (Minor Experiment)	6M
II. Spotters	4X3=12M
C) Leafy / Fruity Vegetables,	
D) Fruits / Spices,	
E) Medicinal Plants / Beverages,	
F) Wood / Timber / Fiber	
III. Herbarium	10M
IV. Viva	5M
V. Record	5M

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B.Sc. BOTANY

III YEAR: Semester-V

Paper-1C: Seed Technology

DSE – 1C **Credits-4**

Theory Syllabus (60 hours)

UNIT- I (15h)

1. Seed: Structure and types.
2. Seed development in cultivated plants, seed quality concept, importance of genetic purity of seed. Hybrid seed production and Heterocyst.
3. Cross pollination, Emasculation, role of pollinators and their management.
4. Collection and storage of pollen for artificial pollination.

UNIT-II (15h)

5. Seed germination: Internal and external factors affecting germination.
6. Physiological processes during seed germination; seed respiration, breakdown and mobilization of stored seed reserves.
7. Seed dormancy: Types, causes and methods of breaking dormancy. Role of Phytochrome.

UNIT-III (15h)

8. Cultural practices and harvesting of Seed: Isolation, Sowing, Cultural practices, harvesting and threshing of the following crops: a) Rice b) Cotton c) Sunflower
9. Seed treatment to control seed borne disease –General account
10. Seed testing- Procedures of seed testing, seed testing laboratories and importance of seed testing.

UNIT-IV (15h)

11. Seed viability, factors affecting seed viability and genetic erosion.
12. Seed storage: Long term and short term storage. Orthodox and recalcitrant seeds. Packing of seeds – Principles, practices, bagging and labelling.
13. Seed banks- National, International and Millennium seed banks.
14. Seed certification- History, Seed certification agency, Indian millennium, general and specific seed certification standard.

Reference:

1. Agrawal, P. K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation. National Seed Corporation Ltd., New Delhi
2. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Bedell, Y. E. Seed Science and Technology. Indian Forest Species. Allied Publishers Limited, New Delhi.
4. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Limited, Hyderabad.
5. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
6. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
7. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977..
8. Hartman, H. T. and D. E. Kestler. 1976. Plant Propagation: Principles and Practices. Prentice & Hall of India, New Delhi.
9. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press (India) Private Limited, Hyderabad..
10. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
11. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA..
12. Tiwari, G. N. and R. K. Goal. Green House Technology – Fundamentals, Design, Modelling and Application. Narosa Publishing House, New Delhi.
13. Tunwar, N. S. and S. V. Singh. 1988. Indian Minimum Seed Certification Standards. The Central Seed Certification Board, Govt. of India, New Delhi.
14 Agrawal PK & Dadlani M. (Eds.). 1992. Techniques in Seed Science and Technology. South Asian Publ.
15. Baskin CC & Baskin JM. 1998. Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination. Academic Press. Basra AS. 2006. Handbook of Seed Science and Technology. Food Product Press.
16. Bench ALR & Sanchez RA. 2004. Handbook of Seed Physiology. Food Product Press. Bewley JD & Black M. 1982. Physiology and Biochemistry of Seeds in Relation to Germination. Vols. I, II. Springer Verlag.
17. Bewley JD & Black M. 1985. Seed: Physiology of Seed Development and Germination. Plenum Press.
18. Copeland LO & Mc Donald MB. 1995. Principles of Seed Science and Technology. 3rd Ed. Chapman & Hall.
19. Khan AA. 1977. Physiology and Biochemistry of Seed Dormancy and Germination. North Holland Co.
20. Kigel J & Galili G. (Eds.). Seed Development and Germination. Marcel Dekker.
21. Murray DR. 1984. Seed Physiology. Vols. I, II. Academic Press. Sadasivam S & Manickam A. 1996. Biochemical Methods. 2nd Ed. New Age.

B.Sc. BOTANY

III YEAR: Semester-V

Paper-1C: Seed Technology

DSE – 1C **Credits-1**

Practical syllabus (30 hours)

Major Experiment

1. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC).
2. Estimation of amylase activity of germinating seeds (Qualitatively).
3. Demonstration of seed dressing using fungicides to control seed borne diseases.
4. Demonstration of seed dressing using Biofertilizers (BGA) to enrich nutrient supply.

Minor Experiments

5. Emasculation, bagging of flower for hybrid seed production.
6. Dissection of Dicot embryo (bean) and Monocot embryo (maize).
7. Pollen viability test using Evan's blue staining (Hibiscus).
8. Harvesting and Importance of following seeds:
   a) Rice
   b) Maize
   c) Cotton
   d) Groundnut and
   e) Sunflower.
9. Methods to break Seed dormancy
10. Study visits to research institutes, seed tests and certification laboratories and Places, seed banks.

Practical Model Question Paper

3 Hours **Max. marks: 50**

1. Major Experiment. (16 marks)
   a) Estimation of amylase activity in germinating seeds.
   (OR)
   b) Seed viability test by triphenyl tetrazolium chloride (TTC)
2. Minor Experiment. (12 marks)
   a) Dissection of Dicot / Monocot embryo
   (OR)
   b) Methods to break Seed dormancy / Seed dressing.

3. Spotters (3x4=12 marks)
   A. Emasculation / Bagging
   B. Germination of seeds.
   C. Importance of following seeds: rice, cotton and sunflower.
4. Record (5 marks)
5. Viva (5 marks)

B.Sc. Botany
III Year: Semester-VI
Horticulture

DSE-3-Optional Paper **Credits-4**

Theory Syllabus

60 hours

UNIT - I

1. Horticulture: Definition, scope and economic importance of horticultural crops.
2. Divisions of Horticulture with suitable examples and their importance.
3. Classification of horticultural crops based on soil, climatic requirements and season of growth.

UNIT-II

4. Area and Production of Horticultural crops in Telangana and India.
5. Natural Propagation: By seeds, Vegetative structures like bulbs, tubers, corms, rhizomes, root stock, runners, offsets and suckers.
6. Artificial Propagation: Cutting, Layering, Grafting and Budding.

UNIT-III

7. Manures: Definition, importance of manures FYM (compost), oil cakes, green manure, Organic manures and vermi-compost.
8. Application of the following plant growth regulators in horticulture- Auxins, Gibberellins, Cytokinins, Ethylene and Brassinosteroids.
9. Green house technology- definitions, types, layout, construction, irrigation systems, care and attention, hardening of plants.

UNIT-IV

10. Adaphic and environmental parameters for horticultural crops, selection of site, planning, training, pruning and cropping system; Garden implements and their uses.
11. Management: Nutrition, Water, Pest and Weed Management.
12. Bonsai and Landscaping techniques
13. Outline of Hydropnics.

References:

1. Bhattacharjee.S.K. 2006. Amenity Horticulture, Biotechnology and Post-Harvest Technology. Pointer publishers. Jaipur
2. Chadha,K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
3. Chandra, R. and M. Mishra. 2003. Micropropagation of horticultural crops. International Book Distributing Co. Lucknow.
4. Chattopadhaya, P.K. 2001. A Textbook of Pomology (Fundamentals of Fruit Growing) Kalyani Publication, New Delhi.

5. Christopher, E.P. 2001. Introductory Horticulture, BioTech Books, New Delhi.
6. Jitendra Singh. 2006. Basic Horticulture. Kalyani Publishers, New Delhi.
7. Rajan, S. and B.L. Markose. 2007. Propagation of Horticultural Crops. New India Publishing, New Delhi.
8. Singh, D.K. 2008. Hitech Horticulture. Agrotech Publishers, Udaipur.
9. Singh, N.P. 2005. Basic Concepts of Fruit Science. International Book Distributing Co., Lucknow.
10. Surendra Prasad and U. Kumar. 1999. Principles of Horticulture, Agro Botanica, Bikaner, India.
11. Utpal Banerjee. 2008. Horticulture. Mangaldeep Publishers.
12. Vijai Kumar Umrao. 2008. Horticulture Terms- definitions and terminology. IBD Publishers, Dehradun.
13. Bansil. P.C. 2008. Horticulture in India. CBS Publishers and Distributers, New Delhi.
14. Kumar, N. 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
15. Adams, C.R. and M.P. early. 2004. Principles of Horticulture. Butterworth - Heinemam, Oxford University Press

B.Sc. Botany

III Year: Semester-VI

Project / Dissertation Work — Credits – 4

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. The Project/Dissertation work will be of 4 credits. Studied subject specific project work can be handled, with a view to develop creative thinking, team spirit and skill. The project work at preliminary level should be assigned to students, in groups.

Project report in the form of dissertation is prepared and submitted by the students. It will be evaluated by the External and Internal Examiners. Head of the Department will chair the evaluation panel and proceedings of viva voce. It carries a maximum of 100 marks.

Project guidelines:

1. Understand the subject broadly.
2. Choose a topic of interest.
3. Refer to the books & interact with subject specific experts.
4. Try to understand the basic principles of Living organisms followed by Plants, with the help of Physics, Chemistry and Statistics.
5. Select the topic applicable locally to know the importance of the subject in daily life. Preferably choose, vegetation around the institution, around home, agricultural crops, vegetable markets and nearby relevant industries.
6. Put together, latest technology and methods, basic knowledge on selected theme, Importance / need, locally applicable.
7. Summarize three years knowledge on the subject, go through Skill enhancement course, correlate to real life and choose the project work.
8. Laboratory facilities, books to refer and faculty with research experience are essential to handle Project.
9. Analyze your Data and Draw a Conclusion
10. Communicate the Results
11. Work division among the group members should be followed
12. Maximum number of students in a group should not exceed 5.

Project Examination	**Max. Marks: 100**
1. Project Report	75 M
3. Seminar Presentation	25 M

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B.Sc. Botany
III Year: Semester-VI

Paper-2A: Plant Molecular Biology

DSE-2A **Credits -4**

Theory syllabus

Lectures: 60

Unit-I: (15 hours)

1. Nucleic acids: Carriers of genetic information, types of genetic material, DNA as the carrier of genetic information.
2. Structures of DNA: Salient features and Types of DNA, Organization of DNA in Prokaryotes. Mitochondrial and chloroplast DNA.
3. Structure of RNA: Structure and Types of RNA's (mRNA, rRNA and tRNA).

Unit-II (15 hours)

4. Nucleosome, Chromatin structure - Euchromatin, Heterochromatin; Constitutive and Facultative heterochromatin.
5. Replication of DNA: Chemistry of DNA synthesis, general principles, Semi-conservative replication of DNA, replication of linear ds-DNA, replication of the 5'end of linear chromosome.
6. Central dogma and genetic code: Central Dogma (Adaptor hypothesis and discovery of mRNA template), salient features of Genetic code.

Unit-III: (15 hours)

7. Mechanism of Transcription: Transcription in prokaryotes and eukaryotes; Split genes-concept of introns and exons, removal of introns, eukaryotic mRNA processing (5' cap, 3' polyA tail).
8. RNA editing and mRNA transport.

Unit-IV: (15 hours)

9. Translation in prokaryotes: Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation.
10. Transcriptional regulation in prokaryotes, Regulation of lactose metabolism (Lac operon) and tryptophan (Trp operon) synthesis in E.coli.

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B.Sc. Botany
III Year: Semester-VI

Paper-2A: Plant Molecular Biology

DSE-2A **Credits -1**

Practical Syllabus

1. Isolation of genomic DNA from E.Coli.
2. DNA isolation from cauliflower head / tomato fruit.
3. DNA estimation by diphenylamine reagent/UV Spectrophotometry.
4. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).
5. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.
6. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)
7. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.
8. Estimation of size of a DNA fragment after electrophoresis using DNA markers (through photographs).

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments

1. Major Experiment 15M
2. Minor Experiment 10M

II. Spotters 4X3=12M

A)
B)
C)
D)

III. Identify and describe the photograph 3M

IV. Viva 5M

V. Record 5M

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B.Sc. BOTANY

III Year: Semester-VI

Paper-2B: Tissue Culture and Biotechnology

DSE-2B **Credits-4**

Theory Syllabus (60 hours)

UNIT – I: (15 hours)

1. Tissue culture: Introduction, sterilization procedures, explants, culture media - composition and preparation; Nutrient and hormone requirements, Micropropagation.
2. Organ culture: Totipotency, Vegetative Organs-Root, Shoot, Leaf culture Reproductive Organs-Anther, Ovule, Embryo culture
3. Callus culture and isolation and fusion of protoplast culture
4. Organogenesis, Embryogenesis (somatic and zygotic).

UNIT- II: (15 hours)

5. Applications of tissue culture: Production of pathogen free plants and stress resistant plants, somaclonal variants and synthetic seeds.
6. Induction of hairy roots and its applications in production of secondary metabolites.
7. Haploidy and triploids, Cryopreservation and Germplasm Conservation.
8. Somatic hybrids and Cybrids.

UNIT- III: (15 hours)

9. Biotechnology: Introduction, history, scope and applications.
10. rDNA technology: Basic aspect of gene cloning, Enzymes used in gene cloning-Restriction enzymes, Ligases, Polymerases.
11. Gene cloning: Recombinant DNA, Bacterial Transformation and selection of recombinant clones, vectors- cloning vehicles (Plasmid, Cosmids, Bacteriophages, & Phasmids; Eukaryotic Vectors (YAC) Gene Construct; Applications of rDNA technology.

UNIT - IV: (15 hours)

12. Gene Libraries: construction of genomic and cDNA libraries, colony hybridization; Probes-oligonucleotide, Polymerase Chain Reaction (PCR) and its applications.
13. Methods of gene transfer- Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics-selectable marker and reporter genes.
14. Application of transgenics in improvement of crop productivity and quality traits. Pest resistant transgenic crops (Bt-cotton & Bt-brinjal); herbicide resistant plants (Roundup Ready soybean); crops with quality traits (Flavr Savr tomato, Golden rice).

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References:

1. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004.
2. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Limited, Hyderabad.
4. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
5. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
6. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977.
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8. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
9. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA.
10. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
12. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
13. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
14. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
15. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

B.Sc. BOTANY

III Year: Semester-VI

Paper-IB: Tissue Culture and Biotechnology

DSE-2B **Credits-1**

Practical Syllabus

30 Hours

Major Experiments

1. Isolation of plant DNA. (Tomato)
2. Production of synthetic seeds /Encapsulation of embryo
3. Preparation of plant tissue culture medium - MS medium
4. Isolation of protoplasts.

Minor Experiments

1. Callus induction
2. Demonstration of Micropropagation/multiple shoots
3. Anther culture
4. PCR –Demonstration
5. Study of biotechnology products: Samples of antibiotics and vaccines
6. Photographs of Gene transfer methods.
7. Instruments used in Biotechnology lab- Autoclave, Laminar air flow, Hot air oven and Incubator.
8. Demonstration of In-vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.

Spotting

1. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.
2. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
4. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.
5. Restriction digestion and gel electrophoresis of plasmid DNA.

Practical Model Question Paper

3 Hours **Max. Marks: 50**

1. Major Experiment (18 marks)
   Isolation of DNA
   (OR)
   Production of synthetic seeds / Encapsulation of embryo
2. Minor Experiment (10 marks)
   Callus / Micropropagation / Multiple shoots
3. Spotters (3x4=12 marks)
   A. Vaccines
   B. Antibiotics
   C. Gene transfer methods / instruments
4. Record (5 marks)
5. Viva (5 marks)

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B.Sc. Botany
III Year: Semester-VI

Paper-2C: Analytical Techniques in Plant Sciences

DSE-2C **Credits - 4**

Theory Syllabus

Lectures: 60

Unit I:

1. Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy.
2. Use of fluorochromes: Fluorescence-activated cell sorting (FACS); Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting.
3. Transmission and Scanning electron microscopy - sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit II:

4. Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, $CsCl_2$ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.
5. Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment.
6. Spectrophotometry: Principle and its application in biological research.

Unit III:

7. Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.
8. Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids;
9. Electrophoresis: PAGE, SDS-PAGE

Unit IV:

10. Biostatistics: Statistics, data, population, samples, parameters;
11. Representation of Data: Tabular, Graphical; Measures of central tendency:
12. Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.

Suggested Readings

1. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGrawHill Publishing Co. Ltd. New Delhi. 3rd edition.
2. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.
4. Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition.

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B.Sc. Botany
III Year: Semester-VI
Paper-2C: Analytical Techniques in Plant Sciences

DSE-2C **Credits - 1**

Practical Syllabus

Lectures: 30

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separate DNA (marker) using PAGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments

A. Major Experiment	12M
B. Minor Experiment	8M
II. Permanent slide preparation	8M
III. Spotters	4X3=12M

C)
D)
E)
F)

IV. Viva	5M
V. Record	5M

***

B.Sc. Botany
Theory Model Question Paper

Discipline Specific Elective (DSE)
&
Generic Elective (GE)

Time :3 hrs **Max. Marks: 80**

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 8 X 4 = 32M

1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-III
7. Unit-IV
8. Unit-IV

II. Essay Questions: 4X 12 = 48M

9. a. Unit-I

   (OR)

   b. Unit-I
10. a. Unit-II

    (OR)

    b. Unit-II
11. a. Unit-III

    (OR)

    b. Unit-III
12. a. Unit-IV

    (OR)

    b. Unit-IV

***

*** Internal Exam carries 20 Marks**

B.Sc. Crop Production
III Year, Semester -VI
Paper -: Optional Paper
Crop Production Technology for Kharif and Rabi Crops
Theory Syllabus

DSE-3 (4hrs./week) **Credits-4**

UNIT-I (Kharif Crops)

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

a. Cereals-Rice, Maize;
b. Millets (Major-Sorghum, Pearl millet, Finger millet, and Minor Millets-Foxtail, Kodo millet and Little millet)

UNIT-II (Kharif Crops)

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

a. Pulses- Red gram, Soybean, Green gram & black gram, Cowpea, Horse gram
b. Oil crops- Sesamum, Castor
c. Fiber- Cotton, Jute

UNIT-III (Rabi Crops)

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

a. Cereals- Wheat, Barley, Oats
b. Pulses- Chick pea, Peas, Rajmah
c. Oil Crops- Ground Nut, Sunflower, Safflower, Mustard

UNIT-IV (Rabi Crops)

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

a. Fibers- Sun hemp, Mesta, Agave
b. Commercial Crops- Tobacco, Sugarcane, Sugar beet

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HYDERABAD-500 007.

SUGGESTED READING:

1. Singh Chidda. 1983. **Modern Techniques of Raising Field Crops**. New Delhi: Oxford & IBH Publishing Co.
2. Chatterjee, BN. and Maiti, S. 1985. **Cropping Systems Theory & Practice**. New Delhi: IBH 3.
3. Reddy, SR. 2004. **Agronomy of Field Crops**. Ludhiana: Kalyani Publishers.
4. Bose Subhash Chandra, M. and Balakrishnan, V. 2001. **Forage Production**. New Delhi: Asian Publishers.
5. Prasad Rajendra. 2002. **Text Book of Field Crop Production**. New Delhi: Technical Editor, ICAR.
6. Singh, SS. 1988. **Crop Production Management**. Ludhiana: Kalyani Publishers.
7. Pal Mahendra, DekaJayanta and Raj, RK. 1996. **Fundamentals of Cereal Crop Production**. New Delhi: Tata McGraw Hill Publishing Co.
8. Rao, I.S. 1964. **Crop Husbandry**. Bapatla, Andhra Pradesh: Sri Lakshmi Press.
9. Chidda Singh.1983. **Modern Techniques of Raising Field Crops**. New Delhi: Oxford and IBH Publishing Co.
10. Rajendra Prasad (Tech.Editor). 2002. **Text Book of Field Crops Production**. New Delhi: ICAR.
11. Singh, S.S. 1988. **Crop Management**. Ludhiana: Kalyani Publishers.
12. Reddy, S.R. 2004. **Agronomy of Field Crops**. Ludhiana: Kalyani Publishers.
13. Singh, N.P. and Singh, R.A. 2002. **Scientific Crop Production.**Ludhiana: Kalyani Publishers.
14. Yadav, R.L. 1993. **Agronomy of Sugarcane - Principles and Practices**. Lucknow: International Book Distribution Co.

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Semester – VI
Paper -: Optional Paper
Crop Production Technology for Kharif and Rabi Crops
Practical Syllabus

Practical

1. Crop planning in multiple cropping systems.
2. Field preparation and layout of experiment plots.
3. Seed treatment and nursery raising in paddy.
4. Sowing of crops in individual plots.
5. Time and method of fertilizer application for *kharif* & *Rabi* crops.
6. Water management for different *kharif* & *Rabi* crops.
7. Fertilizer application and sowing the crop
8. Study of weed control methods in *kharif* & *Rabi* crops (Rice, Redgram, Cotton etc.)
9. Study of plant protection measures in *kharif* & *Rabi* crops (Rice, Cotton, etc,)
10. Methods of harvesting, yield recording and post-harvest care.
11. Inter cultural operations – Thinning and weeding.
12. Study of varietal characters of cereals and oil seed crops.
13. Study of varietal characters of Pulses and fiber crops.
14. Study of varietal characters of Sugarcane, potato and Tobacco.

K. Jhansi

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Telangana State Council of Higher Education, Govt.of Telangana
(Osmania University)
PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc.
MICROBIOLOGY (2020-21)

Code	Course Title	Course Type	HPW	Credits
FIRST YEAR-SEMESTER-1				
BS	AEC-1			2
BS	English			4
BS	Second Language			4
BS	**General Microbiology**	DSC-1A	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-2				
BS	AEC-2			2
BS	English			4
BS	Second Language			4
BS	**Microbial Diversity**	DSC-1B	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SECOND YEAR-SEMESTER-3				
BS	**Haematology**	SEC-1	2	2
BS	**UGC Given**	SEC-2		2
BS	English			3
BS	Second Language			3
BS	**Food & Environmental Microbiology**	DSC-1C	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-4				
BS	**Mushroom Cultivation**	SEC-3	2	2
	UGC Given	SEC-4		2
	English			3
BS	Second Language			3
BS	**Medical Microbiology & Immunology**	DSC-1D	4+2	5
BS	Optional-II			5
BS	Optional-III			5
THIRD YEAR-SEMESTER-5				
	English			3
	Second language			3
BS	**Microbiology and Human Health**	GE	4	4
BS	**1A.Molecular Biology & Microbial Genetics or 1B. Microbial Omics**	DSE-I	4+2	5

BS	Optional-II			5
BS	Optional-III			5
SEMESTER-6				
BS	English			3
BS	Second language			3
BS	**2.A Industrial Microbiology** **or** **2.B Pharmaceutical Microbiology**	DSE-2	4+2	5
BS	**PROJECT WORK / Applied Microbiology**		3+2	4
BS	Optional-II-A/B/C			5
BS	Optional-III-A/B/C			5
Total				150

SEC-2 (Sem III) and SEC-4(Sem IV) are given at the end.

Dept. Microbiology: Osmania University
Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)
With effect from 2020-21
Syllabus for B.Sc Microbiology Code: BS, DSC- 1A
B.Sc I year: I Semester

Title: GENERAL MICROBIOLOGY 4HPW -Credits-4

UNIT-1: INTRODUCTION TO MICROBIOLOGY

Meaning, definition and scope. History of microbiology: Contribution of Louis Pasteur and Robert Koch. Importance and application of Microbiology.

Principles of Microscopy-Bright field, Dark field, Phase-contrast, Fluorescent and Electron microscopy (SEM and TEM). Principles and types of stains-simple stain, differential stain, negative stain.Structural stain-spore, capsule, flagella.Bacterial motility - Hanging drop method.

UNIT-2: STRUCTURE OF BACTERIA, VIRUSES & PURE CULTURE CONCEPT

Prokaryotes - Ultra structure of eubacteria.

General characteristics and classification of virus.

Morphology and structure of TMV and HIV. Structure and multiplication of lambda bacteriophage.

Isolation of pure culture techniques- Enrichment culturing, Dilution plating, streak plate, spread plate, Micromanipulator. Preservation of Microbial cultures – Sub culturing, overlaying cultures with minerals oils, lyophilization, sand cultures, storage at low temperature.

UNIT-3: MICROBIAL NUTRITION AND METABOLISM

Microbial Nutrition – Nutritional requirement, Uptake of nutrients by cell. Nutritional groups of microorganisms – Autotrophs, Heterotrophs, Mixotrophs. Components and types of bacterial growth media – simple and complex media.

Respiration – Glycolysis, HMP Pathway, ED Pathway , TCA Cycle and Anaplerotic reaction, Electron Transport, Oxidative and substrate level phosphorylation.

UNIT-4: STERILIZATION TECHNIQUES AND MICROBIAL GROWTH

Sterilization and disinfection techniques - Physical methods- Autoclave, Hot air oven, Laminar air flow, Filter sterilization. Radiation methods - U.V rays, Gamma rays, Ultrasonic methods. Chemical methods - Alcohols, Aldehydes, Phenol, Halogens and Hypochlorides.

Microbial growth – Different Phases of Growth in Batch culture. Factors Influencing microbial growth. Synchronous, Continuous, Biphasic Growth. Methods for measuring microbial growth – Direct Microscopic, Viable count, Turbidometry, Biomass.

References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harly, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube, R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.
5. Anthanarayan and Panicker, Medical Microbiology.

General Microbiology

PRACTICALS

2HPW-Credits-1

- Handling and calibration of light microscope.
- Simple and differential staining (Gram staining), Spore staining.
- Microscopic observation of cyanobacteria (Nostoc,Spirulina), algae and fungi (Saccharomyces, Rhizopus, Aspergillus, Pencillium, Fusarium).
- Isolation of T2 bacteriophage from sewage sample.
- Preparation of media for culturing autotrophic and heterotrophic microorganisms – algal medium, mineral salts medium , nutrient agar medium, McConkey agar and blood agar.
- Sterilization techniques: Autoclave, Hot air oven and filtration.
- Enumeration of bacterial numbers by serial dilution and plating (viable count)
- Isolation of pure cultures by streak, spread and pour plate techniques
- Preservation of microbial cultures- Slant, Stab, Sand cultures, mineral oil overlay and glycerol stocks
- Turbidometric measurement of bacterial growth and plotting growth curve.

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.

Dept. Microbiology: Osmania University
Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)
With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS, DSC-1B**

B.Sc I year: II Semester

Title: MICROBIAL DIVERSITY **4HPW- Credits-4**

UNIT 1: CONCEPT OF BIODIVERSITY

Basic concept of Biodiversity and Conservation. Elements of Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance & Diversity. Economic Value of Biodiversity & Legal, Ethical and Conservation issues related to uses of biodiversity.
Classification of living organisms; Haeckel, Whittaker and Carl Woese systems. Differentiation of prokaryotes and eukaryotes.
Classification of bacteria as per the second edition of Bergey's manual of systematic bacteriology.

UNIT 2: PROKARYOTIC MICROBIAL DIVERSITY

General characteristics of eubacteria, Rickettsia and Mycoplasma.
Microbial richness: Exploration, significance, conservation and applications. Structural and physiological diversity of Archaea bacteria, Metabolic characteristics of extremophiles (Methanogens, Halophiles, thermoacidophiles).
Gram negatives: Cyanobacteria and Proteobacteria, Gram positives and heterogenous members including Firmicutes, Actinobacteria, Bacteroidetes, Acidobacteria and Planctomycetes

UNIT 3: EUKAROTYIC MICROBIAL DIVERSITY

Eukaryotic microbial diversity. Structural, physiological and metabolic characteristics, of Algae - Cyanophyta, Chlorophyta Bacillariophyta, Phacophyta, Rhodophyta; Fungi -Phycomycetis, Basidiomycetis, Zygomyetes, Oomycets, Asomycetes, Deuteromycetes (imperfect and perfect stages) and Protozoa - Giardia, Entamoeba and Plasmodium.

UNIT 4: MICROBIAL ECOSYSTEMS

Microbial interactions: Symbiosis, neutralism, commensalism, competition, antagonism, synergism, parasitism.
Understanding microbial diversity with Cultivated vs Uncultivated microorganisms.
The Great Plate count anomaly . Cultivation independent methods to assess microbial diversity.
Preserved and perturbed microbial ecosystems, microbiome for sustainable agroecosystems, Human microbiome

References:

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig.N.R (2006)."Microbiology"- 5th Edition McGraw Hill Inc. New York.

2. David, B.D., Delbecco,. R., Eisen, H.N and Ginsburg, H.S (1990) "Microbiology" 5th Edition. Harper & Row, New York.
3. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R. (1986). "General Microbiology" - Mac Milan Education Ltd. London.
4. Brown J.W. (2015) Principles of Microbial Diversity, ASM Press
5. Epstein S.S. (2009) Uncultivated microorganisms, Springer-Verlag Publishers
6. Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15th Edn. (Global Edn.)Pearson Education

MICROBIAL DIVERSITY

PRACTICALS

2HPW-Credits-1

- Isolation of Methanogenic bacteria from manure by anaerobic culturing
- Isolation and enumeration of halophiles from saline environment
- Isolation of bacteria from diversified habitats to demonstrate antagonism, commensalism and synergism
- Isolation of *Cyanobacteria* and fungi from different habitats
- Identification of fungi by staining techniques
- Microscopic observation of soil algae and Protozoa
- Winogradsky's column to demonstrate microbial diversity
- Visit and observe any nearby unique ecosystems to understand the role of microorganisms
- Demonstration of the great plate count anomaly

References:

1. Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
2. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
3. Burns, R.G. and Slater, J.H. (1982). Experimental Microbiology and Ecology. Blackwell Scientific Publications, USA.
4. Peppler, I.L. and Gerba, C.P. (2004). Environmental Microbiology – A Laboratory Manual.Academic Press. New York.
5. Gupte, S. (1995). Practical Microbiology. Jaypee Brothers Medical Publishers Pvt. Ltd.
6. Kannan, N. (2003). Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers.Panima Publishing Co., New Delhi.
7. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory

Experiments in Microbiology, 2nd edition.Himalaya Publishing House, Mumbai.
8. Reddy, S.M. and Reddy, S.R. (1998). Microbiology – Practical Manual, 3rd Edition, Sri Padmavathi Publications, Hyderabad

SKILL ENHANCEMENT COURSE-I (SEC-I)

Dept. Microbiology: Osmania University

Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)

With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS, SEC-1**

B.Sc II year: III Semester

Title: HAEMATOLOGY **2HPW-Credits-2**

UNIT-1: INTRODUCTION TO BLOOD

Blood: definition, characters, composition. Collection of blood – capillary blood: from adults and infants, examinations employed. Venous blood: from adults and infants, examinations employed Composition of blood (RBC, WBC, Plasma, Serum, Platelet cells), Staining of blood films. Total blood picture, Differential count. Blood grouping, Rh-typing. Haemoglobin: composition and normal values, haemoglobin estimation Anti-coagulants.

UNIT-2: BLOOD TRANSFUSION

Principles of blood transfusion, Donor screening – cross matching, collection of blood, preservation and storage. Precautions of handling blood and it's products. Challenges in management of Hemophilia and Anaemia. General account on spread of diseases through blood and blood products. Coagulation mechanism: factors, bleeding time, clotting time. Haematological indices: packed cell volume. Erythrocyte sedimentation: principle – determination.

References:

1. Kawthalkar.Essentials of Haematology Paperback – 2013
2. Lokwani.D.P.The ABC of CBC Interpretation of Complete Blood Count and HistogramsPaperback – 2013
3. RamnikSood . Medical Laboratory technology Methods and Interpretation Jaypee Publications.
4. ShirishMKawthalkar. Essential Of Hematology. Jaypee Publications.

Dept. Microbiology, Osmania University
Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)
With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS, DSC-1C**

B.Sc II year: III Semester

Title: FOOD AND ENVIRONMENTAL MICROBIOLOGY **4 HPW-Credits-4**

UNIT 1: FERMENTED FOODS

Introduction to fermented foods; Health aspects of fermented foods; Fermented vegetables: Processing and fermentation of Sauerkraut and pickles, idly. Dairy Microbiology - Types of microorganisms in milk, significance of microorganisms in milk, Microbial products of milk- Bulgarian milk, Kefir, cheese, yogurt; Microorganisms as food; Probiotics and Prebiotics.

UNIT 2: MICROBIAL FOOD SPOILAGE AND POISONING

Microbial Spoilage of foods; Microbial Food poisoning, risks and hazards; Mycotoxins and their poisoning/toxicity; Food preservation methods and food safety issues. Food Quality: Importance and functions of quality control. Methods of quality assessment of foods; Screening and Enumeration of spoilage microorganisms, Detection of pathogens in food.

UNIT 3: AIR AND WATER MICROBIOLOGY

Microorganisms in air and their importance (brief account); Microorganisms and water pollution Water-borne pathogenic microorganisms and their transmission; Sanitary quality of water; Water pollution due to degradation of organic matter; Aerobic and Anaerobic sewage treatment,

UNIT 4: SOIL MICROBIOLOGY

Soil properties (physical, chemical and biological), Soil microorganisms, Methods of enumeration and activity of microbes in environment/soil; Microbes and plant interactions – Rhizosphere, Phyllosphere and Mycorrhizae; Introduction to Microbial Bioremediation, Microbial degradation of organic pollutants; Carbon and Nitrogen cycle.

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers.ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.
15
5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
7. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA
8. Paul, E.A. and Clark, F.E. (1989). Soil Microbiology and Biochemistry, Academic Press, USA.

FOOD AND ENVIRONMENT MICROBIOLOGY

PRACTICALS

2HPW-Credits-1

- Determination of microbiological quality of milk by MBRT method.
- Isolation of fungi & bacteria from spoiled fruits/vegetables/Milk/Meat products.
- Isolation of microorganisms from air by impingement method.
- Microbiological examination of water by coliform test.
- Determination of biological oxygen demand.
- Extraction of Mycotoxins from contaminated grains/foods.
- Detection of Mycotoxins
- Isolation and identification of probiotic bacteria
- Isolation and identification of probiotic yeast

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers.ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.15
5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA

SKILL ENHANCEMENT COURSE-III (SEC-3)

Dept. Microbiology: Osmania University

Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)

With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS, SEC-3**

B.Sc III year: IV Semester

Title: MUSHROOM CULTIVATION **2HPW-Credits-2**

UNIT-1

- Introduction to mushroom cultivation
- Importance and history of mushroom cultivation in India
- Global status of mushroom production
- Edible mushrooms (white button oyster, Paddy straw).
- Nutritional value and health benefits of mushrooms

UNIT-2

- Steps in mushroom cultivation
  a. Selection of site and types of mushroom
  b. Mushroom farm structure, design layout
  c. Principle and techniques of compost and composting
  d. Principle of spawn production
  e. Casing and crop production
  f. Harvesting and marketing
  g. Entrepreneurship development in Mushroom cultivation
- Pest and pathogens of mushrooms
- Post harvest handling and preservation of mushrooms

Reference:

1. Mushroom cultivation in india by B.C.Suman and V.P. Sharma Published by Daya publishing house New Delhi.
2. Mushrooms Cultivation, Marketing and Consumption Manjit Singh Bhuvnesh Vijay Shwet Kamal G.C. Wakchaure Directorate of Mushroom Research (Indian Council of Agricultural Research) Chambaghat, Solan –173213 (HP)

Dept. Microbiology: Osmania University

B. Sc. Microbiology program under choice based credit system (CBCS)

With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS, DSC-1D**

B.Sc II year: IV Semester

Title: MEDICAL MICROBIOLOGY & IMMUNOLOGY **4 HPW-Credits-4**

UNIT-1: MEDICAL BACTERIOLOGY

Histroy of Medical Microbiology. Normal flora of human body,
Host pathogen interactions.Bacterial toxins, virulence and attenuation.Antimicrobial resistance.
Air borne diseases -Tuberculosis.
Food and waterborne diseases- Cholera, Typhoid.
Contact diseases - Syphilis, Gonorrhea. General account of nosocomial infections.

UNIT-2: MEDICAL VIROLOGY AND PARASITOLOGY

Food and waterborne diseases - Poliomyelitis, Amoebiasis.
Insect borne diseases-Malaria, Dengue fever.
Zoonotic diseases – Rabies
Viral diseases- Hepatitis B, HIV, SARS, MERS; Air borne diseases- Influenza.

UNIT-3: INTRODUCTION TO IMMUNOLOGY

History of immunology. Cells and organs of immune system- Primary and Secondary lymphoid organs.Functions of B&T Lymphocytes, Natural killer cells, Polymorphonuclear cells.
Structure and classification of Antigens, Factors affecting antigenicity.
Antibodies-Basic structure,Types,properties and functions of immunoglobulins.
Types of immunity-Innate and Acquired; Humoral and cell mediated immune response.
Major Histocompatibility Complex- Class I and II

UNIT-4: IMMUNOLOGICAL DISORDERS AND AG-AB REACTIONS

Types of hypersensitivity - Immediate and delayed.
Systemic and localized autoimmune disorders
Complement pathways – Classical and Alternate.
Types of Antigen-Antibody reactions- Agglutination, blood groups, precipitation, neutralization, complement fixation test. Labeled antibody based techniques-ELISA, RIA and Immunofluorescence; Polyclonal and monoclonal antibodies production and application

References:

1. Gottschalk, G. (1986). Bacterial Metabolism, Springer-Verlag, New-York.
2. Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications, Iowa, USA.
3. Moat, A.G. and Foster, J.W. (1995). Microbial Physiology, John-Wiley, New York.
4. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.
5. Reddy, S.R. and Reddy, S.M. (2004). Microbial Physiology, Scientific Publishers, Jodhpur, India.
6. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
7. Elliot, W.H. and Elliot, D.C. (2001). Biochemistry and Molecular Biology, 2nd Edition, Oxford University Press, U.S.A.

MEDICAL MICROBIOLOGY & IMMUNOLOGY

PRACTICALS

2HPW- Credits-1

- Determination of blood grouping and RH typing.
- Total count of RBC and WBC.
- Differential count of blood leucocytes.
- WIDAL test for typhoid(slide test)by Ag-Ab reactions
- VDRL test for syphilis (slide test) by Ag-Ab reactions.
- Ouchterlony double diffusion test
- Separation of serum and plasma
- IMViC test - Indole test, Methyl red test,VogesProskauer test, Citrate utilization test.
- Oxidase test.
- Catalase test.
- Antibiotic sensitivity testing – Disc diffusion method

References:

1. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, .Himalaya Publishing House, Mumbai.
2. Experiments in Microbiology by K.R. Aneja.

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Syllabus for B.Sc Microbiology **Code: BS, GE**

B.Sc III year: V semester

Title: MICROBIOLOGY AND HUMAN HEALTH **4 HPW-Credits-4**

UNIT-1: INTRODUCTION

Historic developments of Microbiology, contributions of Van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch.

Types of microorganisms, Morphological characteristics of bacteria, Staining, cultivation methods of bacteria, Culture Media used for the growth of microrganisms.

UNIT-2: MICROORGANISMS: GOOD AND BAD

Microorganisms related to human health. Normal microbial flora, Human microbiome concept.

Bacterial disease: Typhoid, Tuberculosis, Syphilis

Viral diseases: Flu, SARS, MERS, SARS-CoV-2, HIV

Insect borne: Malaria and Dengue

UNIT-3: **IMMUNITY AND HEALTH**

Introduction to immune system; Understanding the terms: Disease, Infection, Pathogenicity, Prophylaxis, Host resistance, Innate immunity and acquired immunity, Epidemics, Endemics and Pandemics; Importance of probiotics and vaccines for human health

UNIT-4: WASTE MANAGEMENT AND HEALTH HAZARDS

Health hazards associated with dumpage of Industrial and Biomedical waste.

National and international guidelines for the disposal of waste. Guidelines of Central Pollution Control Board (CPCB). Safe disposal and pretreatment of wastes. Mechanical and chemical treatment of the waste. Autoclaving, incineration.

References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harly, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube, R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.
5. Ananthanarayan and Panikar. Text book of Microbiology. Universities Press.

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Syllabus for B.Sc Microbiology **Code: BS, DSE-1A**

B.Sc III year: V Semester

Title: MOLECULAR BIOLOGY & MICROBIAL GENETICS **4HPW-Credits-4**

UNIT-1: MICROBIAL GENETICS

Fundamentals of Genetics – Mendelian laws, Alleles, Crossing over and Linkage
DNA and RNA as genetic material
Structure of DNA – Watson and Crick model
Extra chromosomal genetic elements – Plasmids and Transposons
Replication of DNA- Semi conservative mechanism

UNIT-2: MUTATIONS AND GENETIC RECOMBINATION

Mutations – Spontaneous and induced, Base pair changes, Frameshift, Deletion, Inversion, Tandem duplication, Insertion
Various physical and chemical mutagens
Outline of DNA damage and repair mechanism
Brief account on gene transfer among bacteria – Transformation, Transduction and Conjugation

UNIT-3-GENE EXPRESSION

Concept of gene – Muton, Recon and Cistron
One gene – one enzyme , One gene – one Poly peptide , One gene – one product hypothesis
Types of RNA and their functions
Outline of RNA transcription in Prokaryotes
Genetic code, Structure of Ribosomes and brief account on protein synthesis
Type of genes – Structural, Constitutive, Regulatory
Operon concept.Regulation of gene expression in bacteria – Lac Operon.

UNIT-4-RECOMBINANT DNA TECHNOLOGY

Basic principles of genetic engineering –Restriction endonucleases,
DNA polymerases and Ligases, vectors
Outline of gene cloning methods.
Genomic and cDNA libraries
General account on application of genetic engineering in industry, agriculture and medicine.

References:

1. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
2. Crueger, W. and Crueger, A. (2000). Biotechnology: A Text Book of Industrial Microbiology, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
4. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
5. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.
6. Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5th Edition. McGraw Hill, New York.
7. Glazer, A.N. and Nikaido, H. (1995). Microbial Biotechnology – Fundamentals of Applied Microbiology, W.H. Freeman and company, New York.
8. Old, R.W. and Primrose, S.B. (1994) Principles of Gene Manipulation, Blackwell Science Publication, New York.
9. Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.

MOLECULAR BIOLOGY & MICROBIAL GENETICS

PRACTICALS

HPW- Credits-1

- Colorimetric estimation of proteins by Biuret method.
- Colorimetric estimation of DNA by Diphenyl amine method.
- Colorimetric estimation of RNA by Orcinol method
- Extraction of genomic DNA
- Extraction of plasmid DNA
- Separation and observation of genomic DNA by Agarose gel Electrophoresis
- Separation and observation of plasmid DNA by Agarose gel Electrophoresis

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.
5. Mahy, B.W.J. and Kangro, H.O. Virology – Methods Manual Academic Press, USA.
6. Burleson et al Virology – A Laboratory Manual.Academic Press, USA.

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Syllabus for B.Sc Microbiology **Code: BS, DSE-1B**

B.Sc III year: 5thsemester

Title: MICROBIAL OMICS **4 HPW-Credits-4**

UNIT 1: INTRODUCTION TO OMICS

Introduction to molecular biology. Structure of DNA, RNA. Multi omics approach for analysis of Microbial biology: Genomics, Transcriptomics (RNA-Seq), Proteomics, Metabolomics, Metagenomics and their applications; Basic Concepts in high throughput sequencing or Next-Generation Sequencing methods for use in food-microbiology, diagnostics and Human health.

UNIT 2: PROTEOMICS

Protein structure – Different levels of protein structure, Protein Folding and unfolding. Protein secondary and 3D structure prediction methods. X-ray crystallography, NMR and homology modeling. Protein micro arrays- Protein Markers, Clinical Proteomics, Protein engineering, Proteomic strategies in Cancer, Prions.

UNIT 3: GENOMICS

An introduction of functional genomics; Site-directed mutagenesis, Transposon mutagenesis, DNA microarray, RNA interference, and Chromatin immune precipitation.
Genome annotation, Applications of functional genomics in vaccine and drug designing, Genome editing tools such as CRISPR/Cas9. Databases of Microbial Genomics; Microbial genome projects

UNIT 4: BIOINFORMATICS

Introduction to Bioinformatics and Molecular Databases, Primary Databanks – NCBI, EMBL, DDBJ; Secondary Databases – UNIPROT; Structural Database –PDB; Database similarity search (FASTA, BLAST); Alignment: Pairwise and Multiple sequence alignment; Whole genome sequence; Genome Annotation and Gene Prediction; Primer Designing; Phylogenetic analysis and Tree construction.

References

1. Principles of Protein structure, Schultz, G. E., and Schirmer, R. H. Dr. ShaktiSahi
2. Proteomics, Daniel C. Leibler
3. Microbial Proteomic, MarjoPoutanen
4. Proteins: Structures and Molecular Principles (2d ed.), TE Creighton
5. Organic spectroscopy, William Kemp

6. Proteome Research: Two-Dimensional Gel Electrophoresis and DetectionMethods (Principles andPractice), T. Rabilloud (Editor), 2000, Springer Verlag
7. Introduction to Protein Architecture: The Structural Biology of Proteins, M.Lesk, 2001, Oxford University Press.
8. Molecular Biotechnology by Bernard R. Glick and Jack J Pasternak
9. DNA Microarrays Ed. M. Schena.

MICROBIAL OMICS

PRACTICALS

2HPW-Credits-1

1. Protein isolation from *E coli.*
2. Sequence analysis of proteins (by BLAST, ClustalW and Phylip).
3. Protein structure prediction by Homology modeling.
4. Isolation of Genomic DNA from *E.coli* and its demonstration by OD and agarose electrophoresis
5. Isolation of plasmid DNA from *E.coli* and its demonstration by OD and agarose electrophoresis
6. DNA molecular size determination
7. Primer designing using online software
8. PCR amplification of genes and detection of amplicon by agarose gel electrophoresis

References:

1. Molecular biotechnology by Chanarayppa

2. Methods in Molecular Cloning by Sambrook.

3. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory

Experiments in Microbiology, 2nd edition.Himalaya Publishing House, Mumbai.

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Syllabus for B.Sc Microbiology **Code: DSE-2A**

B.Sc III year: VI Semester

Title: INDUSTRIAL MICROBIOLOGY **4 HPW-Credits-4**

UNIT-1: MICROORGANISMS AND SELECTION
Introduction to Industrial Microbiology, Microorganisms of industrial importance -Yeast, Molds, Bacteria, Actinomycetes. Screening and selection of industrially useful microbes. Steps to maintain seed culture and inoculation strategies for enhanced product yield. Strain improvement strategies. Immobilization methods – adsorption and entrapment.

UNIT-2: FERMENTATION
Design of bioreactor. Physico-chemical standards used in bioreactors. Limitations of bioreactor, Fermentation equipment and its use. Design of fermentor, type of fermenter, agitation, aeration, antifoam, pH and temperature control. Stages of fermentation process. Inoculation media and fermentation media ; Raw materials used in fermentation industry and their processing, Downstream processing.

Unit-3: TYPES OF FERMENTATON
Types of fermentations: Batch, Fed batch, continuous types and kinetics. Submerged, surface, solid state, dual and multiple fermentations. Advantages and disadvantages of solid substrate and liquid fermentations. Fermentation. Common Microbial fermentation, alcohol and lactic acid fermentation.

UNIT-4: MICROBIAL PRODUCTS
Industrial products derived from microbes: vitamins: B12; Vaccines: recombinant vaccines, production of beverages (beer and wine), biofuels (biogas and methane), enzymes (amylase), antibiotics (penicillin), aminoacids (glutamic acid), organic acid (citric acid). Disposal of industrial waste.

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology – A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology.Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.

7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA

INDUSTRIAL MICROBIOLOGY

PRACTICALS

2HPW-Credits-1

1. Screening for amylase producing microorganisms
2. Screening for organic acid producing microorganisms
3. Estimation of Ethanol by potassium dichromate method.
4. Production of citric acid by submerged fermentation
5. Estimation of Citric acid by titrimetry method.
6. Estimation of penicillin.
7. Bacterial slides- Bacillus, Lactobacillus, Yeast, Aspergillus, Pencillium

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology – A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology.Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA.

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Syllabus for B.Sc Microbiology **Code: DSE-2B**

B.Sc III year: VI Semester

Title: PHARMACEUTICAL MICROBIOLOGY **4 HPW-Credits-1**

Unit-1: INTRODUCTION TO CHEMOTHERAPY

History of chemotherapy – plants and arsenicals as therapeutics, Paul Ehrlich and his contributions, selective toxicity and target sites of drug action in microbes. Development of synthetic drugs – Sulphanamides, antitubercular compounds, nitrofurons, nalidixic acid, metronidazole group of drugs.

Unit-2: ANTIBIOTICS

The origin, development and definition of antibiotics as drugs, types of antibiotics and their classification. Non-medical uses of antibiotics.Principles of chemotherapy – Clinical and lab diagnosis, sensitivity testing, choice of drug, dosage, route of administration, combined/mixed multi drug therapy, control of antibiotic/drug usage.

Unit-3: DRUG RESISTANCE

The phenomenon of drug resistance, clinical basis of drug resistance, biochemistry of drug resistance, genetics of drug resistance in bacteria.
Mode of action of important drugs – Cell wall inhibitors (Betalactam – eg. Penicillin), membrane inhibitors (polymyxins), macromolecular synthesis inhibitors (streptomycin), antifungal antibiotics (nystatin)

Unit-4: MICROBIOLOGICAL ASSAYS

Assays for growth promoting substances, nutritional mutants and their importance. Drug sensitivity testing methods and their importance. Assay for antibiotics – Determination of MIC, the liquid tube assay, solid agar tube assay, agar plate assay (disc diffusion, agar well and cylinders cup method).

References:

1. Ananthanarayana, R. and Panicker, C.K.S. (2000). Text Book of Microbiology, 6th Edition, Oriental Longman Publications, USA.
2. Gupte, S. (1995). Short Text Book of Medical Microbiology, 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

3. Biochemistry of antimicrobial action. Franklin,DJ. and Snow, GA.Pub:Chapman& Hall. Antibiotics and Chemotherapy.Garrod, L.P., Lambert, HP. And C'Grady, F. (eds). Publ: Churchill Livingstone.
4. Antibiotics. Lancini, G. and Parenti, F. publ: Springer-Verlag.
The Molecular Basis of antibiotic action. Ga.e, EF.Et al.Publ: Wiley, New York.
Antimicrobial Drug action.Williams, RAD., Lambart, PA.& Singleton, P. Pub:Bios Sci.
Microbiological Assays.Hewitt.

PHARMACEUTICAL MICROBIOLOGY (CBCS)

PRACTICALS

2 HPW- Credits-1

1. Tests for disinfectants (Phenol coefficient/RWC)
2. Determination of antibacterial spectrum of drugs/antibiotics
3. Chemical assays for antimicrobial drugs
4. Testing for antibiotic/drug sensitivity/resistance
5. Determination of MIC for antimicrobial compounds
6. Microbiological assays for antibiotics (Liquid tube assay, agar tube assay, agar plate assays)

Reference/Recommended Books for MB Pharmaceutical Microbiology

1. Disinfection, sterilization and preservation. Block, S.S. (ed). Lea and Febigor, Baltimore
2. Pharmaceutical Microbiology. Huge, W.B. and Russel, AD.Blackwell Scientific, Oxford
3. Inhibition and destruction of microbial cell by Hugo, WB. (ed). Pub: Academic Press,NY
4. Manual of Clinical Microbiology. Lennette, EH. (ed).Pub: American Society for Microbiology, Washington.
5. Principles and Practices of disinfection. Russell, AP.,Hugo,WB., and Ayliffe, GAJ.(eds). Publ. Blackwell Sci.
6. Biochemistry of antimicrobial action. Franklin,DJ. and Snow, GA.Pub:Chapman& Hall.
7. Antibiotics and Chemotherapy. Garrod, L.P., Lambert, HP. And C'Grady, F. (eds). Publ: Churchill Livingstone.
8. The Molecular Basis of antibiotic action. Ga.e, EF. Et al. Publ: Wiley, New York.
9. Antimicrobial Drug action. Williams, RAD., Lambart, PA. & Singleton, P. Pub:Bios Sci.

Elective Against Project
Dept. Microbiology: Osmania University
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Syllabus for B.Sc Microbiology **Code: BS**

B.Sc III year: VI Semester

Title: APPLIED MICROBIOLOGY **3 HPW-Credits-3**

UNIT-1: MICROBIAL PRODUCTS FOR SMALL SCALE ENTREPRENEURS

Maintenance of type strains or reference strain of microorganisms: culture collection centres (MTCC, ATCC). Patenting process and IPR. Microorganisms in agriculture. Nitrogen fixation and phosphate solubilization. Biofertilizers- Production of azolla, rhizobium and mycorrhizae. Biofungicides- Mass production of Trichoderma and Pseudomonas. Biopesticides- Bacterial, fungal and viral.

UNIT-2: METABOLIC ENGINEERING FOR MICROBIAL PRODUCTS

Production of microbial pigments (prodigiosin, violacein, monascin). Bacterial and algal carotenoids. Microrganisms for flavor and aroma production. Biotransformation and metabolic engineering of microorganisms to produce compounds such as esters, terpenes, aldehydes, lactones, geosmin, vanillin and coumarin.

UNIT-3: MICROBIAL DIAGNOSTICS AND HEALTH

Diagnostic microbiology: collection, transport and culturing of clinical samples. Preparation and use of culture media for detection of microbial pathogens. Examination of sample by staining - Gram stain, Ziehl-Neelsen staining for tuberculosis, Blood smear for malarial parasite. Serological methods for rapid detection of bacterial, fungal and viral pathogens.
Techniques used for the diagnosis of hospital acquired infections and multi drug resistant microorganisms. Monitoring of sanitation in community –Biohazard disposal.

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
3. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA.

4. Ananthanarayan R and Paniker CKJ (2009). Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
5. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
6. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.

APPLIED MICROBIOLOGY

PRACTICALS

2 HPW-Credits-1

1. Isolation and enumeration of Rhizosphere microorganisms.
2. Isolation of Rhizobium from leguminous root nodules.
3. Staining & observation of mycorrhizal fungi.
4. Mass production of Rhizobium , Mycrorhizae, Trichoderma and Pseudomonas using different carriers / substrates and methods to assay quality control of bioproducts
5. Grams staining
6. Ziehl-Nielsen staining
7. Blood smear

References:

1. Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
2. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
3. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA

Project

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Syllabus for B.Sc Microbiology **Code: BS**

B.Sc III year: 6th semester

Title: PROJECT **5 HPW-Credits-4**

1. Number of students who will be offered project work will vary batch to batch depending upon the infrastructural facilities and may vary each year (Not exceeding 5 students per group).
2. Project work will involve experimental work and the student will have to complete this in stipulated time.
3. The final evaluation of the project work will be through a Panel involving internal and external examiners.
4. Students will be asked their choice for Project work at the beginning of VI semester and all formalities of topic and mentor selection will be completed.

Project work will be offered in lieu of expertise and infrastructural facilities of the department and will be evaluated for 4 credits.

5. The distribution of marks for project work will be:

Project work: 100 Marks (50 marks for dissertation + 25 marks for research skills + 25 marks for research work presentation).

DEPARTMENT OF MICROBIOLOGY, OSMANIA UNIVERSITY
B.Sc MICROBIOLOGY (CBCS) SEC-2 (UGC) SYLLABUS w.e.f. 2020-21
SEMESTER – III
Microbial Quality Control in Food and Pharmaceutical Industries

TOTAL HOURS: 30 (2HPW) **CREDITS: 2**

Unit 1: Microbiological Laboratory Safe Practices and Determining Microbes in Food / Pharmaceutical Samples **No. of Hours: 15**

Good laboratory practices - Good microbiological practices
Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL1, BSL-2, BSL-3. Discarding biohazardous waste –Methodology of Disinfection, Autoclaving & Incineration. Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods.

Unit 2: Pathogenic Microorganisms of Importance in Food & Water and HACCP for Food Safety and Microbial Standards **No. of Hours: 15**

Enrichment culture technique, Detection of specific microorganisms - on Salmonella Shigella Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar, Ascertaining microbial quality of milk by MBRT. Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations. Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water.

SUGGESTED READING

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press
2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.
4. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

DEPARTMENT OF MICROBIOLOGY, OSMANIA UNIVERSITY

B.Sc. MICROBIOLOGY (CBCS) SEC-4 (UGC) SYLLABUS w.e.f. 2020-21

SEMESTER – IV

FOOD FERMENTATION TECHNIQUES

TOTAL HOURS: 30 (2HPW) **CREDITS: 2**

Unit 1: Fermented/Probiotic Foods **No. of Hours: 20**

Definition of fermented foods, Definition of probiotics and probiotic foods, types of fermented and probiotic foods, Microorganisms, advantages and health benefits. Milk Based Fermented Foods: Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

Unit 3: Grain Based Fermented Foods, Fermented Vegetables, Meat and Fish

No of Hours: 10

Soy sauce, Bread, Idli and Dosa: Microorganisms and production process
Pickels, Saeurkraut: Microorganisms and production process
Types, microorganisms involved, fermentation process

Suggested Readings

1. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press
2. Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.
3. Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan
4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.