

Syllabus: MCA

Hard Core OBJECT ORIENTED PROGRAMMING WITH JAVA 3:0:1

Course Code: 21BH06

Objectives:

- Gain knowledge about basic of Java language syntax and semantics.
- Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
- Gain knowledge on multi-threads programming.

Outcomes:

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Write Java programs to implement error handling techniques using exception handling.
- Develop computer programs to solve real world problems in JAVA.

Unit – I

An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings.

Unit – II

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize() Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance.

Unit – III

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.

Unit – IV

Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization. I/O Basics, Reading Console Input, Writing Console Output, ThePrintWriter Class, Reading and Writing Files.

References

1. Herbert Schildt, Java 2, The Complete Reference, Tata McGraw Hill.
2. E. Balaguruswamy, Programming with JAVA A Primer, McGraw Hill Education.Pvt. Ltd.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	3	2	2	1	1	-	-	-	-	-
CO 2	3	2	3	3	1	-	-	-	-	-
CO 3	3	3	3	3	1	-	-	-	-	-
CO 4	3	2	1	1	1	-	-	-	-	-
Weighted Average	3	2.25	2.25	2	1	-	-	-	-	-

1: Low, 2: Moderate, 3: High

Objectives:

- To write simple Python programs.
- To develop Python programs with conditionals statements and loops.
- To use Python data structures – lists, tuples, dictionaries.
- Design user defined functions, modules, and packages and exception handling methods.
- Create and handle files in Python and learn Object Oriented Programming Concepts.

Outcomes:

- Develop algorithmic solutions to simple computational problems.
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples and dictionaries.

Unit – I: Introduction, Datatypes, Input/Output, Operators and Expressions

Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.

Python Data Types & Input/Output: Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.

Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non-Associative Operators.

Unit – II: Control Structures, Data types and functions

Control Structures: Decision making statements, Python loops, Python control statements.

Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.

Unit – III: Modules, Classes and Objects

Python Modules: Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.

Unit – IV: Exception Handling and Files

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.

File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python.

References:

1. Programming in Python, Pooja Sharma, BPB Publications.
2. Core Python Programming, R. Nageswara Rao, 2nd edition, Dreamtech.
3. Python, The complete Reference, Martin C. Brown, McGraw Hill Education.
4. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	2	2	2	2	2	1	1	-	-	2
CO 2	2	2	2	2	2	1	1	-	-	1
CO 3	3	2	2	1	2	-	-	1	1	1
CO 4	3	2	2	2	2	-	-	-	-	1
Weighted Average	2.5	2	2	1.75	2	1	1	1	1	1.25

1: Low, 2: Moderate, 3: High

Objectives:

- Understand the different issues involved in the design and implementation of a database system.
- Understand and use data manipulation language to query, update, and manage a database.
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.
- Study different tools and terminologies of Data Mining and Data Warehousing.

Outcomes:

- Employ the techniques of SQL in Relational database.
- Implement simple database system by utilizing Data models and schema.
- Employ normalization techniques to overcome Database anomalies.
- Implement various Techniques of Data Mining and Data Warehousing.

Unit I: Database System Concepts and Data Modeling using ER Model

Introduction, Characteristics of the Database Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances, Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Roles, and Structural Constraints, Weak Entity Types.

Unit II: Relational Data Model and Relational Database Constraints

Relational Model Concepts, Relational Constraints and Relational Database Schemas, Update Operations and Dealing with Constraint Violations, SQL Data Definitions and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE Statements in SQL, Specifying Constraints as Assertions and Triggers, Views in SQL.

Unit III: Introduction to SQL programming and Normalisation

Database Programming: Issues and Techniques, Database Programming with Function Calls:SQL/CLI and JDBC, Database Stored Procedures and SQL/PSM; Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Unit IV: Data Mining and Data Warehousing

Overview of Data Mining Technology, Association Rules, Classification, Approaches to Other Data Mining Problems, Commercial Data Mining Tools; Introduction, Definition and Terminology of Data Warehousing, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Problems and Open Issues in Data Warehouses.

References:

1. Fundamentals of Database Systems -Navathe and Elmasri –Pearson Education, Fifth Edition.
2. Introduction to Database systems - CJ Date, Published by Addison-Wesley.
3. Database Systems Concepts, 3rd edition - Abraham Silberschatz, Henry Korth and S. Sudarshan McGraw Hill International Editions.
4. Principles of database systems - Ullman, Computer Science press.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	3	2	2	1	3	1	-	1	-	2
CO 2	2	2	2	1	2	1	-	-	1	1
CO 3	3	3	2	-	3	2	-	2	1	1
CO 4	3	3	1	2	1	1	-	1	1	2
Weighted Average	2.75	2.5	1.75	1.33	2.25	1.25	-	1.33	1	1.5

1: Low, 2: Moderate, 3: High

Soft Core

CLOUD COMPUTING

3:1:0

Course Code:21BS03

Objectives:

- Ability to understand various basic concepts related to Cloud Computing technologies.
- Demonstrate the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- Learn cloud services for individuals.
- Understand the technologies for data security in cloud.

Outcomes:

- Demonstrate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications.
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud.
- Identify the cloud services for the individuals
- Acquire the knowledge on the core issues of cloud computing such as security, privacy, and interoperability.

Unit I:

Introduction: Cloud Computing in a Nutshell, Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management, Challenges and Risks. Migrating into a Cloud- The Seven-Step Model of Migration into a Cloud.

Unit II:

Software as a Service (SaaS): Evolution of SaaS, Challenges of SaaS Paradigm, New Integration Scenarios, SaaS Integration of Products and Platforms, SaaS Integration Services, Business – to Business Integration Services.

Infrastructure As a Services (IaaS): Introduction, Background & Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, Provisioning in a Cloud Context- Amazon Elastic Computer Cloud, Aneka.

Platform As a service (PaaS): Aneka Cloud Platform, Hybrid Cloud Implementation, Aneka Hybrid Cloud Architecture.

Unit III:

The Enterprise Cloud Computing Paradigm- Background, Business Drivers Toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain.

Unit IV:

Data Security in the Cloud- Introduction, Current State, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security.

References:

1. Cloud Computing: Principles and Paradigms – RajkumarBuyya, James Broberg, Andrzej M Goscinski, Wiley publication.
2. Cloud Computing: A Practical Approach - Toby Velte, Anthony Velte, McGraw-Hill Osborne Media.
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud - George Reese, O'Reilly Publication.
4. Cloud Computing Explained: Implementation Handbook for Enterprises - John Rhoton, Recursive Press.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO1	2	-	1	2	3	3	2	3	3	3
CO2	2	-	1	2	2	3	2	2	2	2
CO3	2	1	1	1	2	1	1	2	2	2
CO4	1	-	2	3	2	1	1	2	-	1
Weighted Average	1.75	1	1.25	2	2.25	2	1.5	2.25	2.33	2

1: Low, 2: Moderate, 3: High

Course Code: 21BS05**Objectives:**

- To help students understand the basis of Internet and how communication happens over the World Wide Web.
- To help students understand the basic building blocks of web pages using HTML and CSS.
- To help students understand and use Java script and PHP.
- To help students understand how data driven, dynamic web pages can be created using database connectivity.

Outcomes:

- Develop an ability to implement HTML5 pages using fundamental tags.
- Able to develop style sheet using CSS for a given problem.
- Able to extend JavaScript to validate a form with event handler for a given problem.
- Able to develop a dynamic website with database backend.

Unit I:

Introduction to Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security. Quick introduction to HTML5 : Creating simple web page, basic text formatting, presentation elements, phrase elements, lists, font, grouping elements, basic links, internal document links, email link, Image, Audio and Video, image maps, image formats, Tables – attributes, nested tables, Forms – Attributes, form controls. Introduction to HTML 5 - New tags of HTML 5 – embedding Media content, building input forms, painting on canvas.

Cascading Style Sheet : Introduction, Levels of Style Sheet and specification formats, embedded style sheet, External Style Sheet, inline Style Sheet, Class and ID method, DIV and SPAN tags, Inheritance with CSS, Introduction to CSS 3, HTML 5 and CSS3.

Unit II:

JavaScript: JavaScript in HTML, Language Basics – Variables, operators, statements, functions, Data type conversions, reference types, Document object Model - browser object model - window object, location object, navigator object, screen object, history object, Events and Event handling, Button elements, Navigator object, validations with regular expressions. Introduction to Dynamic documents, Positioning elements, moving elements, elements visibility, changing colors and fonts, dynamic content, Locating mouse cursor, reacting to a mouse click, dragging and dropping of elements.

Unit III:

PHP : Introduction to Server side Programming, Introduction to PHP , PHP and HTML, essentials of PHP, Why Use PHP, Installation of Web Server, WAMP Configurations, Writing simple PHP program, embedding with HTML, comments in PHP, Variables, Naming Conventions, Strings, String Concatenation, String functions, float functions, Arrays, Array – Key pair value, Array functions, is SET, UNSET, gettype(), settype(), control statements (if, switch), Loops, User Defined Functions (with argument, return values), global variable, default value, GET - POST method, URL encoding, HTML Encoding, Cookies, Sessions, Include statement. File:read and write from the file. Ethical use of features of PHP.

Unit IV:

PHP with MySQL, Creating Connection, Selecting Database, Perform Database (query), Use returned data, close connections, file handling in PHP – reading and writing from and to FILE. Using MySQL from PHP (Building a Guestbook).

References:

1. Internet and World Wide Web: How to Program - Paul Deitel, Harvey Deitel, Abbey Deitel, Pearson
2. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2ndEdition. Paperback – 2016by DT Editorial Services (Author)

3. Programming PHP, RasmusLerdorf, Kevin Tatroe, O'Reilly Media Release, March 2002.

Course articulation matrix:

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO										
CO1	2	2	3	2	2	2	-	2	2	1
CO2	3	3	3	3	3	2	-	2	2	1
CO3	3	3	3	3	3	2	-	2	2	2
CO4	3	3	3	3	3	3	-	2	3	3
Weighted Average	2.75	2.75	3	2.75	2.75	2.25	-	2	2.25	1.75

1: Low, 2: Moderate, 3: High

Course Code:21BS09**Objectives:**

- Learn the impact of IoT applications and architectures in real world.
- Illustrate the various methods of deploying smart objects and connect them to network.
- Infer the role of IoT in Industry.
- Understand the role of IoT in Smart and Connected Cities and Public Safety.

Outcomes:

- Interpret the impact of IoT networks in new architectural models.
- Compare and contrast the deployment of smart objects and technologies to connect them as network.
- Elaborate the need of IoT Access Technologies.
- Identify the application of IoT in Smart and Connected Cities and Public Safety.

Unit I: Basics of IoT

What is IoT?, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and OT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack.

Unit II: Smart Objects and Access Technologies

Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies (Any Three)

Unit III: IoT in Industry

IoT in Industry: Smart and Connected Cities-An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples-Smart Traffic Control.

Unit IV: Public Safety

Overview of Public safety, An IoT Blueprint for public safety, Emergency Response IoT Architecture, IoT Public Safety Information Processing.

References:

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, 1st Edition, Pearson Education.
2. Internet of Things- Srinivasa K G, CENGAGE Learning India.
3. Internet of Things (A Hands-on-Approach)-Vijay Madiseti and ArshdeepBahga, 1stEdition, VPT.
4. Internet of Things: Architecture and Design Principles - Raj Kamal,1stEdition, McGraw Hill Education.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	3	3	2	2	2	-	-	-	2	2
CO 2	2	2	2	2	2	-	-	-	2	2
CO 3	3	3	3	2	2	-	-	-	2	2
CO 4	2	3	2	1	2	-	1	1	2	2
Weighted Average	2.5	2.75	2.25	1.75	2	-	1	1	2	2

1: Low, 2: Moderate, 3: High

Course Code: 21BS10**Objectives:**

- Understand the concepts of mobile applications.
- Learn to design mobile applications.
- Learn android application development environment.
- Gain knowledge on Google maps and publishing android applications.

Outcomes:

- Acquire knowledge on basics of mobile application development.
- Acquire knowledge on mobile application design patterns.
- Implement android application using android application environment.
- Students must independently develop android applications and publish them.

Unit I: Getting Started with Android Application Development

All about Android - The Consumer Perspective, The Versions of Android, The Developer Perspective, The Business Perspective, Android Background Material - Getting a Feel for the Big Picture, the main window, Viewing modes, The Designer tool

Unit II: Kotlin for Java Programmers

Defining the Java Issues That Kotlin Fixes - Improving control over null references, removing raw data types, Using invariant arrays, Working with proper function types, Getting rid of the checked exceptions, Kotlin for Everyone - Moving from Development to Execution with Kotlin, What is a compiler? Understanding native code compiler or interpreter issues, Considering the Android Runtime (ART)

Unit III: Overview of Jetpack

Understanding the Benefits of Jetpack - Eliminating boilerplate code, Managing background tasks, Navigating between activities and fragments, Managing memory, Performing configuration changes, Considering the Jetpack Components – Foundation, Architecture, Behavior, UI

Unit IV: Publishing Android App

Creating a Google Play Developer Account - Preparing Your Code, Un-testing the app, Choosing Android versions, Setting your app's own version code and version name, Choosing a package name. Monetizing and Marketing Your App - Choosing a Revenue Model, Charging for your app, Offering an extended free trial, Freemium apps, Selling things with your app, Subscription pricing, Earning revenue from advertising, Variations on in-app advertising, Donationware, Offering your app for free, Marketing Your Application

References:

1. Android® Application Development ALL-IN-ONE, Barry Burd and John Paul Mueller, 3rd Edition.
2. Android in Practice - Charlie Collins, Michael Galpin and Matthias Kappler, DreamTech.
3. Beginning Objective C - James Dovey and Ash Furrow, Apress.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	3	2	3	3	2	2	-	2	3	3
CO 2	3	3	3	3	3	2	-	2	3	3
CO 3	3	3	2	3	3	2	-	2	3	3
CO 4	3	3	3	3	3	2	-	2	3	3
Weighted Average	3	2.75	2.75	3	2.75	2	-	2	3	3

Course Code: 21BS11**Objectives:**

- Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
- Implement in C some standard Linux utilities such as ls, mv, cp etc. using system calls.
- Develop the skills necessary for systems programming including file system programming, process and signal management, and inter process communication.
- Develop the basic skills required to write network programs using Sockets.

Outcomes:

- Work confidently in Linux environment.
- Work with shell script to automate different tasks.
- Write simple system programs involving file and process management.
- Ability to write simple socket programs.

Unit I:

A brief history of Unix and Linux, Architecture, Features.

Unix/Linux Shell: Linux shell commands for getting help: Commands for getting help :whatis, man, info, apropos. Useful unix/linux shell commands :pwd, whoami, who, ls, env, echo, history, passwd, cat, more, less, file, chmod, chown, cp, mv, mkdir, rmdir, whereis, which, locate, ln. Quick overview of basic Linux Utilities: File handling utilities, links: hard and symbolic links, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters: grep, Text processing utilities and Backup utilities.

Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, tab completion, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

Unit II:

Sed and Awk: Sed: Scripts, Operation, Addresses, Commands.

Awk: Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications

Unit III:

Process : Process concept, Layout of a C program image in main memory. Process environment :environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control : process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

Unit IV:

Inter process Communication: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes, FIFO: creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions.

Sockets: Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example: client/server programs-Single Server-Client connection, Comparison of IPC mechanisms.

References:

1. Linux “man” pages and “info” pages.

2. The Linux Documentation Project : <http://www.tldp.org/>
3. Unix Concepts and Applications - Sumitabha Das, 4th Edition, TMH.
4. Beej's Guide to Network Programming : <https://beej.us/guide/bgnet/>
5. Unix Network Programming - W. R. Stevens , PHI.
6. System Programming using C++ - T. Chan, Unix PHI.
7. Beginning Linux Programming - N. Mathew, R. Stones, 4th Edition, Wrox, Wiley India Edition.
8. C Programming Language - Kernighan and Ritchie, PHI.

Course articulation matrix:

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	-	-	2	-	-	1	1
CO 2	3	2	1	-	-	-	-	-	1	1
CO 3	3	2	1	1	-	-	-	-	1	1
CO 4	3	2	1	1	-	-	-	-	1	1
Weighted Average	3	2	1	1	-	2	-	-	1	1

1: Low, 2: Moderate, 3: High

Course Code: 21BS12

Objectives:

- Become familiar with difference between Information retrieval and data Base Management Systems.
- Learn different indexing techniques used in retrieval system.
- Understand the concepts of cluster analysis.
- Understand the text classification techniques.

Outcomes:

- Locate relevant information in large collections of data.
- Impart features of retrieval systems for Text data.
- Analyze the performance of retrieval systems using test collection.
- Implement different clustering algorithms.

Unit I: Boolean retrieval and classical models

An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries; The term vocabulary and postings lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Faster posting list intersection via skip pointers, Positional postings and phrase queries. Index construction – Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, dynamic indexing, other types of indexes.

Unit-II: Computing scores in a complete search system

Efficient scoring and ranking, components of an information retrieval system, vector space scoring and query operator interaction, information retrieval system evaluation, Standard test collections, Evaluation of unranked and ranked retrieval results, Assessing relevance, A broader perspective: System quality and user utility, Results snippets

Unit-III: Data Cluster analysis

What is Cluster Analysis, Different Types of clustering's, Different types of clusters, Kmeans – the basic K-means algorithm, additional Issues, K – means and different types of clusters, Strengths and weaknesses, K – means as an optimization Problem, DBSCAN – Center based approach, The DBSCAN Algorithm, Strengths and weaknesses, Fuzzy Clustering, Minimum spanning tree clustering

Unit-IV: Text classification and naive bayes

The text classification problem, Naive bayes text classification, properties of Naive bayes, feature selection, Evaluation of text classification; Support vector machines and machine learning on documents – Support vector machines and machine learning on documents - Support vector machines: The linearly separable case, Issues in the classification of text documents, Machine – learning methods in ad hoc information retrieval; Web search basics – Background and history, Web characteristics, Advertising as the economic model, The search user experience;

References:

1. Introduction to information Retrieval – Christopher D. Manning, PrabhakarRaghavan, HinrichSchutze, Cambridge University Press.
2. Introduction to Data Mining – Pang – Ning Tan, Vipin Kumar, Michael Steinbach, Pearson.
3. Information Retrieval: Algorithms and Heuristics - David A. Grossman, Ophir Frieder, Second Edition, Springer.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1										
CO 2	-	3	3	2	2	-	-	-	1	1
CO 3	1	3	3	2	2	-	-	-	1	1
CO 4	1	3	3	2	2	-	-	-	1	1
Weighted Average	1	3	2.75	2	2	2	-	-	1	1

1: Low, 2: Moderate, 3: High

Soft Core

BIG DATA ANALYTICS

3:0:1

Course Code: 21BS13

Objectives:

- To identify the characteristics of datasets and compare the trivial data and big data for various applications.
- To introduce to the students the concept and challenges of big data.
- To make students understand the implementation of parallel processing with Map Reduce.
- To teach the students to apply their skills and use tools to manage and analyze the big data.

Outcomes:

- Understand the concept and challenges of big data and why existing technology is inadequate to analyse the big data.
- Develop an ability to collect, manage, store, query, and analyse various form of big data.
- Understand the significance of No SQL databases over RDBMS.
- Map the impact of big data for business decisions and strategy.

Unit I: Wholeness of Big Data

Introduction; Understanding Big Data, Caselet: IBM Watson: A Big Data system; Capturing Big Data; Benefitting, Management, Organizing and Analysing Big data; Technology Challenges for Big Data; Big Data Sources and Applications

Unit II: Big Data Architecture and Distributed Computing Using Hadoop

Google query Architecture; Standard Big Data Architecture; Big data Architecture Examples – IBM Watson, Ebay, Netflix, Paypal; Introduction to Hadoop Framework, HDFS Design Goals, Master Slave Architecture; Installing HDFS – Reading and Writing Local files into HDFS, Reading and Writing Data Streams into HDFS

Unit III: Parallel Processing with Map Reduce:

Introduction, How Google search Works, Map Reduce overview; Sample Map Reduce Application: Word count, Map Reduce Programming, Map Reduce Jobs Execution, Hive and Pig Language capabilities

Unit IV: No SQL databases

Introduction, RDBMS Vs NOSQL, Types of NoSQL Databases, Architecture of No SQL, CAP theorem; HBase – Architecture Overview, Reading and Writing Data; Cassandra – Architecture Overview, Protocols, Data Model, Cassandra Writes and Reads, Replication

References

1. Big Data Made Accessible, Anil Maheshwari, Kindle Edition.
2. Big Data and Analytics, Seema Acharya, SubhashiniChellappan, Wiley Publisher.
3. Big Data Analytics, M. Vijayalakshmi, RadhaShankarmani, Wiley.
4. Data Science and Analytics, V.K.Jain, Khanna Publishing.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	2	2	1	-	1	-	-	-	1	1
CO 2	2	2	1	1	2	-	-	-	1	1
CO 3	3	3	3	2	3	1	-	1	3	2
CO 4	3	3	3	2	2	1	-	-	2	2
Weighted Average	2.5	2.5	2	1.66	2	1	-	1	1.75	1.5

1: Low, 2: Moderate, 3: High

Soft Core MACHINE LEARNING

3:1:0

Course Code:21BS15

Objectives:

- To acquire basic knowledge on machine learning techniques.
- To learn the techniques in the area of pattern recognition and data analytics.
- To introduce the concepts of Dimensionality Reduction and Decision Trees.
- To Impart the mechanism of Kernel machines.

Outcomes:

- Understand the basic principles of machine learning techniques.
- Understand the supervised and unsupervised machine learning algorithms.
- Choose appropriate techniques for real time problems.
- Employ the concepts of Clustering and Kernel machines.

Unit I

Introduction to Machine Learning, types of machine learning, examples. Supervised Learning: Learning class from examples, VC dimension, PAC learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised learning algorithm. Parametric Methods: Introduction, maximum likelihood estimation, evaluating estimator, Bayes' estimator, parametric classification.

Unit II

Dimensionality Reduction: Introduction, subset selection, principal component analysis, factor analysis, multidimensional scaling, linear discriminant analysis. Clustering: Introduction, mixture densities, k-means clustering, expectation-maximization algorithm, hierarchical clustering, choosing the number of clusters. Non-parametric: Introduction, non-parametric density estimation, non-parametric classification.

Unit III

Decision Trees: Introduction, univariate trees, pruning, rule extraction from trees, learning rules from data. Multilayer perceptron: Introduction, training a perceptron, learning Boolean functions, multilayer perceptron, backpropagation algorithm, training procedures.

Unit IV

Kernel Machines: Introduction, optimal separating hyperplane, v-SVM, kernel tricks, vertical kernel, defining kernel, multiclass kernel machines, one-class kernel machines. Bayesian Estimation: Introduction, estimating the parameter of a distribution, Bayesian estimation, Gaussian processes.

References

1. Introduction to Machine Learning, E. Alpaydin, 2nd edition, MIT Press.
2. Machine Learning: A Probabilistic Perspective, K. P. Murphy, MIT Press.
3. Machine Learning in Action, P. Harrington, Manning Publications.
4. Pattern Recognition and Machine Learning, C. M. Bishop, Springer.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	1	3	2	1	1	-	-	-	1	1
CO 2	3	3	3	2	1	-	-	-	1	1
CO 3	3	3	3	2	1	-	-	-	1	1

CO 4	3	3	3	2	1	-	-	-	1	1
Weighted Average	25	3	2.75	1.75	1	-	-	-	1	1

1: Low, 2: Moderate, 3: High

Soft Core

ADVANCED JAVA

3:0:1

Course Code: 21BS16

Objectives:

- Define JDBC and describe the various JDBC drivers.
- List the advantages and explain the life cycle of a Servlet.
- Understand various types of properties in Java beans.
- To know the applications of Java Server Pages.

Outcomes:

- Develop component-based Java software using JavaBeans.
- Develop server-side programs in the form of servlets.
- Implement Entity Java bean in stateless and stateful environment.
- Employ the concepts of EJB and JAR files.

Unit I: J2EE overview and JDBC

The ABC of Programming Languages, Taking Programming Languages up a notch, Distributive Systems – Real Time Transmissions, Software objects, Web services, The Tier – Clients, Resources and Components, J2EE Multi – Tier Architecture, Client tier implementation, Enterprise Application Strategy, A new Strategy, The Enterprise Application.

Unit II: Servlets

Introduction, Life cycle of servlet, A simple Java servlet, Anatomy of Java servlet – Deployment Descriptor, Reading Data from a client, Reading HTTP Request Headers, Sending Data to a client and writing the HTTP Response Header, Cookies and Tracking Sessions

Unit III: Java Server Pages

Introduction, JSP tags – Variables and Objects, Methods, Control statements, Loops, Tomcat, Request String, User Sessions, Cookies, Session objects

Unit IV: Enterprise JavaBeans

Introduction, EJB containers, classes and interfaces, Deployment Descriptors – Anatomy, Environment Elements, Referencing EJB and other resources, query element; Session Java Bean-Stateless and stateful, creating a session java bean; Entity Java Bean – Container Managed Persistence, Bean Managed Persistence; The JAR File

References:

1. The Complete Reference J2EE, Jim Keogh, 1st edition, McGraw Hill Education.
2. Core and Advanced Java, Black Book, Dreamtech Press.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	3	2	-	1	3	-	-	-	-	2
CO 2	3	2	2	2	3	-	-	-	2	3
CO 3	3	3	3	2	3	-	-	-	2	3

CO 4	3	2	2	1	3	-	-	-	2	3
Weighted Average	3	2.25	1.75	1.5	3	-	-	-	1.5	2.75

1: Low, 2: Moderate, 3: High

Soft Core

CYBER SECURITY

3:1:0

Course Code: 21BS22

Objectives:

- Understand cybercrime, legal issues and cyber offences.
- Learn hand held devices, tools and methods used in cybercrime.
- Understand organizational implications and forensics.

Outcomes:

- Understand the concept of cybercrime and offenses.
- Analyze the tools and methods used in cyber security.
- Understand the need of cyber security organizations.

Unit I: Cybercrime and Cyber offenses

Cybercrime: Introduction, Cybercrime definition and origins of the word, Cybercrime and information security, who are Cybercriminals, Classifications of cybercrimes, Cybercrime: The legal perspectives, Cybercrimes: An Indian perspective, Cybercrime and the Indian ITA 2000, a global Perspective on cybercrimes.

Cyber offenses: Introduction, How criminal plan the attacks, Social Engineering, Cyber stalking, Cybercafé and Cybercrimes, the Fuel for Cybercrime.

Unit II: Cybercrime: Mobile And Wireless Devices

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Tools and Methods Used in Cybercrime: Introduction, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

Unit III: Computer Forensics

Introduction, Historical background of cyber forensics, Digital forensics science, the need for computer forensics, cyber forensics and digital evidence, forensics analysis of email, digital forensics life cycle, Network forensics, setting up network forensics laboratory, computer forensics and steganography, Forensics and social networking: The security/privacy threats, Challenges in computer forensics, Special tools and techniques, Forensics Auditing, Anti Forensics.

Unit IV: Cyber security: Organizational Implications

Introduction, Cost of cybercrimes and IPR Issues: Lessons for Organizations, Web threats for organization, Security and Privacy Implications from Cloud Computing, Social media marketing, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling:

An essential component of cyber security., forensics best practices for organizations, Media and asset protection, importance of end point security in organizations.

References:

1. Cyber Security, Nina Godbole, SunitBelapure, 1st edition, Wiley Publication.
2. Cyber Security & Global- Kenneth J. Knapp, Information Science Reference.
3. Information Systems Security, Nina Godbole, 1st edition, Wiley India.
4. Principles of Information Security, Michael E. Whitman, Herbert J. Mattord, 6th edition, Cengage Learning.
5. Cryptography and Network Security, William Stallings, 4th edition, Pearson Publication.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO 1	2	-	-	2	2	2	1	1	1	2
CO 2	2	1	1	2	2	1	-	-	1	-
CO 3	-	-	1	2	-	2	-	-	1	2
Weighted Average	1.3	0.3	0.6	2	1.3	1.6	0.3	0.3	1	1.3

1: Low, 2: Moderate, 3: High

Soft Core

BUSINESS INTELLIGENCE

3:1:0

Course Code:21BS18

Objectives:

- Understand the basics of Business Intelligence and its evolution.
- Know the concepts of querying, reporting and OLAP architecture.
- Learn about the Business Intelligence lifecycle and its methodologies.
- Get an overview of various technologies associated with Business Intelligence.

Outcomes:

- Acquire the knowledge on Business Intelligence methodologies.
- Comprehend the User models of Business Intelligence in real time scenarios.
- Employ the lifecycle strategies on various BI capabilities.
- Compare and contrast various BI implementations in major companies.

Unit I: Introduction and Basics

Understanding Business Intelligence: Limited Resources, Limitless Decisions, Business Intelligence Defined: No CIA Experience Required, BI's Big Four, The BI Value Proposition, A Brief History of BI, Data collection from stone tablets to databases, BI's Split Personality: Business and Technology, BI: The people perspective; Meeting the BI Challenge: The BI Spectrum- Enterprise versus departmental BI, Strategic versus tactical business intelligence, Power versus usability in BI tools, Reporting versus predictive analytics

Unit II: Business Intelligence User Models and OLAP

Basic Reporting and Querying: Querying and reporting in context, Reporting and querying toolkit characteristics, Self-Service Reporting and Querying, Building and using ad-hoc queries, building simple on-demand self-service reports, Adding capabilities through managed querying/reporting, Data Access: Classical BI: pull-oriented information access, Emerging BI: pushing critical insights to users. OLAP: Online Analytical Processing: OLAP in Context, OLAP Application Functionality, OLAP Architecture: The OLAP Cube, OLAP access tools. OLAP versus OLTP

Unit III: The BI Lifecycle

The BI Big Picture: So Many Methodologies, So Little Time, Starting at the beginning, The exception to the rule: Micro-BI, Customizing BI for Your Needs: Your not-so-clean slate, Initial activities, Selecting BI products and technologies, Taking a Closer Look at BI Strategy: The Big Picture, Your Current BI Capabilities (or Lack Thereof), Assessing your business infrastructure, Assessing the technology stack, top to bottom, Keep the good stuff, Throw out the bad stuff

Unit IV: BI and Technology

Data Warehouses and BI, consolidating information across silos, Structuring data to enable BI, Data Models, Dimensional data model, Other kinds of data models, Data Marts, Operational Data Stores, The BI Software Marketplace - A little history, Mergers and acquisitions Major Software Companies in BI – Oracle, Microsoft, SAP, IBM

References:

1. Business Intelligence For Dummies- Swain Scheps, 1st edition, Wiley publishing.
2. Business Intelligence and Analytics: Systems for Decision Support, Ramesh Shardha. 10th edition, Pearson, 2014.
3. Business analytics for managers: taking business intelligence beyond reporting, Gert H.N, 2nd edition, Wiley Publishing.

Course articulation matrix:

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	1	1	-	-	-	-	1	1
CO 2	3	2	1	2	-	-	-	-	1	1
CO 3	3	3	1	2	-	-	-	-	1	1
CO 4	3	3	1	1	-	-	-	-	1	1
Weighted Average	2.75	2.5	1	1.5	-	-	-	-	1	1

1: Low, 2: Moderate, 3: High

CO 1	-	-	3	2	2	2	1	1	2	1
CO 2	-	-	-	-	2	2	1	1	-	-
CO 3	-	-	-	1	-	2	2	1	-	1
CO 4	-	-	-	2	1	1	1	1	-	2
Weighted Average	-	-	0.75	1.25	1.25	1.75	1.25	1	0.5	1

1: Low, 2: Moderate, 3: High

Soft Core

COMMUNICATION SKILLS

3:1:0

Course Code: 21BS20

Objectives:

- The factors governing good communication and how good communication skills can be developed.
- How good communication skills are a critical building block to both personal and business success.
- How to use effective communication skills in business.
- The need to modify communication depending on business situation and circumstances.

Outcomes:

- Understand and apply knowledge of human communication and language processes as they occur across various contexts from multiple perspectives.
- Understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.
- Find, use, and evaluate primary academic writing associated with the communication discipline.
- Communicate effectively orally and in writing.

Unit I

Importance of communication, its basic model, formal and informal communications, barriers to communication, feedback and its effectiveness, Non- Verbal communication.

Unit II

Oral communication, Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills, – Public speaking- Expressing Techniques, understanding your audience, importance of listening, role of visual aids, persuasive communication.

Unit III

Written communication – Good writing – Styles and Principles – Text, Email, Memorandums, reports, Letters, resume writing.

Unit IV

Group Discussion, Interview skills- types of interviews, telephonic interview, Time management, Stress management.

References

1. Business Communication for Success, University Of Minnesota Libraries Publishing Edition, 2015.
2. Soft skills: know yourself & know the world, Dr. Alex K.
3. Basic Management skills for all, S J McGrath E H, 9th Edition, PHI Learning.

Course articulation matrix:

PO										
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10

CO 1	-	-	-	-	2	-	3	3	2	3
CO 2	-	-	3	3	2	3	-	3	3	3
CO 3	-	3	3	-	2	2	-	3	3	3
CO 4	-	-	3	3	-	2	-	3	3	3
Weighted Average	-	3	3	3	2	2.33	3	3	2.75	3

1: Low, 2: Moderate, 3: High

M.Sc.(Computer Science)

Soft Core **JAVA PROGRAMMING** [3:0:1]

Course Code:19J1S1

Objectives:

- To gain an understanding of the object oriented paradigm and concepts in general.
- Learn the basics of the Java environment and the programming language.
- To learn how to implement different object oriented concepts in Java.
- To learn about using files and creating packages.

Outcomes:

- Understand different aspects of object oriented paradigm.
- Develop an ability to model problems and solutions using java.
- Able to utilise inheritance, polymorphism and other principles to model solutions.
- Able to create and use packages.

Unit I: Object-Oriented Programming (OOPS) concepts:

Classes & Objects, Pillars Of Object Oriented Programming, OOPS concepts and terminology, Encapsulation & Examples, Abstraction & Examples, Inheritance: Advantages of OOPS, What is Java?, Execution Model Of Java, Bytecode, First Java Program, Compiling and Interpreting Programs, The JDK Directory Structure, Data types and Variables: Primitive & non-Primitive Datatypes & Declarations, Variables & Types, Numeric & Character Literals, String formatting and Parsing, String Literals, The Dot Operator.

Unit II: Methods:

What are Methods? Method Structure, Declaration Of Methods, Calling Of Methods, Defining Methods, Method Parameters Scope, static methods, Operators and Expressions: Expressions, Operator Precedence, The Cast Operator, Control Flow Statements, While and dowhile Loops, for Loops, The continue Statement, The break Statement, Objects and Classes: Defining a Class, Creating an Object, Accessing Class Members, Instance Data and Class Data, Defining Methods, Constructors, Access Modifiers, Inheritance & Polymorphism: Inheritance in Java, Types Of Inheritance, Method Overloading, Run-time Polymorphism, Method Overriding, super keyword.

Unit III: Java Files and I/O:

What is a Stream?, Reading and Writing to Files (only txt files), Input and Output Stream classes, using the file class, Using Streams, creation of files, reading/writing characters, bytes, Interfaces and Abstract Classes: What is an Interface, Defining Interfaces, Separating Interface and Implementation, Implementing and Extending Interfaces, Abstract Classes.

Unit IV: Packages:

What is a Package?, Advantages of using a Package, Types Of Packages, Naming Convention, Steps For Creating Packages, The import Statement, Static Imports,

CLASSPATH and Import, Defining Packages, Package Scope, Exception Handling: Exceptions Overview, Exception Keywords, Catching Exceptions, The finally Block, Exception Methods, Declaring Exceptions, Defining and Throwing Exceptions, Errors and Runtime Exceptions, Assertions.

References:

1. Programming with JAVA- A Primer, E. Balagurusamy, Tata Mc-Graw-Hill.
2. JAVA for you- P Koparkar, Tata Mc-Graw-Hill.

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	-	3	2	-	2	3
CO 2	-	3	2	-	2	3
CO 3	-	3	3	-	2	3
CO 4	-	3	3	-	2	3
Weighted Average	0	3	2.5	0	2	3

1: Low, 2: Moderate, 3: High

Hard Core

DATABASE MANAGEMENT SYSTEMS

[

3:0:1]

Course Code:19J2H3

Objectives:

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database.
- Comprehend the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Outcomes:

- Comprehend data models and schemas in DBMS.
- Use SQL- the standard language of relational databases.
- Understand the functional dependencies and design of the database.
- Understand the concept of Transaction and Query processing.

Unit I

Overview of Database Systems and Entity- Relationship Model

A historical perspective, file system versus a DBMS, advantages of a DBMS, levels of abstraction in a DBMS, structure of a DBMS, people who work with databases, entity, entity types, entity sets, attributes, keys, relationships, relationship sets and additional features of ER-model-key constraints, participation constraints and weak entities.

Unit II

Relational model, Relational Algebra and Structured Query Language Relational model- Concepts, relational constraints and relational database schemas. Relational algebra - Basic and additional relational operations with examples. Data definition, constraints and schema changes in SQL, Basic queries in SQL: insert, delete and update statements and joins in SQL, views in SQL.

Unit III

Database Design, Overview of storage and indexing Informal design guidelines for relational schemas, functional dependencies, normal forms, general definitions of first, second, third and boyce-codd normal forms. File organization and indexing: sequential file organization, heap file organization, clustered indexes primary and secondary indexes, hash based indexing and B+ tree-based indexing.

Unit IV

Overview of transaction management The ACID properties, consistency and isolation, atomicity and durability, transaction on schedules, concurrent execution of transactions, motivation for concurrent execution, serializability, anomalies due to interleaved execution, lock-based concurrency control, strict two phase locking and performance of locking.

References

1. Fundamentals of Database Systems by Navathe and Elmasri –Pearson Education, Fifth Edition.
2. Database Systems Concepts, 3rd edition by Abraham Silberschatz, Henry Korth and S. Sudarshan, Tata McGraw Hill.
3. Principles of database systems by Ullman, Computer Science press.
4. DBMS by Prof. S.Nandagopalan, 7th Revised Edition.

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	1	2	2	-	1	1
CO 2	2	3	3	-	2	2
CO 3	1	2	1	-	1	1
CO 4	1	2	1	-	1	-
Weighted Average	1.25	2.25	1.75	0	1.25	1.33

1: Low, 2: Moderate, 3: High

Soft Core COMPUTER GRAPHICS

[2:1:1]

Course Code:19J2S2

Objectives:

- Provide an overview of various device level algorithms.
- Provide an understanding of homogeneous coordinates and various 2D and 3D transformations
- Provide an introduction to 3D concepts like projections, curves.
- Make the students understand how to implement the computer graphics concepts using OpenGL.

Outcomes:

Acquire knowledge and understanding of:

- The structure of an interactive computer graphics system, and the separation of system components.
- Device level algorithms that renders various shapes and clipping operations.
- 2D and 3D geometrical transformations and viewing.
- Techniques for representing 3D geometrical objects.

Unit I

Graphics hardware: Video display devices, Raster-scan systems, Graphics software: Coordinate representations, Graphics functions, standards, Introduction to OpenGL.

Graphics Output Primitives: Coordinate reference frames, Two-Dimensional reference frame in OpenGL, OpenGL Point Functions, Line Functions, Curve functions.

Scan-Conversion: Line-Drawing Algorithms: DDA, Bresenham's, Setting frame-buffer values, Circle-Generating algorithms : Midpoint Circle Algorithm.

Unit II

Filled area primitives: Scan-line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm, Inside-outside tests. Brief overview on Anti aliasing methods. 2D geometrical transformations: Basic two-dimensional geometric transformations, Homogeneous Coordinates and Matrix Representation, Inverse Transformations, Brief overview of Composite transformations, Reflection, Shear, OpenGL functions for two-dimensional geometric transformations, Programming examples.

2D viewing: Windows and viewports, Two-dimensional viewing pipeline, clipping window, Normalization and viewport transformations, Brief overview of OpenGL 2D viewing functions.

Unit III

2D Clipping Algorithms: Point clipping, Line clipping: Cohen-Sutherland and Liang-Barsky Line clipping, polygon fill-area clipping: Sutherland-Hodgman algorithm, Text clipping.

3D geometrical transformations: 3D translation, 3D scaling. 3D rotation: coordinate-axis rotations, general 3D rotations, Other 3D transformations, Affine transformations, OpenGL geometric transformation functions.

Unit IV

Three-dimensional viewing: Overview, Three-dimensional viewing pipeline, Projection transformations, 3D viewing functions. Spline representations : Interpolation and Approximation splines, parametric and Geometric continuity conditions, Bezier spline curves, B-Spline curves. Visible surface detection : Classification of visible surface detection algorithms, Back-Face detection, Depth buffer method.

References

1. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Fourth Edition, Pearson India Education Services.
2. Computer Graphics Principles & Practice in C, Foley, Vamdam, Feiner, Hughes, Pearson Education.
3. Open GL Super Bible : Comprehensive Tutorial and Reference, Richard S Wright and Jr. Michael Sweet, 7th Edition, Pearson Education.
4. Computer Graphics, Roy A. Plastock, Gordon Kalley, Schaum's Outlines, McGraw Hill.
5. Computer Graphics 2nd Edition (Paperback) by Steven Harrington, Tata McGraw Hill.

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	3	3	-	-	-	1
CO 2	3	3	-	-	-	1
CO 3	3	3	-	-	-	1
CO 4	3	3	-	-	-	1
Weighted Average	3	3	-	-	-	1

1: Low, 2: Moderate, 3: High

Soft Core

WEB TECHNOLOGIES

[3:0:1]

Course Code:19J2S5

Objectives:

Help students understand:

- Basics of Internet and how communication happens over the World Wide Web.
- The basic building blocks of web pages using HTML and CSS.
- Use of Java script and PHP.
- How Data driven, dynamic web pages can be created using database connectivity.

Outcomes:

Develop ability to:

- Implement HTML5 pages using fundamental tags.
- Develop style sheet using CSS for a given problem.
- Extend JavaScript to validate a form with event handler for a given problem.
- Develop a dynamic website with database backend.

Unit I

Introduction to Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security. Quick introduction to HTML5 : Creating simple web page, basic text formatting, presentation elements, phrase elements, lists, font, grouping elements, basic links, internal document links, email link, Image, Audio and Video, image maps, image formats, Adding flash content and video, Tables– attributes, nested tables, Forms – Attributes, form controls, Frames – Frame set, nested frames, attributes. Introduction to HTML 5 - New tags of HTML 5 – embedding Media content, building input forms, painting on canvas.

Cascading Style Sheet : Introduction, Levels of Style Sheet and specification formats, embedded style sheet, External Style Sheet, inline Style Sheet, Class and ID method, DIV and SPAN tags, Inheritance with CSS, Introduction to CSS 3, HTML 5 and CSS3.

Unit II

JavaScript: JavaScript in HTML, Language Basics – Variables, operators, statements, functions, Data type conversions, reference types, Document object Model - browser object model – window object, location object, navigator object, screen object, history object, Events and Event handling, Button elements, Navigator object, validations with regular expressions. Introduction to Dynamic documents, Positioning elements, moving elements, elements visibility, changing colors and fonts, dynamic content, Locating mouse cursor, reacting to a mouse click, dragging and dropping of elements.

Unit III

PHP : Introduction to Server side Programming, Introduction to PHP , PHP and HTML, essentialsof PHP, Why Use PHP, Installation of Web Server, WAMP Configurations, Writing simple PHPprogram, embedding with HTML, comments in PHP, Variables, Naming Conventions, Strings,String Concatenation, String functions, float functions, Arrays, Array – Key pair value, Arrayfunctions, is SET, UNSET, gettype(), settype(), control statements (if, switch), Loops, User DefinedFunctions (with argument, return values), global variable, default value, GET - POST method, URLencoding, HTML Encoding, Cookies, Sessions, Include statement. File:read and write from the file.Ethical use of features of PHP.

Unit IV

PHP with MySQL, Creating Connection, Selecting Database, Perform Database (query), Use returned data, close connections, file handling in PHP – reading and writing from and to FILE.Using MySQL from PHP (Building a Guestbook).

References

1. Beginning HTML, XHTML, CSS, and JavaScript, Jon Duckett, Wiley Publishing.
2. JavaScript Step by Step, Microsoft Press, Steve suehring, 2nd Edition, PHI.
3. Beginning PHP 5.3, Matt Doyle, Willey Publishing.

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	-	3	-	-	1	1
CO 2	-	3	-	-	1	1
CO 3	1	3	2	-	1	1
CO 4	1	3	2	-	1	1
Weighted Average	1	3	2	0	1	1

1: Low, 2: Moderate, 3: High

HC PYTHON PROGRAMMING

[3:0:1]

Course Code:19J3H2

Objectives:

- Understand programming paradigms brought in by Python.
- To learn to use python for text processing and file handling, with a focus on RegularExpressions, List and Dictionaries.
- Learn how to use python for Data mining with a case study.
- Learn how to use python for Image processing with a case study.

Outcomes:

- Develop ability to program in Python with hands on Regular Expression, and write TextProcessing scripts.
- Write file handling scripts.
- Learn to use Python for Data and Image processing.
- Get hands on experience of Cluster Analysis using Python.

Unit I

Python Fundamentals: Introduction, Python Objects, Built-in Functions, Numbers and Strings,Conditionals and Loops, Functions, Passing Arguments, String FunctionsOperators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples File Objects, File Built-in Function,File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, FileSystem, File Execution, Persistent Storage Modules

Unit II

Regular Expressions: Introduction/Motivation, Special Symbols and Characters for REs, REs andPython. Dictionaries: Introduction, Operators, Built-in Functions, Built-in Methods, DictionaryKeys.Data Processing: Storing in List and Strings, Dispersion, Central Tendency, Mean Median Mode,Frequency Distribution, Standard Deviation Using Files for large dataset, statistics with real data,reading data from internet, Accessing Stock Market Data, Correlating Stock data

Unit III

Image Processing and Data Mining: Introduction, RGB Color Model, Object for Image Processing,Image Processing (Negative Images, Gray Scale, Resizing, Stretching, Flipping, Edge Detection)

Unit IV

What is Data Mining? Implementing Cluster Analysis on Simple Data, Distance between twopoints, Clusters and Centroids, File Processing, Visualization.

References

1. Core Python Programming, Chun, J Wesley, Second Edition, Pearson.
2. Python Programming in Context, Bradley N Miller, David L Ranum, Second Edition.
3. Head First Python, Barry, Paul, 2nd Edition, ORIelly.
4. Learning Python, Lutz, Mark, 4th Edition, ORIelly.
5. “The Python Tutorial” at <https://docs.python.org/3/tutorial/index.html>
6. “Beginners Guide to Python” at <https://wiki.python.org/moin/BeginnersGuide>

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	-	2	1	-	3	3
CO 2	-	2	1	-	3	3
CO 3	2	3	1	-	3	3
CO 4	3	3	1	-	3	3
Weighted Average	2.5	2.5	1	0	3	3

1: Low, 2: Moderate, 3: High

Soft Core

C# PROGRAMMING

[3:0:1]

Course Code:19J3S3

Objectives:

- To provide an overview of the .NET framework.
- Understand Object-Oriented Paradigm using C# programming.
- Learn extended OOP's concept in C# environment.
- Understand the concepts of interfaces and multithreading.

Outcomes:

- Acquire the knowledge of .NET framework.
- Develop an ability to write programs in C#.
- Implement the extended OOP's concept in C# environment.
- Develop applications using standard C# libraries.

Unit I

Understanding .NET: The C# Environment: The .Net Strategy, The Origins of .Net Technology, The .NET Framework, The Common Language Runtime, Framework Base Classes, Benefits of the .NET Approach. Overview of C#: Introduction, A Simple C# Program, Namespaces, Adding Comments, main Returning a Value, Using Aliases for Namespace Classes, passing String Objects to Write Line Method, Command Line Arguments, Main with a Class, Providing Interactive Input, Using mathematical Functions, Multiple main Methods, Compile Time Errors, Program Structure, Program Coding Style. Methods in C# Introduction, Declaring Methods, The Main Method, Invoking Methods, Nesting of Methods, Method Parameters, Pass by Value, Pass by Reference, The Output Parameters, Variable Argument Lists, Method Overloading. Arrays, Strings, Structures and Enumerations.

Unit II

Classes and Objects: Introduction, Basic Principles of OOP, Defining a Class, Adding Variables, Adding Methods, Member Access Modifiers, Creating Objects, Accessing Class members, Constructors, Static Members, Static Constructors, Private Constructors, Copy Constructors, Destructors, Member Initialization, The this Reference, Nesting of Classes, Constant Members, Read-only Members, Properties, Indexers. Operator Overloading: Introduction, Overloadable Operators, Need for Operator Overloading, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Comparison Operators.

Unit III

Inheritance: Introduction, Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel Inheritance,

Hierarchical Inheritance. Run-Time Polymorphism: Overriding methods, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, and Sealed Methods. Managing Errors and Exceptions: Introduction, What is Debugging?, Types of Errors, Exceptions, Syntax of Exception handling Code, Multiple Catch Statements, Using Finally Statements, Nested Try Blocks, Throwing Our Own Exceptions, Checked and Unchecked Operators.

Unit IV

Interfaces: Introduction, Defining an Interface, Extending an Interface, Implementing Interfaces, Interfaces and Inheritance, Abstract Class and Interfaces. Multithreading in C#: Introduction, Understanding the System. Threading Namespace, Creating and Starting a Thread, Scheduling a Thread, Synchronizing Threads, Thread Pooling. Delegates and Events: Introduction, Delegates, Delegate Declaration, Delegate Methods, Delegate Instantiation,

References

1. PROGRAMMING IN C# - A PRIMER by E Balaguruswamy, Third Edition, and Tata McGraw-Hill.
2. C# 4.0: The Complete Reference by Herbert Schildt, Tata McGraw-Hill.

Course Articulation Matrix

PO	PO1	PO2	PO3	PO4	PO5	PO6
CO						
CO1	-	3	1	-	-	2
CO2	-	2	1	-	-	1
CO3	-	3	2	-	-	1
CO4	-	3	2	-	-	2
Weighted Average	-	2.75	1.5	-	-	1.5

1: Low, 2: Moderate, 3: High

Soft Core

ANDROID PROGRAMMING

[3:1:0]

Course Code:19J3S4

Objectives:

- Learn to build simple android applications.
- Get an understanding of essentials of application design and user interface design.
- Understand different android APIs used to store and manage the data through SQLite.
- Understanding different android networking and web APIs to share the data between the applications.

Outcomes:

- Build sample android application.
- Develop user interfaces for android applications.
- Develop android applications to share data between different applications.
- Deploy android applications.

Unit I: Introduction to Android

History of Mobile Software Development, The Open Handset Alliance, The Android Platform Android SDK, Building a sample Android application, Anatomy of Android applications, Android terminologies.

Unit II: Android Application Design Essentials

Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, AndroidManifest File and its common settings , Using Intent Filter, Permissions , Managing Application resources in a hierarchy , Working with different types of resources.

Unit III: Android User Interface Design Essentials

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Unit IV: Using Android APIs

Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers , Using Android Networking APIs , Using Android Web APIs, , Deploying (selling) your Android application

References:

1. “Android Wireless Application Development”, Lauren Darcey and Shane Conder, 2nd edition, Pearson Education.
2. “Professional Android 2 Application Development”, Reto Meier, Wiley India.

Course Articulation Matrix

PO	PO1	PO2	PO3	PO4	PO5	PO6
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CO						
CO1	2	3	2	-	1	1
CO2	3	3	2	-	1	2
CO3	3	3	2	-	2	2
CO4	3	3	3	-	2	2
Weighted Average	2.75	3	2.25	-	1.5	1.75

Soft Core

BIG DATA ANALYTICS

[3:1:0]

Course Code:19J3S5

Objectives :

- To identify the characteristics of datasets and compare the trivial data and big data for various applications.
- To introduce students the concept and challenge of big data.
- To know the implementation of parallel processing with Map Reduce.
- To teach students in applying skills and tools to manage and analyze the big data.

Outcomes :

- Understand the concept and challenges of big data and why existing technology is inadequate to analyse the big data.
- Develop an ability to collect, manage, store, query, and analyse various form of big data.
- Understand the significance of No SQL databases over RDBMS.
- Map the impact of big data for business decisions and strategy.

Unit I: Wholeness of Big Data

Introduction; Understanding Big Data, Caselet: IBM Watson : A Big Data system; Capturing BigData; Benefitting, Management, Organizing and Analyzing Big data; Technology Challenges for Big Data; Big Data Sources and Applications

Unit II: Big Data Architecture and Distributed Computing Using Hadoop

Google query Architecture; Standard Big Data Architecture; Big data Architecture Examples – IBM Watson, Ebay, Netflix, Paypal; Introduction to Hadoop Framework, HDFS Design Goals, MasterSlave Architecture; Installing HDFS – Reading and Writing Local files into HDFS, Reading and Writing Data Streams into HDFS

Unit III: Parallel Processing with Map Reduce:

Introduction, How Google search Works, Map Reduce overview; Sample Map Reduce Application: Word count, Map Reduce Programming, Map Reduce Jobs Execution, Hive and Pig Language capabilities

Unit IV: No SQL databases

Introduction, RDBMS Vs NOSQL, Types of NoSQL Databases, Architecture of No SQL, CAP theorem; HBase – Architecture Overview, Reading and Writing Data; Cassandra – Architecture Overview, Protocols, Data Model, Cassandra Writes and Reads, Replication

References

1. Big Data Made Accessible by Anil Maheshwari.
2. Big Data Analytics by M. Vijayalakshmi Radha Shankarmani

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	1	-	-	-	3	2
CO 2	3	3	2	-	2	2
CO 3	2	2	-	-	3	2
CO 4	3	2	-	-	2	2
Weighted Average	2.25	1.75	2	0	2.5	2

Soft Core ADVANCED DATABASE MANAGEMENT SYSTEM [2:1:1]

Course Code:19J4S2

Objectives:

- To evaluate emerging architectures for database management systems.
- To develop an understanding the manner in which relational systems are implemented and the implications of the techniques of implementation for database performance.
- To assess the impact of emerging database standards on the facilities which future database management systems will provide.

Outcomes:

- Critically assess new developments in database technology.
- Interpret the impact of emerging database standards.
- Evaluate the contribution of database theory to practical implementations of database management systems.

Unit I: Database Design Methodology, Query Processing and Physical Design

Database Design and Implementation process, UML diagrams as an aid to Database Design Specification, Overview of Query Processing : Measures of Query cost, Algorithms for SELECT and JOIN Operations, Pipelining : Implementation of Pipelining, Evaluation algorithms for pipelining, Overview of Query Optimization, Physical Database Design in Relational Databases.

Unit II: Transaction Processing Concepts, Object and Object-Relational Databases

Introduction to Transaction Processing: Transaction and System Concepts, Desirable Properties of Transactions, Transaction Support in SQL. Concepts for Object Databases: Overview of Object-Oriented Concepts, Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type Hierarchies and Inheritance. Overview of the Object Model of ODMG, Overview of SQL and its Object-Relational Features, Evolution of Data Models and Current Trends.

Unit III: Security, Advanced Modelling and Distribution

Database Security : Security issues, Enhanced Data Models for Advanced Applications: Active Database Concepts and triggers, Distributed Databases: Distributed Database Concepts, Data Fragmentation, Transparency, Distributed Transactions, Types of Distributed Database Systems, Overview of Concurrency Control Distributed Databases.

Unit IV: Emerging Technologies

Overview of Data Mining Technology, Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographic Information Systems (GIS).

References:

1. Fundamentals of Database Systems – Fifth Edition – Ramez Elmasri, Shamkant B Navathe.
2. Database System Concepts – Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Fifth Edition- McGraw – Hill.

3. Database Systems – Thomas Connolly, Carolyn Begg – Third Edition – Pearson Education.
4. An Introduction to Database Systems – Eight Edition- Date C J - Addison Wesley.
5. Strategic Database Technology – Simon A R, Morgan Kaufmann.

Course Articulation Matrix

PO	PO1	PO2	PO3	PO4	PO5	PO6
CO						
CO1	3	2	1	-	1	1
CO2	3	3	2	-	2	2
CO3	3	3	3	-	2	3
CO4	3	3	2	-	2	2
Weighted Average	3	2.75	2	0	1.75	2

1: Low,2:Moderate,3: High

[3:1:0]

PO	PO1	PO2	PO3	PO4	PO5	PO6
CO						

CO1	3	3	1	-	2	1
CO2	3	3	1	-	2	1
CO3	3	3	1	-	2	1
CO4	3	3	1	-	2	1
Weighted Average	3	3	1	0	2	1

Soft Core

COMMUNICATION SKILLS

[4:0:0]

Course Code:19J1S4

Objectives:

- The factors governing good communication and how good communication skills can be developed.
- How good communication skills are a critical building block to both personal and business success.
- How to use effective communication skills in business.
- The need to modify communication depending on business situation and circumstances.

Outcomes:

- Understand and apply knowledge of human communication and language processes as they occur across various contexts from multiple perspectives.
- Understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.
- Find, use, and evaluate primary academic writing associated with the communication discipline.
- Communicate effectively orally and in writing.

Unit I

Importance of communication, its basic model, formal and informal communications, barriers to communication, feedback and its effectiveness, Non- Verbal communication - Etiquettes.

Unit II

Oral communication, Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills, – Public speaking- Expressing Techniques, importance of listening, role of visual aids, persuasive communication.

Unit III

Written communication – Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

Unit IV

Interview skills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview- Mock Interview - Quick Tips.

References

1. Soft skills: know yourself & know the world, Dr. Alex K.
2. Communication for results – C Hamilton & Parker.
3. Instrument of Communication – P Meredith.
4. Basic Management skills for all – E H McGrath.
5. Managerial Communication – P M Timm.

6. Thesis and Assignment writing – Anderson.

Course articulation matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	-	-	2	3	1	-
CO 2	1	-	3	-	2	2
CO 3	-	3	3	3	-	-
CO 4	1	2	3	3	2	3

1: Low, 2: Moderate, 3: High

Course code: 20A101

HC 01: BUSINESS COMMUNICATION

Total Credits: 4 per week

Credit Pattern: 3:1:0

No of hours: 5

1. Course Description:

The course covers the various aspects of communication which will enable the students to equip themselves to effectively communicate both in personal life and in business. These aspects include a decent knowledge on the process of communication, forms of communication, effective writing skills, effective oral and digital presentation skills which is most vital in today's business scenarios.

2. Course Objectives:

This course subject will help the students;

- To learn various aspects of business communication and communication skills
- To familiarize with the mechanics of writing
- To communicate in English precisely and effectively through oral and written form
- To learn the presentation skills required in business communication

3. Course Contents:

Module 1: Elements of Communication: Meaning & Definition, Role, Communication Process–Importance of communication in business and management – Communication structure in organizations- Horizontal, Vertical, upward, downward, crosswise and spiral – Communication channels – Communication in conflict (Barriers)/tips to overcome the communication conflicts.

Module 2: Verbal and Non-Verbal Forms of Communication: Verbal; oral and written – Non-verbal; Kinesics, Paralinguistic, Proxemics and Chronemics.

Communication technology – overview, types of communication technology: Telephone, mobile phones, emails, teleconferencing, audio conferencing, video conferencing, webinar (Skype, zoom), etc.

Module 3: Business Correspondence: Introduction to business letters – Types of Business Letters –acknowledgement letters – recommendation letters – acceptance letters – sales letters – appreciation letters – correspondence through email for all the types of letters mentioned above.

Meeting notices – circulars – memo – public notices – agenda for a meeting – minutes of a meeting –inviting quotations – Request for Tenders (RFT) - Placing orders

Module 4: Report writing and Presentation skills: Business reports – types of reports structure of a report – specimen reports – Precise writing– summarizing skills.

Presentation skills – preparing text and slides – audience awareness – visual aids – making effective Power Point Presentation – physical appearance and posture – practicing and delivery of presentation – checklist for Power Point Presentation – Mock Presentations by students.

COURSE OUTCOME:

CO 1: Learn the communication structure in an organization

CO 2: Use of technology in various forms for business communication

CO 3: Draft various business letters and business reports

CO 4: Make effective presentations through oral and digital means

Reference Books:

1. Business Correspondence and report writing - R. C. Sharma and Krishna Mohan
2. Business Communication – Urmila Rai
3. Communication Skills – Sanjay Kumar
4. Business Communication – Meenakshi Raman

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	3	-	-	-	3	2	-
CO2	1	1	3	-	-	3	-	-
CO3	2	3	3	-	-	3	-	-
CO4	-	-	3	-	-	3	2	-
Weighted Average	0.75	1.75	2.25	-	-	3.00	1.00	-

Course code: 20A104

HC04: BUSINESS RESEARCH METHODS

Total Credits: 4

Credit Pattern: 3:1:0

No of hours:5 per week

1. **Course Description:** This course provides the coverage of business research methods, ethical issues in business research methods, research process, data collection methods, designing of questionnaire, various statistical tools like univariate and bivariate analysis and report writing.
2. **Course Objectives:** The course is envisaged to provide the student the knowledge and skill related to conduct of research related to business. This basic course familiarizes the student with the technicalities of executing a research assignment, in particular the applied research domain.
3. **Pedagogy:** The lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content. This session focuses on student involved and student driven content study. Identified groups of students make presentations and interact with both the faculty and the other students. The aspects reinforced through lecture and tutorial is taken up for practical study. Here the students would undertake field exercises related to different aspects of the course contents.

4. Course Contents:

Module: 1 Business Research: Meaning – types - process of research- management problem - defining the research problem - formulating the research Hypothesis - developing the research proposals - research design formulation - sampling design - planning and collecting the data for research - data analysis and interpretation - Research Application in business decisions - Features of good research study-Ethics in research, Plagiarism, Digital Technologies and falsifications.

Background to Research: Developing research questions-Research paradigms- Contributions of research to theory and practice-Importance of scientific research in business decision making - Types of research and research process

Module: 2 Types of Business Research Design: Exploratory and Conclusive Research Design Exploratory Research: Meaning, purpose – methods - secondary resource analysis, comprehensive case methods, expert opinion survey, focus group discussions - Conclusive research Design - Descriptive Research – Meaning - Types-cross sectional studies and longitudinal studies - Experimental research design-Meaning and classification of experimental designs - Pre experimental design, Quasi - experimental design – True experimental design, statistical experimental design - Observation Research – Meaning – Uses - Participation and Non-participation – Evaluation - Conducting an Observation study - Data collection.

Literature Review: Identifying - accessing and managing information and scholarly literature - Academic writing and referencing - Literature review development- Argumentation and synthesis

Module: 3 Measurement and Data Collection: Primary and Secondary data Primary data collection methods – Observations – survey - Interview and Questionnaire - Qualitative Techniques of data collection. Questionnaire design – Meaning - process of designing questionnaire - Secondary data –Sources- advantages and disadvantages Measurement and Scaling Techniques: Basic measurement scales-Nominal scale - Ordinal scale - Interval scale - Ratio scale. Attitude measurement scale - Likert's Scale - Semantic Differential Scale - Thurston scale - Multi-Dimensional Scale – Data Processing

Sampling: Concepts - Types of Sampling - Probability Sampling - simple random sampling, systematic sampling - stratified random sampling - cluster sampling -Non Probability Sampling-convenience sampling-Judgemental sampling-snowball sampling - quota sampling - Errors in sampling

Module: 4 Preparing the Data for Analysis: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation. Errors in Hypothesis Application of statistical tools for the analysis of data. Technology in research. Report writing and presentation of results: Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Course Outcome:

CO1: Identify the Research problems in the area of Business and Commerce

CO 2: Write a literature review that synthesizes and evaluates literature in a specific topic area to justify a research questions

CO 3: Apply appropriate research design and methods to address a specific research question and acknowledge the ethical implications of the research

CO 4: Develop a research proposal/research paper on the basis their study.

CO 5: Present and defend a research proposal/ research paper.

References:

1. Business Research Methods, William G. Zikmund, The Dryden Press
2. Research for Development: A Practical Guide, Sophie Laws, VISTAAR Publications

3. Methodology in Social Research, ParthaNath Mukherjee, Sage Publications
4. Research Methodology –Concepts and Cases by Seepak Chawla and Neena Sodhi, Vikas Publications.

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	-	3	-	-	-
CO2	3	3	-	-	3	1	-	-
CO3	-	3	3	3	3	-	-	-
CO4	3	-	3	-	2	3	-	-
CO5	-	3	3	-	3	3	-	-
Weighted Average	1.8	2.4	2.2	0.6	2.8	1.4	-	-

Course code: 20A107

SC03: ADVANCED AUDITING

Total Credits: 4

CreditPattern:3:1:0

No of hours:5 per week

1. Course Description:

This paper is to educate the present auditing practices, conceptual understanding, different terminologies, International Auditing practices, comparison with Indian Auditing practices. To know leading & Top Auditing Firms and its importance, to learn Auditing and Digitalization, Indian Standards on Auditing (SA), major scams in India and its impact on economy of the Country.

2. Course Objectives:

After completion of the course the students should capable with:

- a) To understand the conceptual ideology of auditing and its practices.
- b) To know the importance of auditing with different accounting practices.
- c) To compare the national auditing practices with international auditing principles.
- d) To have a detailed knowledge on Auditing Standards and its uses.
- e) To evaluate impact of auditing on the Indian & global economy and its contribution for the economic development.

3. Pedagogy:

The course content is covered class room lecture, students' interaction/seminar, case discussion, major scams and work out the practical insight of auditing issues, challenges as an auditor and also visiting companies for practical exposure. Practical Works: Auditing, Standards, Practice Manuals, Leading and pending cases on auditing issues, on-line auditing methods, proper scrutiny and verification of accounting for best auditing practices.

4. Course Contents:

Module 1: Introduction - Objectives of Auditing, Different Types of Auditing - Auditor - Qualification, Qualities, Rights and Duties, Ethics in auditing, Audit of Auditors, Rotation of Auditors - Computerized Environment - Auditing and Digitalization, Audit Programme - Internal Check and Internal Control - Government Accounting - Professional Accounting - Auditing Boards - GAAS, CAG, PCAOB case studies

Module 2: Auditing Standards and Audit Procedures

Auditing Standards - Generally Accepted Auditing Standards - Introductory Matters SA 100-199 - General Principles and Responsibilities SA 200-299 - General Activities SA 1200 - Auditor Communications SA 260 - Quality Control for an Audit of Financial Statements - Statements SA 220 and Guidance Notes - Case studies

Audit Procedures - Audit Planning and Risk Assessment SA 300-499 - Auditing Internal Control Over Financial Reporting - Audit Procedures in Response to Risks – Nature – Timing - and Extent - Auditor's Responsibilities Regarding Supplemental and Other Information - Concluding Audit Procedures, Post-Audit Matters - Case Studies

Module-3: Audit Reports - Auditor Reporting SA 700-799 - Reporting on Audits of Financial Statements - Other Reporting Topics - Matters Relating to Filings Under Federal Securities Laws - Other Matters Associated with Audits (SA 6101, SA 6105, SA 6110, SA 6115) - Standards on Quality Control (SQC's) - Standards on Auditing (SAs) - Audit Committee and Corporate Governance - Audit of Limited Companies Schedule III of Companies Act 2013 - Environmental Auditing, Audit Data Analytics - Case Studies - Leading & Top Auditing Firms –Case studies.

Module: 4: Audit Regulation and Laws - CAG Recommendations, Hierarchy of Audit regulations in India, Investigation, Forensic Audit - Peer and Quality Review - Auditing Software – Winman – SAP - Audit related Penalties - Imprisonment and Prosecution - Rethinking of Audit - International Auditing Practices - Comparison with Indian Auditing practices - Indian Standards on Auditing (SA) - Major Scams in India and its Impact on Economy of the Country - Case Studies - Kingston Cotton Mill Company 1896 – Sahara and Subratha Rai Case Study.

Course Outcomes

- CO-1: Knowing the Indian Auditing Standards and Audit Procedures.
- CO-2: Learning the auditing practice of different sectors.
- CO-3: Preparation of audit report as per CARO 2016.
- CO-4: Practice of audit through online.

References:

1. A Hand Book of Practical Auditing – by B.N. Tandon, S. Sundhara bahu& S Sudharsnam, Publisher: S.Chand Publishing, New Delhi.
2. Advanced Auditing and Professional Ethics – ICAI, [https://www.icaai.org/Auditing Standard](https://www.icaai.org/Auditing%20Standard)
3. Internal Audit Practice from A to Z, Patrick Onwura Nzechukwu, Book

Store, <https://bookstore.theiia.org/>

4. Advanced Auditing & Professional Ethics, By CAPanakjGarg,
5. Simplified Approach to Advanced Auditing and Professional Ethics byVikas Oswal
6. <https://www.cag.gov.in/content/audit-regulations>
7. <https://www.aicpa.org/research/standards/auditattest/sas.html>
8. <https://www.investopedia.com/terms/g/gaas.asp>
9. <https://www.dummies.com/business/accounting/auditing/generally-accepted-auditing-standards/>

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	2	-	-	-	-
CO2	3	3	-	-	-	-	-	-
CO3	-	3	-	-	-	3	-	-
CO4	-	3	2	-	-	-	-	-
Weighted Average	1.5	2.25	0.5	0.5	-	0.75	-	-

Course code: 20A204

SC04: COMPUTER APPLICATIONS IN COMMERCE

Total Credits: 4

Credit Pattern: 3:1:0

No of hours: 5 per week

1. Course Description:

This course is designed to provide knowledge and skills in computer applications in commerce. It focuses on computer applications in Accounting, Finance, Taxation-GST, Statistics and Operations Research.

2. Course Objectives:

The objective of the course is to enable students to understand computer applications in Accounting, Finance, online trading, online banking and online submission of income tax, indirect tax returns and XBRL applications in accounting. SPSS applications in statistical analysis and Operations Research.

3. Pedagogy:

Lectures, assignments, presentation, case analysis, online demonstrations and computer practical sessions

4. Course Contents:

Module1: Computer Applications in Financial Accounting: Features of Tally ERP.9. Setting up a new company and creating Masters in Tally ERP9 – Data Management security levels and controls - Technological advantages of Tally.ERP9 - Role of XBRL in Business Reporting - Fundamentals of XBRL. Features of XBRL software - **Evolution of extensible Business Reporting Language (XBRL)** - Commercial & Industrial Taxonomy of MCA - Instance Document - **Filling of Financial statements using XBRL Software** - Analysis of XBRL financial statements

Module 2: Computer Applications in Financial Management and Taxation: Using MS Excel to solve financial management problems- Present Value -

Future Value - NPV etc - Online Trading of Securities - Online Banking - Filing of Online Application for PAN and TAN - Online submission of Income Tax Returns – Form 49 A From 49 AA Form 49 B, and TDS Return - E-filing of indirect taxes return –GST.

Module 3: Computer Applications in Statistical Analysis: Features of SPSS - Creating files and data entry in SPSS - Preparation of frequency tables and graphs - Computation and interpretation of Mean - Standard Deviation - Standard Error -Simple and multiple correlation – regression - Analysis of variance - t-Test - Chi-Square Test.

Module 4: Computer Applications in Operations Research: Mathematical formulation of Linear Programming and Integer Programming problems and solve them using computer software

Computer Lab Practical:

1. Computation of Present Value, Future Value, Net Present Value using MS Excel. Filing of online application for PAN,TAN.
2. Online submission of Income Tax Returns and Indirect Tax Returns.
3. E-filing of indirect taxes return –GST.
4. Online Banking
5. Online Trading.
6. Completing accounting cycle using Tally ERP9.
7. Online submission of Financial Statements using XBRL
8. Computation of descriptive statistics, correlation, regression using SPSS.
9. Solving Linear Programming and Integer Programming problems.

Course Outcomes:

CO1: The application of accounting software for preparation of financial statements by using tally ERP.9.

CO2: Application of capital budgeting techniques such as NPV, IRR, PV etc., by using MS-Excel.

CO3: Analyze the research data by using SPSS software.

CO4: Filing of income tax return Forms and TDS Return and E-filing of indirect taxes return and filing of online application for PAN and TAN.

CO5: Preparation of financial report by using XBRL.

4. References:

1. Tally.ERP 9 Essentials, 2009, Tally Solutions Pvt. Ltd.
2. Mastering Financial Modeling-Alastair Day.
3. www.xbrl.org.
4. www.iasb.org.
5. www.spss.org
6. www.rbi.org.
7. www.incometax.india.gov.in.
8. www.xbrl.icaai.org.
9. www.mca.gov.in
10. www.bse.org.[nse.org](http://www.nse.org).[sebi.org](http://www.sebi.org).
11. Goods and Services Tax –by Dr. H.C. Mehrotra, Prof. V.P. Agarwal, Dr. S.K.Batra, Sahitya PublicationsAgra.

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	-	-	-	-	3
CO2	2	3	3	-	3	-	-	3
CO3	2	3	3	-	3	-	-	3
CO4	2	3	3	-	-	-	-	3
CO5	2	3	3	-	-	-	-	3

Weighted Average	2	3	3	-	1.2	-	-	3
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Course code: 20A207

OE01: STOCK MARKETS AND INVESTMENT DECISIONS

TotalCredits:4

CreditPattern:3:1:0

No of hours:5 per week

1. Course Description:

Stock markets are more popular today as they provide a wonderful opportunity to the general public to invest their savings. This course provides the coverage of fundamentals of stock markets, indices, instruments and trading in stocks and shares including DEMAT Account.

2. Course Objectives:

The course is designed to meet the expectations of non-commercial graduates and intended to help students to:

3. Course Objectives:

The course is designed to meet the expectations of non-commercial graduates and intended to help students to:

1. Comprehend the role of stock markets as an avenue for investments.
2. Understand the different types of stock market instruments.
3. Comprehend the basics relating to trading in stocks.
4. Understand the fundamentals of indices such as SENSEX and NIFTY

3. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content. Tutorials include writing assignments and visits to stock exchanges.

4. Course Contents:

Module 1: Stock Markets: Meaning - History- Functions of Stock Exchange - Leading Stock Exchanges in India - NSE and BSE - Role of SEBI - Investor's Protection – Grievance Redressal

Module 2: Stock Market Instruments - Short Term and Long Term Instruments – Shares - Types of Shares – Debentures - Types of debentures - Bonds - Types of Bonds - Benefits of Investments in Stocks - Stock v/s Debenture - Case studies

Module 3: Trading in Stock Market: Trading Mechanism - PAN Card, Speculation- Types of Speculation - Advantages and Drawbacks of Speculation - DEMAT Account - Depository Services - NSDL - CSDL Brokers- Brokerage-Settlement Procedure - Case studies – **Investors** – Brokers - Registration of brokers - Functions of brokers - kinds of broker Brokerage - Clearing house - Case Study.

Module 4: Stock Market Indices and Risk Management: SENSEX – NIFTY - SENSEX S&P - CNX - MID CAP - SMALL CAP - Large CAP - Factors impacting on indices - Recent changes in the Stock Market Volatilities- Risk Management – Systematic and Unsystematic risk, Case studies

Course Outcomes:

CO-1: Enhancing the knowledge on theoretical and practical concepts of Indian stock markets and Stock Market Instruments

CO-2: Understanding the Trading mechanism in stock market

CO-3: Analyze the Stock price movement using BSE-SENSEX and NSE-NIFTY as benchmark indices

CO-4: Learning online trading mechanism

References:

1. Capital Markets- By Dr. S. Guruswamy, Mcgraw Hill Publications.
2. Capital Market and Investment Management- By Dr. M.S. Khan, S.M. Farisal, Laxmi Publications, first edition.
3. Capital Market Instruments- By Dr. G. Kotreshwar, Chandana Publications, Mysore.
4. Equity Shares, Preferred Shares and Stock Market Indices- By Sunil, Parameswaran, Mcgraw Hill Publications.

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	-	-	-	-	1
CO2	1	3	3	-	-	-	-	3
CO3	1	2	2	-	3	-	-	1
CO4	-	-	3	-	-	-	-	2
Weighted Average	1.25	2	2.5	-	0.75	-	-	1.75

Course code: 20A305

SC09: ENTREPRENEURSHIP DEVELOPMENT

Total Credits:4

Credit Pattern:3:1:0

No of hours:5

1. Course Description:

The course will cover the characteristics of and types of entrepreneurs, identifying problems and opportunities, creative problem solving, developing a viable business model and entrepreneurial supporting system etc.

2. Course Objectives:

- To familiarize the students with the concept and overview of entrepreneurship with a view to enhance entrepreneurial talent.
- To impart knowledge on the basics of entrepreneurial skills and competencies to provide the students with necessary inputs for creation of new ventures.
- To explore new vistas of entrepreneurship in 21st century environment to generate innovative business ideas.

3. Pedagogy:

The subject matter will be presented through lecture, classroom discussion, workshops, special lecture programmes from industry experts, case study analysis and industrial visits.

4. Course Contents:

Module-1 Introduction: Meaning of entrepreneur - Evolution of the concept - Types of Entrepreneur - Concept of Entrepreneurship Evolution of Entrepreneurship - Theories of Entrepreneurship - Stages in Entrepreneurial Process- Entrepreneurial Competencies - Role of Entrepreneurship in Economic Development - Factors affecting Entrepreneurship - Problems of Entrepreneurship in India- entrepreneurial policy – culture and entrepreneurship -Case Study.

Module-2 Establishing Enterprises: Generating new ideas - Entrepreneurial Motivation - Identifying the Business Opportunities - Business Plan -Meaning of business plan - Business plan process - Advantages of business planning - Marketing plan - Production/operations plan - Organization plan - Financial plan - Final Project Report with Feasibility Study - preparing a model project report for starting a new venture – case studies.

Module -3 Institutions Supporting System: Role of Government in promoting Entrepreneurship - A brief overview of financial institutions in India - Central level and state level institutions - SIDBI - NABARD - IDBI - SIDCO - Indian Institute of Entrepreneurship - DIC - Single Window - Latest Industrial Policy of Government of India- Start-up India- startups and climate for startups MUDRAScheme.

Module -4 Managing the Enterprise: Financial Management: Working Capital Management - Financial Planning & Control - Marketing Management - Marketing Plan & Control - CRM – Product Development & Marketing –

Production Management: Inventory Control, Productivity, and Break Even Analysis – Human Resource Management: Manpower Planning – Labor Productivity – Industrial Relations. Success and failure stories of social entrepreneurs.

Course Outcomes:

CO 1: Understanding the distinct entrepreneurial traits.

CO 2: Know the parameters to assess opportunities and constraints for new business ideas.

CO 3: Understand the systematic process to select and screen a business idea.

CO 4: Design strategies for successful implementation of ideas.

CO 5: Write a business plan.

CO 6: know the role of Central and State Government institutions in the development of Entrepreneurship in India.

References:

1. Vasant Desai, The Dynamics' of Entrepreneurial Development and Management, Himalaya Publishing House, 2009.
2. Poornima M. Charantimath, 'Entrepreneurial Development And Small Business Enterprises', Pearson Education Licensee, New Delhi 2006.
3. Matthias Fink, Sascha Kraus, The Management of Small and Medium Enterprises, Routledge Studies in Small Business, 2009
4. S. Nagendra, V.S. Manjunath, "Entrepreneurship and Management", Pearson Education Licensee, New Delhi 2011.

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	-	-	-	-	-	-
CO2	1	3	-	-	2	-	-	-
CO3	2	2	-	-	-	-	-	-
CO4	1	3	-	-	-	-	-	-
CO5	2	2	-	-	3	3	-	3
CO6	2	3	-	-	-	-	-	-
Weighted Average	1.83	2.33	-	-	0.83	0.50	-	0.50

Course code: 20A306

SC10: ELECTIVE GROUP A-BUSINESS TAXATION

PAPER1: GOODS AND SERVICES TAX AND CUSTOMS DUTY

Total Credits:4

Credit Pattern:3:1:0

No of hours:5

1. Course Description:

This paper is to educate the taxation students about Indian Tax System, its background, and its operation in the global competitive market. The importance and administration of the indirect taxes in the Indian market oriented economy and its role in achieving the objectives of modern welfare government and to evaluate the impact of GST in the present Indian Tax Scenario.

2. Course Objectives:

- After completion of this course the students would be able:
- To provide an overview of GST, implementation and structure of GST in India
- To provide an understanding of levy, collection, valuation and input tax credit of GST
- To understand about GST audit
- To give an overview of customs duty and valuation of custom duty

3. Pedagogy:

- 1) Lecture:
- 2) Tutorial and bridge class (for Non-taxstudents)
- 3) Live leading cases: pending and deciding in the high court and supremecourts.
- 4) Practical works: Tax planning, Tax management, filing of various tax returns and working as consultants and tax adviser for small companies nearby dealers and companies relating to GST and Customs

4. Course Contents:

Module 1: INTRODUCTION TO GST – Background - History- Constitutional Provision for Indian Tax System-structure of Indian Tax System- Different Types of Taxes- Taxes under Indirect tax- Structure of GST -Types of GST – CGST- SGST- IGST- UTGST - Tax as subsumed in GST - Tax is not subsumed in GST- GST council.

Module 2: Taxes under GST- Registration of GST - Levy and Incidence of GST-Rates and Schedules- GST on Exports-Imports and SEZ supplies- E-Commerce- Financial and related services-Value of supply- Input tax credit- Manner of distribution of credit by input service distributor - Recovery of credit distributed in excess- Payment of tax, interest, penalty and other accounts- Utilization of input tax credit.

Module 3: Other Aspects under GST – Tax invoice, Credit and Debit notes>Returns- Payment of tax- Assessment and audit- Appeals and revisions,

Module4: Customs Duty:

Customs Act-1962 and Rules- Regulations- Circulars and Notifications-Customs Tariff Act-and applicable Rules – authority for advanced ruling - Provisions for levy of Customs Duty- Types of Customs Duties- Basic Principles of Classification of Goods and Valuation of Goods- Special Provisions regarding Baggage, Goods Imported or Exported by Post- and Stores- Duty Draw-Back Schemes- Impact of GST on Customs Duty-Illustrative Problems on Customs Duty - CaseStudies.

Course Outcomes

CO-1: Overview of Good and Services Tax system and structure in India.

CO-2: Practical application of levy, collection, valuation and ITC under GST

CO-3: Filing of online GST return

CO-4: Understanding the concept of Custom's duty, its valuation and duty drawback in India

References:

1. Indirect Taxes- Law and Practice:V.S.Datey
2. Karnataka GSTManuals
3. GST ReadyReckoner
4. Bare Acts of Customs, Customs Tariff Acts,GST
5. Public Finance- B. P. Tyagi
6. Public Finance -Prof.H.Doltan
7. GST Bill/Act2016
8. CST Law and Practice-SSGupta
9. Basic of GST-Nitya Tax AssociationTaxman
10. GST Manual- TaxmanPublication
11. Indian GST for Begineers –JayaramHiregange and Deepak Rao
12. CA PracticalManuals
13. www.gstindia.com

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	-	-	-	-	-	-
CO2	2	3	3	-	1	-	-	3
CO3	3	3	3	-	-	-	-	3
CO4	3	3	2	-	-	-	-	-
Weighted Average	2.75	2.75	2	-	0.25	-	-	1.5

Course code: 20A406

SC 18 - ELECTIVE GROUP A: BUSINESS TAXATION

PAPER 1: CORPORATE TAX LAW AND PLANNING

TotalCredits:4

CreditPattern:3:1:0

No ofhours:5

1. Course Description:

This course is focus on different heads of income, taxable in the hands of companies, computation of gross total income, deduction, exemptions, set off and carry forward of loss. Tax planning relating to various managerial decisions for reducing the tax burden, allocation of investments, and maximize the company wealth. As a tax consultant of the corporate tax laws of the company to give advice to the drawing officers regarding TDS, advance payment of tax and remittances of tax, for his employees.

2. Course Objectives:

This course is intended to enable the students to:

- Understand the incidence based and residential status of the companies.
- Understand the different sources of income for corporate assesses.
- Analyze the basic principal of tax planning to reduce the tax burden of the company
- Understand the role of tax consultant relating to TDS, Advance payment of Tax, remittance of corporate income tax, preparation of various Forms.
- To understand assessment procedure and tax filing

3. Pedagogy:

The course content is covered class room lecture, remedial class for non-tax students, student seminar, case discussion, and work out the problem on the company problems as student, as consultant and as a tax authority and also visiting company and tax office for practical exposure.

4. Course Contents:

Module 1: Introduction: Definition of Company, Features and Types of Company - Indian Company - Domestic Company - Foreign Company - Widely-Held Company – Closely - Held Company - Residential Status of company - Tax Incidence - Corporate Tax Policy - Corporate Tax Revenue and Expenditure – MoR Statistics.

Module 2: Computation of Taxable Income- Computation of taxable income under different heads of income - House property - Profit and Gain from Business or Profession - Capital Gain and Income from Other Sources - Treatment of Corporate Loss - Carry Forward and Set-off of Losses - Deductions, Exemptions and Concisions from Gross Total Income - Sec-115JB - Minimum Alternative Tax - its importance and objectives - Simple calculation on Book Profit calculations -Case Studies.

Module 3: Tax Planning- Tax Avoidance and Tax Evasion, Mc. Dowell's Case - Tax planning with Dividend Policy - Bonus Shares, Tax Planning - Tax Management - Tax Planning with reference to specific managerial decisions- Make or Buy - Own or Lease - Purchase by Installment or by Hire – shut down or continue operations - tax planning relating to capital structure - International Taxation - Domestic Tax v/s International Tax - DTAA- Case studies.

Module 4: Procedure for Assessment- Assessment Types, Hierarchy of Tax Authority, Deduction of Tax at Source (TDS) and Collection of Tax at Source (TCS) - Remittance of Tax - Advance Payment of Tax (APT), Tax Returns – Refunds - Appeals and Revisions - Duties and Responsibilities of TDS Officer - Preparation and Issue of different forms for tax collection - FORM-16 and FORM 3CA, 3CB and 3CD - Case Studies.

5. Course Outcomes

CO-1: Knowing overview of Corporate tax system in India

CO-2: Exposure on practical approaches towards taxable income of the company

CO-3: Application of Income Tax rules in managerial decisions such as, Make or buy, dividend decisions, etc.

CO-4: Online Filing of returns for corporate assessee

6. References:

1. Direct Taxes: H.C. Mehrotra and Dr.S.P.Goyal Sahitya Bhavn NewDelhi.
2. Direct Taxes law and practice: Bhagavathi Prasad, Vishva Prakashana, NewDelhi.
3. Direct Taxes Aggarwal P.K “Tax Planning for Companies” Hind Law Publishers, New Delhi.
4. Corporate Tax Planning and Management: Lakhotia, VisionPublishers.
5. Taxman’s Direct Tax Laws and Practice: Dr.Vinod K Singhanian and KapilSingania Taxman’s Publications (p) Ltd., NewDelhi.

Course Articulation Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-
CO4	2	3	3	-	-	-	-	3
Weighted Average	2.5	2.75	0.75	-	-	-	-	0.75

SKILL DEVELOPMENT – 1

Course Code:20C108

Nature	Area	Semester
Foundation	General Management	I
Course Code	Course Name	Credit/Distributions
	Skill Development - 1	(L-0:T-0:P-1) Credit = 01

Course Objectives:

1. To provide an analytical and practical overview of the basic skills needed for a manager
2. To comprehend the art of presentation, e-mail etiquette and data interpretation

Unit I: Presentation Skills

03 Hours

Technical aids used for presentation; Chalk and Board, Over head Projectors, Paper Handouts, Flip Chart, Artifacts or Props, basic Understanding of PowerPoint

Unit II: Advanced Presentation Skills

03 Hours

Rules and Guidelines for creating a good Presentation, The beginning, Actual content and closing of a Speech, Holding audience attention and Handling Questions

Unit III: Email Etiquettes

04 Hours

Subject & Body of an email, Rules of emails: No Spamming, Disclaimer etc.

Guidelines of an email: Reply, Reply all, Forward etc., Mass Mail service providers like Mail Chimp etc.

Unit IV: E-Mail Analytics

03

Hours

Analytics like Click through Rate, Open rate, Opt out Rates etc., Email Threats like Phishing and Spamming

Unit V: Data Interpretation

03 Hours

Basic interpretation of graphical representation of data, Basic Interpretation of Percentage based data.

SKILL DEVELOPMENT – 2

Course Code: 20C207

Nature	Area	Semester
Foundation	General Management	II
Course Code	Course Name	Credit/Distributions
	Skill Development - 2	(L-0:T-0:P-1) Credit = 01

Course Objectives

1. The present course is designed to provide an effective communication required for a successful manager
2. To encourage the students to ideate entrepreneurial thoughts

UnitI: **03**
Hours

Advance Goal Setting, Effective Communication Skills (Empathetic Communication), Power of Positive Thinking, Emotional Intelligence

UnitII: **03**
Hours

Problem Solving techniques, Power of Preparedness, Entrepreneur- ship (How to ideate and start a business and Stress Management tools

UnitIII: **04**
Hours

Team work, Team building exercise, Leadership Skills, Self Confidence

UnitIV: **03**
Hours

Listening skill exercises, Creativity, Body language

UnitV: **03**
Hours

Training on relevant Courses before Graduation, Grooming, Cleanliness, Decorum, Table Manners

SKILL DEVELOPMENT – 3

Course Code: 20C313

Nature	Area	Semester
Foundation	General Management	III
Course Code	Course Name	Credit/Distributions
	Skill Development - 3	(L-0:T-0:P-1) Credit = 01

Course Objectives

1. To think logically and appreciate the reasoning capability
2. To Involve the students in group discussion and mock interview exercises to enhance their employability

UnitI: 02

Hours

Language enhancement tips, written communication skills, public speaking skills

Unit II: 02

Hours

Exercises to develop right attitude, Self-Development, time management

UnitIII: 04

Hours

Quantitative Aptitude & Logical Reasoning

UnitIV: 04

Hours

GD & Mock GD

UnitV: 04

Hours

Resume Writing, HR Interview, FAQs & Mock Interview

ENTREPRENEURSHIP& QUALITY MANAGEMENT

Course Code: 20C303

Nature	Area	Semester
Foundation	General Management	II
Course Code	Course Name	Credit/Distributions
	Entrepreneurship	(L-2:T-0:P-2) Credit = 04

Course Objectives

1. To understand the concept of Entrepreneurship
2. To gain knowledge on preparation of Business Plan
3. To explore the theories and practices of the term quality
4. To impart hands on experience in various quality systems

Unit – 1

10

Hours

Foundations of Entrepreneurship: nature of Entrepreneurship, social & cultural factors in nurturing entrepreneurship. Institutional support for promoting study of incubation

Unit – II

10

hours

Business Planning: from idea generation to preparation of detailed business plans. Exercises in preparation of business plans.

Unit – III

10 Hours

Rural & social entrepreneurship: potential for entrepreneurship in rural India, SHGs, micro credit etc., Case studies of rural & social entrepreneurship in India.

Unit – IV Introduction to Quality Management: 12 Hours

Introduction to TQM, Meaning of the terms quality, quality control and quality assurance, importance of quality, quality dimensions of products and services, quality and competitive advantage, cost of quality, TQM, Evolution of TQM, Basic principles of TQM, TQM VS Traditional management, advantages of TQM

Unit – V Quality Systems

14

Hours

Quality Management Systems (QMS) Introduction, meaning of QMS, ISO 9000, Benefits of ISO, ISO 9000-2008 series, implementation of ISO 9000, Problems related to ISO 9000, QS 9000, Need for QS 9000, QS 9000 series Environmental Management System (EMS), ISO 14000 series, Benefits of ISO 14000, Integrating ISO 9000 & 14000, SEI-CMM level 5.

Recommended Text Books:

1. Entrepreneurship – Prof. T.V.Rao
2. Total Quality Management Text and Cases, G. Nagalingappa & Manjunath VS, Excelbooks.
3. Management and Control of Quality, James R. Evans, 8/e 2012, Cengage Learning
4. Total Quality Management, Dale H. Besterfield, 3rd Edition, Pearson Education
5. Total Quality Management, Shridhar Bhat, Himalaya Publication

Reference Books:

1. Entrepreneurship-Mathew J Manimala
2. Total Quality Management by PoornimaM.Charantimath, Pearson Education.
3. Quality Control Handbook by JURAN, Mc.Graw Hill Publication.

MOLECULAR CELL BIOLOGY(FCHC)

Total Credit: 04 Total Marks-Theory 70+30 (100 M) Total Hours: 48 hours Course Outcome: Students should study this paper to know –

1. The structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Cell cycle and cellular processes.
3. Concept of cancer biology and signal transduction.
4. Phytochemicals in cancer treatment and stems cells.

Module- I

Organization of the cell 12 hours

Universal features of cells, Ultra-structure of prokaryotic and eukaryotic cells (Plants and animals), Structure of plant cell wall, Structure of cell membrane and models, functions of cell membrane, Intracellular organelles: Structure and functions of Ribosomes, Golgi apparatus; Mitochondria, Chloroplast, Lysosomes, Centrosome, Endoplasmicreticulum, Nucleus-Internal organization, Chromatin- structure and function, cellular cytoskeleton.

Module - II

Cellular processes 12 hours

Cell cycle and its regulation, Cell cycle check points, Molecular dynamics of cell division, interphase, Mitosis and meiosis, Cyclins and CDKs, Cell differentiation: Stem cells, Differentiation of stem cells into different cell types and organization into specialized tissues, apoptosis, necrosis & autophagyMolecular mechanisms of membrane transport active, passive and facilitated, Receptor mediated endocytosis.

Module - III

Cancer Biology 12 hours

Introduction, Historical account, classification, Characteristics of cancer cells, hallmark features of cancer cells, Carcinogenesis, Exogenous and endogenous carcinogens, cancer initiation, promotion and progression, Cancer cell cycle, Viruses and cancer, Oncogenes, Tumor suppressor genes with examples, cancer therapy present and future, Role of p53 in cancer. Role of phytochemicals in cancer treatment, cancer stem cells.

Module - IV

Basics of Signal Transduction 12 hours

Extra-cellular matrix components, Cell junctions, Cell adhesion molecules, Hormones and their receptors, Cell surface receptors as reception of extra-cellular signals, Types of cell signalling, Growth factors- EGFR, VEGF, PDGF and their Signalling, signalling through G-protein coupled receptors; Second messengers in signal transduction pathways: cAMP

and calcium ions (Ca^{2+}), signalling through Receptor tyrosine kinases ,MAP kinase pathway,P13K -Akt pathway

PRACTICAL IB:

Total Credit: 02 Total hours: 32

- 1) Microscopic examination of prokaryotic and eukaryotic cells using staining techniques.
- 2) Isolation of mitochondria by differential centrifugation.
- 3) Measurement of cell dimension by micrometry.
- 4) Cell Counting and viability by trypan blue exclusion method.
- 5) Bacterial growth curve.
- 6) Study of mitosis in onion root tips.
- 7) Study of meiosis in onion flower buds.
- 8) Polytene chromosomes.
- 9) Study of chromosomes by air-dry technique.

REFERENCES:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. 2008. Molecular Biology of the Cell. (5th Ed.) New York: Garland Science.
2. Cooper, G. M., and Hausman, R. E. 2013. The Cell: a Molecular Approach (6th Ed.). Washington: ASM, Sunderland.
3. Hardin, J., Bertoni, G., Kleinsmith, L. J., and Becker, W. M. 2012. Becker's World of the Cell. Boston (8th Ed.). Benjamin Cummings.
4. Kleinsmith, L.J., and Kish, V. M. 1995. Principles of Cell and Molecular Biology (2nd Ed.) Harper Collins College Publishers, New York, USA.
5. Lodish H., and Berk A. 2016. Molecular Cell Biology (8th Ed.). New York. W H Freeman.
6. E-books

- https://cdn.preterhuman.net/texts/science_and_technology/nature_and_biology/Cell

_and_Molecular_Biology/Molecular%20Cell%20Biology%205th%20ed%20-

%20Lodish%20et%20al.pdf

- http://standing.weebly.com/uploads/2/3/3/5/23356120/8_-_unit_30c.pdf
- file:///C:/Users/Dr.%20Divya/Downloads/Cancer%20Biology%204th%20ed%20-

%20R.%20Ruddon%20(%20PDFDrive%20).pdf

Web links:

- <https://www.slideshare.net/musselburghgrammar/cell-molecular-biology>
- <https://www.slideshare.net/TapeshwarYadav1/basics-of-molecular-biology-56429099>
- <https://slideplayer.com/slide/12568274>.

FUNDAMENTALS OF BIOCHEMISTRY (FCHC)

Total Credit: 04

70+30 (100 M)

Total Marks-Theory

Total Hours: 48 hours

Course Outcome: Students should study this paper to know –

1. The basics of biomolecules.
2. Functions of biomolecules in the biological system.
3. Interactions among the biomolecules in the nature.
4. The fundamental principles in sequencing of DNA.

Module 1: Basics of Chemical Bonding and Carbohydrates

18 hours

Bonding: Covalent bond; coordinate bond; coordinate bond formation in transition metals. Bonding of iron in hemoglobin and cytochromes, cobalt in Vit B12, magnesium in chlorophyll. Special properties of water; Structure and bonding, non-covalent interactions, reactions of carbohydrates.

Carbohydrates: Structure and classification of carbohydrates, monosaccharides (pentoses, hexoses), disaccharides (lactose, sucrose, maltose) and polysaccharides (starch, cellulose, glycogen and bacterial cell wall polysaccharides) explanations.

Module 2: Basics of Amino Acids and Proteins

10 hours Amino

acids: Nomenclature, classification and buffering properties, zwitterionic structure, reactions of Amino acids.

Proteins: Primary, secondary, tertiary and quaternary structures, protein sequencing.

Factors responsible for protein folding: Anfinsen's experiment. Non-covalent interactions and S-S bridges in stabilizing the proteins, Denaturation and renaturation of proteins, molten globule, chaperones.

Module 3: Basics of Lipids & Enzymology

08 hours Lipids:

Classification & reaction of lipids; oils, fats, and waxes. Occurrence and properties of fatty acids, esters of fatty acids, cholesterol, phospholipids, glycolipids, sphingolipids, cerebrosides and gangliosides. Role in cell membrane.

Enzymology: Classification, enzyme activity, Michaelis-Menten kinetics, LB plot, inhibition - competitive, uncompetitive, non-competitive, determination of K_i , active site, allosterism - ATCase, isoenzymes- LDH, catalytic strategies, co-enzymes and cofactors, multienzyme complexes-PDC.

Module 4: Basics of Nucleic Acids

12 hours

Nucleic Acids: DNA as genetic material, Griffith, Avery & Macleod experiments, isolation of DNA & RNA from biological sources, secondary structure of DNA, Watson and Crick model, Chargaff's rule; B and Z DNA. Features of mitochondrial, chloroplast DNA and plasmids. Secondary structure of tRNA and clover leaf model. Physicochemical properties of nucleic acids, melting of DNA, T_m ; factors affecting T_m , Cot curve, classification of DNA based on Cot curve.

REFERENCES:

1. Bahl, A. 2010. Advanced organic chemistry. S Chand & Company Limited.
2. Berg, J. M., Tymoczko, J. L., and Stryer, L. 2006. Biochemistry: International edition. W H Freeman & Company Limited.
3. Berg, J. M., Tymoczko, J. L., and Stryer, L. 2002. Biochemistry (5th Ed.). W H Freeman.
4. Mathews, P. 2002. Advanced chemistry. Cambridge low price editions. Cambridge University Press, UK.

5. Morrison, R., and Boyd, R. 1992. Organic Chemistry (6th Ed.). Englewood Cliffs, NJ: Prentice Hall.
6. elson, D. L., Lehninger, A. L., and Cox, M. M. 2008. Lehninger principles of biochemistry. New York : W.H. Freeman.
7. Voet, D., andVoet, J. G.2010. Biochemistry,(4thEd.) New York: J. Wiley & Sons.
8. Videos for the concept:
 - www.khanacademy.org – Chemical Bonding, Chemistry of Biomolecules
 - www.yourgenome.org – Structure of DNA

Weblink:

- <https://www.slideshare.net/AshfaqAhmad52/introduction-to-biochemistry-67924875>
- <https://slideplayer.com/slide/252874/>

PRACTICAL IA:

Total Credit: 02
hours: 32

Total

1. Preparation buffers and solutions &Measurement of pH.
2. Determination of pKa of aminoacids.
3. Estimation of reducing sugar by DNSmethod.
4. Estimation of proteins by Lowry'method.
5. Estimation of proteins by Bradford'method.
6. Estimation of proteins by Bicinchronicacid method.
7. Estimation of amino acids by Ninhydrin method.
8. Estimation of cholesterol by Zak's method.
9. Estimation of saponification and iodine value of lipids.
10. Estimation of total carbohydrates by phenosulfuric acid method.

TECHNIQUES IN BIOLOGY (FCHC)

Total Credit: 04

Marks-Theory 70+30 (100 M)

hours Course Outcome: Students should study this paper to know –

Total

Total Hours: 48

1. This paper is designed to give a brief introduction to most of the techniques used in the field of biological analyses.
2. Nevertheless, the topics in this paper are to be taught compendiously.
3. The fundamental principles in cell homogenization.
4. Importance of bioanalytical techniques.

Module I:

Biological samples: Types and preparation 12 hours

Study Models: *In vivo* and *in vitro* models; Microbial, Animal, Plants; choice of models; types of studies, auxotrophs. Routes of exposure of test chemicals in animals. Culture: microbes, animal and plant cells in laboratory.

Cell fractionation techniques: Tissue homogenization, Cell lysis techniques, extraction of cell cellular contents. Protein purification techniques: salting in, salting out, dialysis and ultrafiltration.

Centrifugation: Svedberg's constant, sedimentation velocity and sedimentation equilibrium.

Ultra centrifugation: Differential and density gradient centrifugation, centrifugal elutriation, isolation of cell organelles (e.g. Mitochondria) from biological tissue samples.

Module II: Spectroscopic analysis

12 hours

Principles and applications of colorimeter, spectrophotometer, fluorimeter, multiwell plate reader. Beer-Lambert's Law and its limitations. Extinction coefficient, chromogenic and fluorescent probes, their applications. Principle of flame photometry, and X-ray crystallography, IR, ESR, NMR & Raman's spectroscopy.

Module III: Chromatographic and electrophoretic techniques:

12

hours Chromatography: Principles, working and applications of paper chromatography (radial, ascending, descending and 2-D), Thin layer chromatography, Brief introduction, application of Adsorption, Ion exchange, Gel filtration, Affinity, Gas chromatography. Chromatofocusing, HPLC, UPLC and FPLC.

Protein electrophoresis: Polyacrylamide gel electrophoresis, SDS-PAGE, IEF & 2DEF. Visualizing proteins using CBB, silver stain; glycoproteins and lipoproteins staining, Brief introduction to Zymogram and reverse zymogram;

Nucleic acid electrophoresis: Agarose gel electrophoresis, Visualizing nucleic acids in using Ethidium bromide and UV. Fluorescence probes: SYBR green and Eva green, Taq man, PFGE and capillary electrophoresis.

Module IV: Radiochemistry and Mass spectroscopy

12 hours

Isotopes: Heavy isotopes and radio isotopes, half-life, decay constant, detection and quantitation; Principle and working of GM counter and scintillation counter (solid/liquid).

Mass spectroscopy Principle and construction of mass spectrometer. m/e, tof, MALDI and ESI. LC-MS, LC-MS-MS.

Applications of radioactivity: Radio isotopes in biology ^3H , ^{14}C , ^{32}P , ^{131}I , ^{35}S ; Labeling of proteins and nucleic acids, autoradiography, pulse chase method, carbon dating..

REFERENCES:

1. Marshall, A. G. 1978. Biophysical chemistry: principles, techniques, and applications: Wiley New York.
2. Micklos, D. A., and Freyer, G. A. 1990. DNA science; a first course in recombinant DNA technology: Cold Spring Harbor Laboratory Press.
3. Purohit, S., and Mathur, S. 1999. Drugs in Biotechnology fundamentals and applications. Purohit SS., Ed., Maximum Publishers, India.
4. Slater, A., Scott, N., and Fowler, M. 2003. Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University Press, Oxford, New York,
5. Walker, M., and Rapley, R. 2009. Route maps in gene technology. John Wiley & Sons.
6. Wilson, K., and Walker, J. 2010. Principles and techniques of biochemistry and molecular biology. Cambridge University Press.

Weblink:

- <https://www.slideshare.net/mprasadnaidu/molecular-biology-techniques>.
- <https://www.slideshare.net/MeenalAggarwal2/chromatographic-techniques>.
- <https://www.slideshare.net/JayashreeShanmugam14/cell-fractionation-115544348>.

PRACTICAL IA:

Course Outcome: Students should study this paper to know –

1. Hands on training in chromatographic techniques
2. Analysis of biomolecules using spectroscopic techniques
3. Estimating the enzymes and their activity.
4. The concepts of homogenization and sedimentation and working of centrifugation techniques.

Total Credit: 02
32

Total hours:

1. Ascending, descending and circular paper chromatography for separation of amino acids.
2. TLC of amino acids (1D and 2D).
3. Column chromatography- gel filtration.
4. Gel electrophoresis- native and SDS-PAGE and estimation of molecular weight of proteins.
5. Demonstration of HPLC, LC-MS, XRD, NMR, Confocal and Electron microscopy.
6. Wavelength scans of proteins and nucleic acids.
7. Preparation of homogenates and mitochondria from plant and animal tissues.
8. Estimation of molar extinction coefficient of methylene blue (Beer Lambert's Law).
9. Isolation of esterase from green peas using ammonium sulphate precipitation.
10. Estimation of esterase activity using colorimetric method.
11. Separation of WBC, RBC and platelets using gradient centrifugation.

GENETICS(FCSC)

Total Credit: 03

Marks-Theory 70+30 (100 M)

hours Course Outcome: Students should study this paper to know –

Total

Total Hours: 48

1. The development of Genetics and the principles of Mendel.
2. The concepts of Viral, Bacterial, Fungal & Algal genetics.
3. Mutation and Mutagenesis.
4. Detailed account on transposable elements and transpositions.

Module- I

14 hours

History and developments of genetics. Principle of Genetic Transmission: Mendel's Experiments, Symbols and terminology, Principle of dominance and segregation, Principle of independent assortment, Mendelian inheritance and probability (Multiplication and Addition rules). Extensions of Mendelian Principles: co-dominance, incomplete dominance, gene interactions, multiple alleles, lethal alleles, pleiotropy, penetrance and expressivity, polygenic inheritance, linkage and crossing over, sex linked inheritance, sex limited and influenced traits, genome imprinting, extra nuclear inheritance.

Module- II

12 Hours

Viral Genetics: Lytic and Lysogenic cycles, Phage Phenotypes, Phenotypic Mixing, Recombination and Mapping. Bacterial Genetics: Bacterial Transformation- Types of transformation mechanisms found in prokaryotes, Bacterial Conjugation- properties of the F plasmid, F^+ x F^- mating, F' x F^- conjugation, Hfr conjugation. Fungal Genetics: *Neurospora*- Tetrad analysis and linkage detection - 2 point and 3 point crosses, chromatid and chiasma interference, Mitotic recombination in *Neurospora*. Algal Genetics: *Chlamydomonas*- unordered tetrad analysis - Recombination and Mapping. Floral meristems and floral development in *Arabidopsis*, ABC model.

Module- III

12 Hours

Mutation and mutagenesis: Nature, type and effects of mutations. Mutagenesis – physical and chemical mutagens, base and nucleoside analog, alkylating agents, interrelating agents, ionizing radiation. Induction and detection of mutation in microorganisms and *Drosophila*. Site directed

mutagenesis and its applications.

Recombination: Homologous and non-homologous recombination, Holliday model, site-specific recombination.

DNA Repair: Mechanism of genetic repair- direct repair, photoreactivation, excision repair, mismatch repair, post-replicative recombination repair, Repair of double-strand breaks, SOS repair.

Module- IV

10 Hours

Sex Determination-Sex chromosomes, Chromosomal and genetic basis of sex determination. Sex determination in *C.elegans*, *Drosophila*, human and Plant (*Melandrium*). Dosage compensation- Genic balance, Gene dose, Molecular basis of dosage compensation in *Drosophila* and man.

Transposable elements- discovery in maize and bacteria, transposal elements in bacteria and bacteriophage, types and functions; Transposable elements in eukaryotes- Plants, *Drosophila* and Humans, mechanisms of transpositions.

PRACTICALS IB :

Course Outcome: Students should study this paper to know –

1. Study of special chromosomes structures
2. Performing the techniques used inducing mutation
3. Determining the mutant tests
4. Differentiating the mutants of *Drosophila*

Total Credit: 02

Total hours: 32

1. Replica plating technique for transfer of bacterial colonies.
2. Ultra-violet killing curve and determination of mutant types in *Saccharomyces cerevisiae*.
3. Induction of mutation
4. Isolation of streptomycin resistant strain of *E. coli* by gradient plate method.
5. Ames test
6. Study of special chromosomes- B chromosomes, and sex chromosomes.
7. Determination of chiasma frequency in onion.
8. To solve genetic problems on linkage, ordered and unordered tetrads
9. Study of Mutations in *Drosophila*
10. Study of Autosomal and sex linked gene inheritance in *Drosophila*

REFERENCES:

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Robert, K., and Watson, J. D. 1999. Molecular biology of the cell. Garland Pub. Inc. New York.
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3. Atherly, A.G., Girton, J. R., and Donald, J.R. 1999. The Science of Genetics. Saunders College Publishing, Fort Worth. Texas.
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14. Strickberger and Monroe W. 2000. Evolution (3rd Ed.). Jones & Bartlett Publisher, Inc. USA.
15. Tamarin, R. H. 2009. Principles of Genetics (7th Ed.) Tata-McGraw Hill, New Delhi.
16. Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine M., and Losick, R. 2004. Molecular Biology of the Gene (5th Ed.). Pearson Education Pt. Ltd., New Delhi, India.

Web links

- <https://www.youtube.com/watch?v=L42IwtPC7eM>
- <https://www.youtube.com/watch?v=3VrGkCm4sT4>
- <https://www.youtube.com/watch?v=l-9iUpFGbxE>
- <https://www.youtube.com/watch?v=pdEgBMXJdeg>
- https://www.youtube.com/watch?v=VIS_4G3Ysyk
- <https://www.youtube.com/watch?v=TfBnfxm0Xyc>
- https://www.youtube.com/watch?v=he260FUU5_M
- <https://www.youtube.com/watch?v=BlNUNmfGn7I>
- <https://www.youtube.com/watch?v=o4yJF90OR9M>
- https://www.youtube.com/watch?v=_cJfsWYR42M

MICROBIOLOGY (FCSC)

Total Credit: 03

Marks-Theory 70+30 (100 M)

hours Course Outcome: Students should study this paper to know –

1. The characteristics of microbes, their taxonomy and diversity.
2. The growth of microbes and their control.
3. The relationship between microbes and environment.
4. The beneficial and harmful effects of microorganisms.

Total

Total Hours: 48

Module I

12 hours

The beginning of microbiology and Microbial Characteristics

Introduction to Microbiology and Microbes; History and scope of Microbiology – Hook, Antony van Leeuwenhoek and Cohn; Contribution of Pasteur and Koch. Prokaryotic cell structure, pure culture techniques; bacterial genetics: transformation, transduction and conjugation; antimicrobial resistance. Culture collection and Maintenance of cultures.

Module II

12 hours

Microbial Taxonomy and Microbial diversity

Criteria for classification of bacteria; Bergy's manual, Cyanobacteria, acetic acid bacteria, lactic acid bacteria and Mycobacteria. Archaea: Halophiles, Methanogens and thermophiles. Viruses: general properties of virus, viral structure, sub-viral particles – viroids and prions. Eukarya: algae and fungi, general characteristics and outline classification.

Module III

12 hours

Microbial Growth and Control

Microbial growth: Growth curve, batch and continuous culture system, factors affecting growth like temperature, acidity, alkalinity. Sterilization, disinfection and antisepsis: physical and chemical methods for control of microorganisms, antibiotics,

Microbes and environment: Nutrient cycles (carbon and nitrogen cycle); microbial communication

system; quorum sensing, prebiotics and probiotics.

Module IV

12 hours

Beneficial and Harmful effects of Microorganism

Beneficial aspects of microbes and their metabolites in food industry, Bioremediation. Important microbial diseases of Plants caused by fungi, bacteria and viruses. Important infectious diseases of humans, caused by bacteria, protozoa and viruses - tuberculosis, malaria and AIDS. Emerging and

resurgent infectious diseases, SARS-COV 2 structure and virulence of virus. Host-Microbe interaction (pathogen interaction, microbiome analysis method).

REFERENCES:

1. Matthai, W., Berg, C. Y., and Black, J. G. 2005. Microbiology, Principles and Explorations. Boston, MA: John Wiley & Sons.
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3. Pelczar, M. J., et al., 2001. Microbiology (5th Ed.). New York: McGraw-Hill.
4. Rekadwad, B, 2020. Microbial Systematics, Taxonomy, Microbial Ecology, Diversity. CRC Press.
5. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., and Willey, J. M. 2011. Prescott's Microbiology. WileyNew York, McGraw-Hill.

Weblink:

- https://www.slideshare.net/sarah_jumali/1-introduction-to-microbiology
- <https://www.austincc.edu/cbeaman/micro%20ppt/chp%201%20combined.ppt>

PRACTICALS IB:

Course Outcome: Students should study this paper to know –

1. Performing different aseptic techniques to grow microorganisms.
2. Identification of cultured microorganisms using staining techniques.
3. Determine the microbes using microscopic and biochemical analysis.
4. Understanding practically the role of antibiotics.

Total Credit: 02

Total hours: 32

1. Preparation of liquid and solid media for growth of microorganisms
2. Isolation and maintenance of organisms by plating, streaking and serial dilution methods, slants and stab cultures, storage of microorganisms
3. Isolation of pure cultures from soil and water
4. Microbial growth curve
5. Measurement of bacterial population by turbidometry and serial dilution methods.
6. Effect of temperature, pH, carbon and nitrogen sources on growth.
7. Microscopic examination of bacteria, yeast and molds& study of organisms by gram stain, acid fast stain and staining for spores.
8. Assay of antibiotics and demonstration of antibiotic resistance.
9. Biochemical characterization of selected microbes

Total Credit: 04
Marks-Theory 70+30 (100 M)
hours

Total
Total Hours: 48

Course outcome: After studying this paper the students will know –

1. To understand biological activities and metabolism at DNA and protein level
2. The course gives an in-depth insight into the molecular aspects of life - the central dogma.
3. It explains molecular aspects of genes and its regulation- genome- gene expressions heredity- recombination- protein synthesis- molecular basis of diseases- mutations genetic analysis etc.
4. Understand the molecular tools and its application in basic research and applied research in various fields of life sciences.

Module 1:

08 Hours

1. Genome organization: Prokaryotic and eukaryotic genome organization, central dogma, structural organization of chromosome, structure and functions of DNA & RNA, Biochemical evidences for DNA as genetic material.
2. DNA: Chemistry of DNA, Forces stabilizing DNA structure, Physical Properties of DNA (UV absorption spectra Denaturation and renaturation), chemical that react with DNA, Interaction with small ions, DNA binding motifs: Zinc finger, leucine zipper, helix-turn- helix others motifs, DNA binding and kinks.

Module 2

12 Hours

1. DNA topology: Supercoiled form of DNA, Biology of supercoiled DNA, DNA topoisomerases, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication.
2. DNA Replication: Characteristics and functions of bacterial DNA polymerases I, Mechanism of prokaryotic DNA replication, models of replications in prokaryotes. Fidelity of replication, Eukaryotic DNA polymerases and mechanism of replication. Replication of viral DNA, DNA replication in telomeric regions, Telomerases, mechanisms of action of topoisomerase I and II, Models of DNA replication, Inhibitors of replication.

Module 3:

14 Hours

1. Transcription: Characteristics and function of bacterial RNA polymerases Eukaryotic RNA polymerases, mechanism of transcription and regulation. transcription factors, Stringent response. Post transcriptional modifications of mRNA mechanism of splicing, Processing of tRNA and rRNA. Inhibitors of transcription. Mechanism of action of ribozymes.
2. Translation: Structure and role of tRNA in protein synthesis, ribosome structure, basic feature of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes), Post translational processing, Control of translation in eukaryotes (Antisense RNA, Heme and interferon).

Module 4:

14 Hours

1. Regulation of Gene expression in prokaryotes and eukaryotes: Positive and negative regulation. lac-, ara-, his- and trp- operon regulation; antitermination, global regulatory responses; Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.

2. Protein localization&Gene Silencing: Export of secretory proteins- signal hypothesis, transport and targeting of proteins to mitochondria, chloroplast, peroxisomes, Gene Silencing: Definition, types, RNAi pathway, shRNA & CRISPR- CAS.
3. Non coding RNA: coding and non coding RNA,types of ncRNA : Short ncRNA(mi RNA,Sn RNA,Pi RNA,t-RNA &it's fragments,SnoRNA)long ncRNA ,functional significance of ncRNA

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1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D.1994. Molecular Biology of the Cell. Garland Science, New York.
2. Cooper, G.M. 1997.The Cell: A molecular approach, ASM Press, USA.
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4. Elliott, W. H., and Elliott, D. C. 2006. Biochemistry and Molecular Biology (3rd Indian Ed.). Oxford University Press, Oxford.
5. Garrett, R.H. and Gresham, C.M.1995. Molecular aspects of Cell Biology, International edition, Saunders College Publishing.
6. Karp, G. 1996.Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.
7. Lodish, H., Baltimore, D., Berk, A., Zipursky, B.L., Matsudaira, P., and Darnell, J. 2004. Molecular Cell Biology, Scientific American Books Inc. NY.
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10. Old, R.W., Primrose, S.B. 1993.Principles of gene manipulation - An introduction to genetic engineering (7th Ed.). Blackwell Scientific Publications.
11. Weblinks :
 - i. <https://www.slideshare.net/ShobhaSurbhaiyya/gene-silencing-69645867>.
 - ii. <https://www.slideshare.net/lalvarezmex/dna-topology>.
12. Research/Review articles:
 - i. Anderson, P. and Ivanov, P., 2014. tRNA fragments in human health and disease. FEBS letters, 588(23), pp.4297-4304
 - ii. Basto, A. P., et al., 2021. Micro RNAs in Tfh regulation: Small molecules with a big impact. European Journal of Immunology, 51(2), 292-295
 - iii. Crick, F. H. 1958. On protein synthesis. In SympSocExpBiol (Vol. 12, No. 138-63, p. 8).
 - iv. Karakar, D., *et al.*, 2021.The Role of Lnc RNAs in translation. Non coding RNA 7 (1):16. .

- v. Langston, L. D., et al., 2006. DNA replication: keep moving and don't mind the gap. *Molecular cell*, 23(2), 155-160.
- vi. Mleczko, A. M., et al. 2014. Ex-translational function of tRNAs and their fragments in cancer. *Acta Biochimica Polonica*, 61(2).

PRACTICALS IIA:

Course Outcome: Students should study this paper to know –

1. Perfuming the methodology applied to extract DNA & RNA from different sources.
2. Methods applied to purify the nucleic acids,
3. Estimation of extracted and purified DNA & RNA
4. Determining the purity, concentration and applying it for different digests and ligates.

Total Credit: 02

Total hours: 32

1. Estimation of DNA by diphenyl amine method.
2. Estimation of RNA by orcinol method.
3. Isolation of Genomic DNA from yeast cell,
4. Determination of purity and concentration of isolated DNA using spectrophotometer and agarose gel electrophoresis.
5. Determination of RNase & DNase activity
6. Isolation of RNA & analysis using Bleach Gel electrophoresis
7. Restriction digestion of plasmid and analysis
8. DNAligation

GENETIC ENGINEERING (FCHC)

Total Credit: 04

Marks-Theory 70+30 (100 M)

48 hours Course Outcome: Students should study this paper to know –

Total

Total Hours:

1. To understand cloning and expression vectors.
2. Methods involved in gene manipulation and techniques of gene analysis.
3. The vast knowledge of gene editing.
4. The knowledge about the Ex vivo and in vivo gene therapy.

Module-I

12 hours

Cloning and Expression vectors: Plasmids, lambda vectors, M13 Phage, cosmids, phagemids, Artificial chromosome vectors-YACs, PACs and BACs, plant and animal viruses as vectors, Transposons, Expression vectors- prokaryotic (pRSET, pET), eukaryotic (pcDNA3, pCEP), Baculovirus and Pichia vector system, plant based vectors- Ti and Ri, binary and shuttle vectors, Gene cloning: genomic cloning, c-DNA cloning,

Module- II

12 hours

Gene manipulation Restriction enzymes, restriction mapping, cloning in plasmid, Phage and cosmid vectors, insertion of foreign DNA into host cells-transformation, electroporation, transfection transient and stable, screening methods for transformants, downstream processing of recombinant proteins, affinity tags- His-tag, GST-tag, MBP-tag, Fc-tag. Construction and screening of genomic and cDNA libraries, chromosome walking, Chromosome Jumping, BAC libraries and assembly of BACs into contigs.

Module- III

14 hours

Gene analysis techniques

Hybridization techniques- Southern, Northern, South-western, Far-western, Colony hybridization, fluorescence *in situ* hybridization, molecular probes-preparation, labelling, amplification, applications, Polymerase chain reaction-Principle, primer designing, Types- RT-PCR, Realtime PCR, colony PCR, Multiplex PCR, Hot-start PCR, asymmetric PCR, Sequencing methods- chemical sequencing of DNA (Maxam and Gilberts methods and Sangers dideoxy method), automated DNA sequencing, sequencing by DE-MALDI- TOFMS, microarray. ChIP and Chip-on- chip techniques Chromogenic *in situ* hybridization, qPCR, next generation sequencing.

Module- IV

10 hours

Gene therapy, transgenics and Genome editing

Ex vivo and *in vivo* gene therapy, Vectors and other delivery systems for gene therapy, *In vitro* gene therapy, gene therapy of genetic diseases: eg. Neurological, metabolic disorders and cystic fibrosis, viruses for gene therapy- lentivirus, adenovirus. Gene targeting, knockout mice, genome editing by CRISPR-CAS

PRACTICAL IIA:

Course Outcome: Students should study this paper to know –

1. Performing the competent cell preparation.
2. Isolating the plasmid and inducing the gene expression.
3. Determining the protease activity in extracted protein.
4. Producing the recombinant protein.

Total Credit: 02

Total hours: 32

1. Salt fractionation of Yeast protein and quantification.
2. Isolation of plasmids from bacteria by agarose gel electrophoresis.
3. Preparation of competent *E. coli* cells for Bacterial transformation.
4. Induction of gene expression and purification of the induced protein from the host.
5. Amplification, Purification and separation of PCR product.
6. Determination of Proteinase activity on proteins.
7. Production of recombinant protein.

REFERENCES:

1. Brown, T.A. 2010. Gene Cloning and DNA Analysis-An Introduction (6th Ed.). Blackwell Science.
2. Brown, T.A., 2011. Introduction to Genetics: A Molecular Approach (1st Ed.). Garland Science.
3. Desmond, S. T., and Nicholl, 2002. An Introduction to Genetic Engineering. (1st Ed.) Cambridge University Press. Cambridge.
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11. <https://www.khanacademy.org>
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Weblink:

- <https://www.slideshare.net/SECBIO/genetic-engineering-13933607>
- [https://www.cabarrus.k12.nc.us/cms/lib/NC01910456/Centricity/Domain/7718/Biotechnol
ogy%20PP_Genetic%20Engineering_RD.pptx](https://www.cabarrus.k12.nc.us/cms/lib/NC01910456/Centricity/Domain/7718/Biotechnol%20PP_Genetic%20Engineering_RD.pptx)

MOLECULAR DIAGNOSTICS(FCSC)

Total Credit: 03

Marks-Theory 70+30 (100 M)

hours Course Outcome: Students should study this paper to know

Total

Total Hours: 48

1. The course focuses on learning and understanding how the various molecular techniques that were studied can be developed and utilized in diagnosis.
2. The course explains common analytical techniques and molecular techniques related to the development and use of diagnostics.
3. Students learn about the clinical applications of molecular diagnostic in patients with infectious disease.
4. They can find their future focus in biotechnology companies developing and marketing Diagnostic kits.

Module-1

08 hours

Introduction and History of diagnostics:

1. Introduction and History of diagnostics of diseases, mode of infection, types of infectious diseases, philosophy and general approach to clinical specimens. genetic basis of diseases, inherited diseases. Infection – mode of transmission in infections, factors predisposing to microbial pathogenicity, inborn errors of metabolism.
2. Traditional disease diagnosis methods: Diagnosis of infectious diseases caused by bacteria, fungi, viruses, protozoa and Helminthes, Philosophy and general approach to clinical specimens, Sample collection- method of collection, transport and processing of samples, Interpretation of results, Normal microbial flora of the human body, Host - Parasite relationships.

Module- 2

14 hours

Molecular techniques for diagnosis

1. Basics and Implication of Molecular techniques in Genome resolution, detection and analysis of pathogen causing disease : PCR, Real-time; Multiplex; FISH; RFLP; DGGE; SSCP; Nucleic acid sequencing; new generations of automated sequencers; Microarray chips; EST; SAGE; microarray data normalization & analysis; molecular markers: 16S rRNA typing; MALDI TOF-MS; Metabolite profile for biomarker detection the tissues in various disorders by making using LCMS & NMR technological platforms.
2. Biochemical tests & Immunoassays: Detection and quantification of biochemical parameters
Types: RIA, ELISA, Chemiluminescent
IA, FIA and specific applications;
Immunohistochemistry – principle and techniques.
Different Levels of Biosafety
Containment.

Module-3

Major Metabolic & Genetic disorders: 12 hours

Traditional methods for the diagnosis of metabolic errors (Diabetes Type 1 & Type 2, hyperthyroidism & Hypothyroidism). Disease due to genetic disorders (Sickle cell anemia & Cystic fibrosis). Identifying human disease genes., Methods available for the diagnosis of genetic diseases and metabolic disorders. Blood (formation, composition, function and pathology of blood disorders (haemoglobinopathies, hemophilia), Muscle disorders (Duchenne muscular dystrophy-DMD, Becker's muscular dystrophy-BMD, spinal muscular atrophy-SMA), Bone disorders

1. (Osteogenesis imperfecta, Rheumatoid arthritis), Skin disorder (Muir-Torre syndrome), Eye disorder (Retinitis pigmentosa).
2. Neonatal and Prenatal disease diagnostics. Gender identification using amelogenin gene locus. Amplification of Y chromosome specific Short Tandem Repeats (Y-STR). Analysis of mitochondrial DNA for maternal inheritance, Karyotyping & characteristics of Karyotyping.. Molecular diagnosis for early detection of cerebral palsy, Down syndrome etc.

Cancer diagnosis:

1. Molecular Oncology Tests, Analysis of the Expression of Multiple Genes and Cancer Prognosis, Analysis of Lymph Nodes to Detect Metastasis of Breast Cancer, Screening for Colorectal Cancer: Stool-Based DNA Screening, Leukemias and Lymphomas, DNA Methylation Tests and Cancer, Predicting Risk of Developing Cancer.
2. Personalized Medicine: Pharmacogenomics and Companion Diagnostics, Cytochrome P450 and Drug Metabolism, Targeted Cancer Therapies and Companion Diagnostics Tests, Testing for HER2/neu Overexpression in Breast Cancer, Testing for Epidermal Growth Factor Receptor (EGFR), UGT1A1 Genetic Variants, Pharmacogenetics and Response to Antiretroviral Therapy, Thiopurine Methyltransferase and Metabolism of Thiopurine Drugs

REFERENCES:

1. Bruns, D. E., Ashwood, E. R., and Burtis, C. A. 2007. Fundamentals of Molecular Diagnostics. Saunders Group.
2. Buckingham, L., and Flaws, M. L. 2007. Molecular Diagnostics: Fundamentals, Methods & Clinical applications. F.A. Davis Company
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5. Greenwood, D., Slack, R.C.B., and Peutherer, J.F. 1997. Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. (15th Ed.). Churchill Livingstone, London.
6. Leonard, D. G., Bagg, A., Caliando, A. M., Deerlin, V. M., and Kaul, K. L. (Eds.) 2007. Molecular pathology in clinical practice, pp. 411-424, Springer.
7. McPherson, R. A., and Pincus, M. R. 2007. Henry's Clinical Diagnosis and Management by Laboratory Methods, Elsevier Health Sciences.

Weblinks :

- https://www.slideshare.net/Dentist_abdurrahman/genetic-disorders-47095869
- <https://www.ihrp.uic.edu/files/4%20Screening%20and%20Diagnosis.ppt>

PRACTICALS IIB:

Course Outcome: Students should study this paper to know:

1. The diagnosis of different hormones
2. The practical training of genome resolution and analysis
3. The metagenomic approach to identify the microbes.
4. Learning the techniques involved in microbial diagnosis such as PCR, ELISA.

Total Credit: 02

Total hours: 32

1. Hormone assay for thyroid (TSH, T3, T4)
2. Isolation of Genomic DNA from Spleen or Liver ,Quality / Quantity checking of Nucleic acids by a) UV Spectrophotometer and Agarose Gel Electrophoresis.
3. Isolation of Metagenome (sediment/soil).
4. Qualitative detection of HBsAg in human serum or plasma.using ELISA.
5. Nucleic acid labelling and Southern Hybridization.
6. RNA isolation &PAGE .
7. Culture independent analysis of microbes by DGGE (Denatured Gradient Gel Electrophoresis).
8. Molecular diagnosis of parasitic disease.
9. Identification of human bacterial pathogens by Polymerase chain reaction.
10. Demonstration of Karyotype analysis.

IMMUNOLOGY (FCHC)

Total Credits: 04

Total Marks: Theory 70+30 (100M)

Total Hours: 48 hours Course Outcome: Students should study this paper to know –

1. Role of immune system in maintaining health
2. Cellular and molecular basis of immune responses
3. How immune responses are triggered and regulated
4. How the knowledge of immunology can be transferred into clinical decision-making through case studies presented in class.

Module-I
Hours

14

a) Over view and Types of immunity:

Innate immunity: anatomic barriers, physiologic barriers, phagocytic barriers, microbial antagonism, acute phase reactants, anti-microbial peptides, interferons, inflammation, Pattern Recognition Receptors (PRRs), Pathogen Associated Molecular Patterns (PAMPs) and Damage Associated Molecular Patterns (PAMPs). Complement system: components, pathways of activation and biological consequences.

Acquired immunity: Active (Naturally acquired and artificially acquired), Passive (Naturally acquired and artificially acquired), Adoptive immunity, Humoral and Cell mediated immune response

- b) Tissues of immune system:** Structural organization and functions of Lymphatic system, Primary lymphoid organs (Bone marrow, Thymus) Secondary lymphoid organs and tissues (Spleen, Lymph node, Tonsils, Adenoids, Peyer's patches, Lamina propria, Mucosa-associated lymphoid tissue, Gut-associated lymphoid tissue).
- c) Cells of the immune system:** Hematopoiesis, Biology, Development and Functions of PMNLs, NK cells, Macrophages, T-Lymphocytes, B-Lymphocytes, Dendritic cells

Module-II
Hours

12

- a) Antigens, and Antibodies:** Antigens, Immunogens and Haptens, Factors influencing immunogenicity, adjuvants, epitopes, Structure and functions of immunoglobulins, Synthesis of immunoglobulins, Genetic basis of immunoglobulin diversity.
- b) MHC molecules:** Types, structure, diversity and functions
- c) Antigen recognition:** Thymus dependent and independent Antigens, Clonal selection and immunological memory of B and T cells, Antigen processing and presentation (Endogenous pathway, Exogenous pathway, Cross presentation), Superantigens.
- d) Monoclonal Antibodies:** Hybridoma technology and production of mAbs, types, and applications. Advantages and disadvantages of mAbs in therapy.

Module-III
Hours

12

- a) Immune System in Health and Disease: Immunological Tolerance and Autoimmunity, Autoimmune Diseases (Organ specific autoimmune diseases-Graves' disease, Myasthenia Gravis, Systemic autoimmune diseases-Multiple Sclerosis, Rheumatoid Arthritis, Systemic Lupus Erythematosus), Immunosuppression, Hypersensitivity (Type I, II, III & IV).
- b) Vaccines and Vaccination: Principles of vaccination, Immune response to vaccines (Primary and Secondary response), Whole-Organism vaccines, Purified macromolecules as vaccines, Recombinant vaccines, DNA vaccines, Multivalent subunit vaccines and Edible vaccines, Vaccine safety, Reverse vaccinology. Overview of COVID-19 vaccines.
- c) Primary & Secondary Immuno-Deficiency Disorders:

Primary: Wiscott-Aldrich syndrome, Severe combined immunodeficiency disease (SCID), DiGeorge syndrome, Ataxia-telangiectasia, Leucocyte adhesion defects, Chronic granulomatous disease, X-linked agammaglobulinemia, Complement deficiencies. Gammopathies (Multiple myeloma).

Secondary: AIDS, Malnutrition, Drug regimen, Diabetes, Chronic infection.

Module-IV

10 Hours

- a) Clinical Immunology: Transplantation of tissues and organs: Nomenclature of transplantations, Transplantation reactions, HvG and GvH. Exception from rejections, Major and minor blood groups, Blood transfusion, tissue typing, Kidney and bone marrow transplantations. Immunosuppressive drugs. Tumor immunology: Neoplasms, tumor-associated antigens, immune response to tumor antigens, immunologic factors favoring tumor growth, immune surveillance, Tumor necrosis factor α and β . Metastatic processes, Immunodiagnosis, Antitumour drugs, Immunotherapy.
- b) Immunological Techniques: *In vitro* antigen-antibody reactions, serotyping, agglutination, complement fixation, immunoprecipitation, Immunodiffusion, ELISA, RIA, IHC, Immunoelectrophoresis.

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