



# BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

## MASTER OF COMPUTER APPLICATIONS Scheme of Teaching and Examination: 2022-23

### SEMESTER - II

#### Software Engineering

Course Code	22MCA201	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

#### Credits: 04

#### Course objectives:

This course will enable students to

1. Understand the software development process.
2. Analyse the system requirements
3. Design the system with UML tools
4. Explore the basic principles of software testing and debugging.
5. Apply different levels of testing, test case, test plan for any given project.

#### Module - 1

**Introduction:** Implication and Scope of Software Engineering and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Overview:** Introduction, Professional software development, case studies. Software Process: software process with models, process activities, coping with change, process improvement. Agile Software development: Agile methods, techniques, project management, scaling agile methods.

(09 Hours)

#### Module - 2

**Requirements Engineering:** Functional and non-functional requirements, requirements engineering process, requirements elicitation, requirements specification, requirements validation, requirements management.

**System Modeling:** Context models, interaction models, structural models, behavioral models, model-driven engineering.

(08 Hours)

#### Module - 3

**Design and implementation:** Object- oriented design using the UML, Design patterns, implement issues, open-source development.

**Domain-Driven-Design:** Communication and use of the language, binding model and implementation.

(08 Hours)

#### Module - 4

**Software Evolution:** Evolution process, program evolution dynamics, software maintenance, Legacy system management.

**Software Testing:** Development testing, Test-driven development, Release testing, user testing.

**Sociotechnical systems:** Complex systems, systems engineering, system procurement, system development.

(08 Hours)

<b>Module – 5</b>	
<p><b>Project Management:</b> Risk management, managing people, teamwork.</p> <p><b>Project planning:</b> Software pricing, plan-driven development, project scheduling, Agile planning, Estimation techniques.</p> <p><b>Quality Management:</b> Software quality, software standards, reviews and inspection, software measurements and metrics.</p>	
<b>Recap:</b> Summary of SE concepts	(09 Hours)
<b>Laboratory</b>	
<p><b>List of Programs:</b></p> <p>Using UML tools implement the patterns with different types of modeling such as class diagram, sequence diagram, use case diagram, activity diagram etc. Implement using Java programming.</p> <ol style="list-style-type: none"> <li>1. Publisher-Subscriber pattern</li> <li>2. Command pattern</li> <li>3. Client-dispatcher pattern</li> <li>4. Proxy pattern</li> <li>5. Forwarder-Receiver pattern</li> <li>6. Polymorphism pattern</li> </ol>	
<p><b>Course outcomes:</b></p> <p>The students will be able to:</p> <p>CO1: Explore the basic aspects of Software Engineering.</p> <p>CO2: Analyze the requirements of a software systems</p> <p>CO3: Perform testing for the software system.</p> <p>CO4: Create different models for the given problem.</p> <p>CO5: Evaluate the project in terms of risk and quality</p>	
<p><b>CIE:</b></p> <ul style="list-style-type: none"> <li>• CIE is based on Theory and Laboratory Components of the course.</li> <li>• Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.</li> <li>• CIE involves tests, assignments, case studies, reports etc.</li> </ul>	
<p><b>SEE:</b></p> <ul style="list-style-type: none"> <li>• SEE will be conducted for 100 marks.</li> </ul>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd, 2011.</li> <li>2. Eric Evans “Domain-Driven Design: Tackling Complexity in the Heart of Software”, Wesley, 2003. URL: <a href="https://sd.blackball.lv/library/Domain-Driven%20Design%20Tackling%20Complexity%20in%20the%20Heart%20of%20Software.pdf">https://sd.blackball.lv/library/Domain-Driven Design Tackling Complexity in the Heart of Software.pdf</a></li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Pankaj Jalote: Software Engineering, Wiley India Pvt Ltd (2010)</li> <li>2. Roger S Pressman: Software Engineering-A Practitioners approach, 6th Edition, McGraw-Hill, 2010.</li> </ol>	



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## MASTER OF COMPUTER APPLICATIONS Scheme of Teaching and Examination: 2022-23

### SEMESTER – II

#### Mobile Application Development

Course Code	22MCA202	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

#### Credits: 04

#### Course objectives:

This course will enable students to

1. Understand the preliminary requirements to build mobile applications
2. Design the GUI based activity screens using one of the tools of mobile application
3. Analyze the flows of activities of mobile applications
4. Apply the technologies to create mobile adaptive web applications.
5. Implement and Test Builds using one of the marketing tools of mobile.

#### Module – 1

**Introduction:** Implication and Scope of Mobile Application Development concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Overview:** Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate – Understanding Mobile Applications: Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design.

(09 Hours)

#### Module – 2

**Getting Started with Android Programming:** What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar

(08 Hours)

#### Module – 3

**Android UI Design and Location Based Services:** Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files

(08 Hours)

#### Module – 4

**Android Messaging and Networking:** SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text files – Accessing Web Services – Performing Asynchronous Call – Creating your own services – Communicating between a service and an activity – Binding, activities to services

(08 Hours)

#### Module – 5

**Feedback and Oscillator Circuits:** iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of iOS – Building Derby App in iOS – Other useful iOS things.

**Flutter:** Creating a basic app using flutter.

**Recap:** Summary of MAD concepts

(09 Hours)

**Course outcomes:**

The students will be able to:

- C01: Explore the design features of mobile devices.
- C02: Develop applications using views, intents, fragments and graphics.
- C03: Design an application using Internal and external database.
- C04: Design an application using image capturing and location based.
- C05: Develop a mobile application based on societal and environmental issues.

**Laboratory**

1. Views
2. Activities
3. Fragments
4. Intents
5. Layouts and Layout Managers
6. Graphics & Media
7. Internal & External Database
8. SMS Messaging
9. Image capturing and Location based applications
10. Notification
11. Flutter Framework

**CIE:**

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

**SEE:**

- SEE will be conducted for 100 marks.

**Text Books:**

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", 1st Edition, 2012, ISBN: 978-1-118-20390-3
2. Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011.
3. Marco L Napoli, "Beginning Flutter Hands on Guide to App Development", Wrox Publications 2020

**References:**

1. Reto Meier, "Professional Android 4 Application Development", Wrox Publications 2012.



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## MASTER OF COMPUTER APPLICATIONS Scheme of Teaching and Examination: 2022-23

### SEMESTER – II

#### Web Technologies

Course Code	22MCA203	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

#### Credits: 04

#### Course objectives:

This course will enable students to

1. Explore the various web scripting technologies.
2. Use HTML/XHTML, CSS, and Bootstrap to Design and Decorate simple to complex web pages.
3. Validate the web page at client side, server side using either JavaScript / ES6 Script.
4. Build a societal related problem based web application.

#### Module – 1

**Introduction:** Implication and Scope of Web Technologies concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Responsive Web Page Design:** Concept of Bootstrap. Bootstrap file structure, basic HTML template. Global styles, Default Grid System. Basic Grid HTML, offsetting columns, nesting columns, fluid grid system, container layouts, responsive design, typography, emphasis classes, Lists, code, Tables, Optional Table classes, Table row classes, Forms, buttons, Images, Icons.

(09 Hours)

#### Module – 2

**JavaScript and DOM Model:** JavaScript primitives, operations, expressions, keyboard input and screen output, control statements, object creation and modification, Arrays, Functions, Constructors, Pattern Matching using regular expressions, Errors in scripts. Javascript execution environment, the document object model, Elements access in Javascript.

(08 Hours)

#### Module – 3

**Handling Events in JavaScript:** Events and Event Handling. Handling Events from Body Elements, Handling Events from Text Box and Password elements, the DOM2 Model, the navigator object, Dom Tree Traversal and Modification.

**Dynamic Documents with JavaScript:** Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content, stacking elements, locating the mouse cursor, reacting to a mouse click, slow movement of elements, dragging and dropping elements.

(08 Hours)

#### Module – 4

**ECMAScript 6 (ES6):** Differences between ES5 and ES6, features, Source Maps, Block Scope, Default Parameters, Rest Parameters, Spread Operator, Destructuring, Arrow Functions, Enhanced Object Literals, Classes, Getters and Setters, New Math Functions, New Number Functions, Numeric Literals, New String Methods, Template Strings, New Array Functions and Methods, New Object Functions, Reflect Object, for-of Loops, Collections (Set, Map, WeakSet, WeakMap), Promises, Modules, jspm, Iterators and Iterables, Generators, Proxies, Tail Call Optimization, async and await, Type Annotations.

(08 Hours)

<b>Module – 5</b>	
<b>AJAX (Asynchronous JavaScript) Basics:</b> AJAX Principles, HTTP Primer, AJAX Communication Techniques, Cache Control, AJAX Patterns: Communication Control Patterns – Predictive Fetch, Page Preloading Example, Submission Throttling, Incremental Form and field validation example, Periodic refresh, Multi-stage Download. Fallback Patterns – Cancel Pending Requests, Try Again.	
<b>Recap:</b> Summary of Web technologies concepts	(09 Hours)
<b>Laboratory</b>	
1. Design a web page of Karnataka Tourism and apply appropriate CSS styles to the web page using HTML/XHTML elements 2. Design an Entertainment portfolio and apply appropriate web contents 3. Design a web page of Complaint registration form and apply the following: 4. Design a Login web page to accept the username and password as input and perform modifications. 5. Design an attractive event registration web page to accept the name, primary contact, address, email, type of event to participate, gender, age-group and terms & conditions field and perform the various actions. 6. Design a simple 2D game web page, which uses XHTML, CSS and Dynamic Javascript. 7. Build a department web application page using AJAX. 8. Build a college single page web application using ReactJS.	
<b>Course outcomes:</b> The students will be able to: C01: Explore Basic Concepts and tools of web technologies. C02: Design simple to complex web pages using suitable web technologies. C03: Validate the web page at client side, server side using suitable scripting technologies. C04: Apply the creativity in building web pages using suitable GUI code. C05: Build a web application with data handling capability.	
<b>CIE:</b> <ul style="list-style-type: none"> <li>• CIE is based on Theory and Laboratory Components of the course.</li> <li>• Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.</li> <li>• CIE involves tests, assignments, case studies, reports etc.</li> </ul>	
<b>SEE:</b> <ul style="list-style-type: none"> <li>• SEE will be conducted for 100 marks.</li> </ul>	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Jake Spurlock, “Bootstrap – Responsive Web Development”, O’Reilly, First Edition, 2013.</li> <li>2. Nicholas C. Zakas, et.Al., “Professional Ajax”, 2nd Edition, Wiley India Edition, 2010.</li> <li>3. Mark Volkmann, “ECMAScript (ES) 6”, Object Computing Inc, 2014.</li> </ol>	
<b>References:</b> <ol style="list-style-type: none"> <li>1. Robert W. Sebesta, “Programming the World Wide Web” 8th Edition, Pearson, 2014</li> <li>2. DT Editorial Services, “HTML5 Black Book” Dreamtech Press, 2nd Edition, 2016</li> <li>3. Fabio Cimo, Bootstrap Programming Cookbook, Exelixis Media P. C., 2015</li> </ol>	



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**MASTER OF COMPUTER APPLICATIONS**  
**Scheme of Teaching and Examination: 2022-23**

**SEMESTER – II**

**JAVA PROGRAMMING**

Course Code	22MCA204	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

**Credits: 04**

**Course objectives:**

This course will enable students to

1. Understand the basic constructs of Java programming.
2. Solve any given problem by applying various OOP concepts.
3. Understand the concepts of Multithreading to develop complex applications.
4. Design web applications using Servlets and JSP.
5. Develop applications using JDBC and EJB.

**Module – 1**

**Introduction:** Implication and Scope of Java and Advanced Java Programming concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Java Programming Fundamentals:** Java Programming Fundamentals, Introducing Data Types and Operators, Program Control Statements, Introducing Classes, Objects and Methods.

**Methods, Classes and Inheritance:** Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Constructors and Inheritance, using super to Call Superclass constructors, using super to Access Superclass Members, creating a Multilevel Hierarchy, Superclass References and Subclass Objects, Method Overriding, Overridden Methods, Polymorphism, Using Abstract Classes, Using final.

(09 Hours)

**Module – 2**

**Interfaces, Packages, and Exception Handling:** Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Package Fundamentals, Packages and Member Access, Importing Packages, The Exception Hierarchy, Exception Handling Fundamentals, the Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, Throwing an Exception, Throwable, using finally, using throws.

(08 Hours)

**Module – 3**

**Multithreaded Programming and Enumerations:** Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads, Enumerations, The Values() and Valueof() Methods, Instance variables and enumerations.

(08 Hours)

<b>Module – 4</b>	
<p><b>Servlets:</b> Servlet Structure, Packaging, Lifecycle, HTTP Request and response, Handling client request, Form data, HTTP status request headers, HTTP Status codes, HTTP response headers, Handling cookies, Session tracking.</p> <p><b>Java Server Pages:</b> Need of JSP, Basic syntax, Scripting elements, Limiting Java code in JSP, JSP expression, JSP directives, JSP attributes.</p> <p style="text-align: right;">(08 Hours)</p>	
<b>Module – 5</b>	
<p><b>JDBC:</b> Steps to connect to the database, Connectivity with Oracle or MySQL, DriverManager, Connection, Statement, ResultSet interfaces, PreparedStatement, ResultSetMetaData, DatabaseMetaData.</p> <p><b>Server Side Component Types:</b> The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message Driven Bean, Entity Bean.</p> <p><b>Recap:</b> Summary of Java and Advanced Java Programming concepts</p> <p style="text-align: right;">(09 Hours)</p>	
<b>LABORATORY</b>	
<p><b>Lab Programs covering the Concepts:</b></p> <ol style="list-style-type: none"> <li>1. Constructor Overloading and Method Overloading</li> <li>2. Classes and Objects</li> <li>3. Inheritance</li> <li>4. Packages and Interfaces</li> </ol>	<ol style="list-style-type: none"> <li>5. Servlets</li> <li>6. JSP directives and attributes</li> <li>7. JDBC</li> <li>8. Entity Beans</li> </ol>
<p><b>Course outcomes:</b> The students will be able to:</p> <p>CO1: Demonstrate the basic programming constructs of Java and OOP concepts to develop Java applications.</p> <p>CO2: Illustrate the concepts of generalization and run time polymorphism to develop reusable components.</p> <p>CO3: Exemplify the usage of Multithreading in building efficient applications.</p> <p>CO4: Build web applications using Servlets and JSP.</p> <p>CO5: Design applications using JDBC and Enterprise Java Beans.</p>	
<p><b>CIE:</b></p> <ul style="list-style-type: none"> <li>• CIE is based on Theory and Laboratory Components of the course.</li> <li>• Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.</li> <li>• CIE involves tests, assignments, case studies, reports etc.</li> </ul>	
<p><b>SEE:</b></p> <ul style="list-style-type: none"> <li>• SEE will be conducted for 100 marks</li> </ul>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Herbert Schildt, Dale Skrien, "Java Fundamentals: A comprehensive Introduction", Tata McGraw Hill Edition 2013.</li> <li>2. Marty Hall, Larry Brown, "Core Servlets and Java Server Pages", Volume 1, Core Technologies, 2nd Edition.</li> <li>3. Andrew LeeRubinger, Bill Burke, "Developing Enterprise Java Components: Enterprise JavaBeans 3.1", O'Reilly.</li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Hari Mohan Pandey, "Java Programming", Pearson Education, 2012.</li> <li>2. "Java 6 Programming: Black Book", Dreamtech Press, 2012.</li> <li>3. Michael Sikora, "EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard", SPD, 2008</li> </ol>	





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**MASTER OF COMPUTER APPLICATIONS**  
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**SEMESTER – II**

**Big Data Analytics**

Course Code	22MCA2052	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

**Credits: 03**

**Course objectives:**

This course will enable students to

1. Understand the basics of analytics process model and its requirements.
2. Solve any given analytics problem by applying various algorithms for handling large volumes of data.
3. Understand the HDFS architecture and Map-Reduce techniques for solving the big data problems.
4. Explore Spark architecture and its APIs.
5. Use Hive Query Language against large datasets.

**Module – 1**

**Introduction:** Implication and Scope of Big Data Analytics concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Big Data and Analytics:** Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements, Types of Data Sources, Sampling, Types of Data Elements, Data Exploration, Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data Labels, Categorization.

(09 Hours)

**Module – 2**

**Predictive and Descriptive Analytics:** Target Definition, Linear Regression, Logistic Regression, Decision Trees, Neural Networks, Support Vector Machines, Ensemble Methods, Multiclass Classification Techniques, Evaluating Predictive Models; Association Rules, Sequence Rules, Segmentation.

(08 Hours)

**Module – 3**

**The Hadoop Distributed File system:** The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, Anatomy of a File Read, Anatomy of a File Write.

**Map Reduce:** A Weather Dataset, Data Format, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job.

(08 Hours)

**Module – 4**

**Big Data and Spark:** What is Apache Spark? Spark's Architecture, its language API, Data Frames, Partitions, Lazy Evaluation, Spark's Toolset, Overview of Structured API Execution.

(08 Hours)

<b>Module – 5</b>	
<b>Programming Hive:</b> Hive in the Hadoop Ecosystem, Data Types and File Formats, HiveQL: Data Definition, Databases in Hive, Alter Database, Creating Tables, External Tables, Partitioned Tables, External Partitioned Tables, Dropping Tables, Alter Tables, HiveQL: Data Manipulation, Queries (till GROUP BY Clauses).	
<b>Recap:</b> Summary of BDA concepts	(09 Hours)
<b>Course outcomes:</b> The students will be able to: CO1: Identify the business problem for a given context and frame the objectives to solve it using data analytics tools. CO2: Differentiate various types of analytics algorithms and context of their application. CO3: Illustrate the architecture of HDFS and MapReduce. CO4: Explore Spark architecture and its language APIs CO5: Write Hive queries against large datasets on clusters	
<b>CIE:</b> <ul style="list-style-type: none"> <li>60% of CIE is based on Internal Assessment Tests</li> <li>40% of CIE is based on Alternate Assessment Methods</li> </ul>	
<b>SEE:</b> <ul style="list-style-type: none"> <li>SEE will be conducted for 100 marks</li> </ul>	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications” Wiley.</li> <li>Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.</li> <li>Bill Chambers, Matei Zaharia, “Spark: The Definitive Guide”, O’reilly, 2018.</li> <li>Jason R, Dean W, Edward C, “Programming Hive”, O’reilly, 2012.</li> </ol> <b>References:</b> <ol style="list-style-type: none"> <li>Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley.</li> <li>Chris Eaton, Dirk Deroos et al., “Understanding Big data”, McGraw Hill, 2012.</li> </ol>	



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## MASTER OF COMPUTER APPLICATIONS Scheme of Teaching and Examination: 2022-23

### SEMESTER – II

#### Operations Research

Course Code	22MCA2063	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

### Credits: 03

#### Course objectives:

This course will enable students to

1. Analyse managerial problems in industry so that they are able to use resources more effectively.
2. Formulate mathematical models for quantitative analysis of managerial problems in industry.
3. Analyse the mathematical models of real problems in Operations Research
4. Frame LP Problems with solutions to solve them.
5. Improve decision making and develop critical thinking.

#### Module – 1

**Introduction:** Implication and Scope of Operations Research concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

**Overview:** Operations Research – A Quantitative approach to Decision making, Features of OR, OR Approaches to problem solving, Methodology of Operations Research.

**Linear Programming:** Introduction, Structure of Linear Programming Model, Advantages, General Mathematical Model of LPP, Examples of LP Model Formulation, Graphical Solution methods of LP Problem.

(09 Hours)

#### Module – 2

**Linear Programming:** The Simplex Method, Two-Phase Method, Big M Method.

(08 Hours)

#### Module – 3

**Duality:** Primal-Dual Relationship, Solving the Dual given the primal, Interpreting the results of Dual and Primal, Dual Simplex Method.

**PERT and CPM:** Network Representation, Critical Path (CPM) computations – Steps and procedures, Problems based on CPM computation, PERT networks – Introduction, Steps and procedure involving PERT networks, Problems based on PERT networks.

(08 Hours)

#### Module – 4

**Assignment Problem:** Mathematical model of Assignment Problem, Hungarian method for solving assignment problem.

**Transportation Problem:** Transportation problem, Mathematical model of Transportation problem, Methods of finding initial solution (North-West corner rule, Least cost method, Vogel's Approximation method), Test for Optimality in TP using MODI method (uv-method).

(08 Hours)

<b>Module – 5</b>	
<b>Theory of Games:</b> Introduction, Two-person zero-sum game, pure strategies (Minimax and Maximin principles), Mixed strategies, Dominance Rule, Algebraic method to solve games without saddle point, Graphical method to solve the games, Solving games using LPP method. Sequencing Problems: Processing n jobs through two machines (Johnson's Procedure).	
<b>Recap:</b> Summary of Operations Research concepts	(09 Hours)
<b>Course outcomes:</b> The students will be able to: C01: Explore the importance of Operations Research C02: Apply the different approaches of OR to problem solving C03: Formulate a LPP for a given problem C04: Obtain optimal solutions for any given problem C05: Compute the critical path in any given network.	
<b>CIE:</b> <ul style="list-style-type: none"> <li>• 60% of CIE is based on Internal Assessment Tests</li> <li>• 40% of CIE is based on Alternate Assessment Methods</li> </ul>	
<b>SEE:</b> <ul style="list-style-type: none"> <li>• SEE will be conducted for 100 marks.</li> </ul>	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. S D Sharma "Operation Research", Kedarnath, Ramnath and Co, 2002</li> <li>2. J K Sharma, "Operations Research Theory and Applications", 5<sup>th</sup> Edition, McMillan Publication, India.</li> </ol> <b>References:</b> <ol style="list-style-type: none"> <li>1. Taha H A, "Operations Research – An Introduction", 7th Edition, 2006.</li> </ol>	