

ST. JOSEPH'S UNIVERSITY

BENGALURU-27



ST. JOSEPH'S INSTITUTE OF INFORMATION TECHNOLOGY

**DEPARTMENT OF COMPUTER SCIENCE AND
APPLICATIONS**

SYLLABUS FOR POSTGRADUATE PROGRAMME

M.Sc. (COMPUTER SCIENCE)

For Batch 2021-2023

MSc

PROGRAM OBJECTIVES

- Provide high quality training to the students through the latest computer technology.
- To trigger their mind in the field of project, provide an ambiance of learning, inculcate interdisciplinary approach in project and in working environment.
- To enable the students to develop their team building and communication skills with the professional approach.

Course Outcomes: At the end of the course, the student should

CO1	Knowledge	Have acquired a fair knowledge of Software development and various computer Advanced concepts are being in use.
CO2	Understand	Have developed a fair amount of understanding on Advanced concepts and skills to approach to develop a project on his/her own.
CO2	Apply	Be able to implement s/w tools and techniques especially open sources to resolve the interdisciplinary problems.
CO3	Analyze	Be able to compare and relate the techniques to provide required results.
CO4	Evaluate	Be able to select optimal solution to solve the problems.
CO5	Create	Be able to develop complete real-world project applicable to present situation in various entities.

SUMMARY OF CREDITS

FIRST SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS7121	Object Oriented Programming using JAVA	4	4	50	50	100
CS7221	Theory of Computation	4	4	50	50	100
CS7321	Design and Analysis of Algorithms	4	4	50	50	100
CS7421	Cyber Security	4	4	50	50	100
PRACTICAL						
MCS1P1	Object Oriented Programming JAVA Lab	6	3	25	25	50
MCS1P2	Design and Analysis of Algorithm Lab	6	3	25	25	50

Total Number of Credits: 22

SECOND SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS8121	Advanced Database Management System	4	4	50	50	100
CS8221	Machine Learning with Python	4	4	50	50	100
CS8321	Advanced Web Technologies	4	4	50	50	100
CS8421	Principles of Compiler Design	4	4	50	50	100
CS8521	Software Project Management	4	4	50	50	100
PRACTICAL						
MCS2P1	ML with Python lab	6	3	25	25	50

MCS2P2	Advanced Web Technologies &ADBMS Lab	6	3	25	25	50
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Total Number of Credits: 26

THIRD SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS9122	Data Analytics with HADOOP	4	4	50	50	100
CS9222	Mobile Communication and Applications	4	4	50	50	100
Department Elective (One of the two)						
CSDE9322	1) Internet of Things	4	4	50	50	100
CSDE9422	2)Cloud Computing and Information Storage Management	4	4	50	50	100
CS9522	Seminar and Comprehensive Viva Voce	4	4	25	25	50
PRACTICAL						
MCS3P1	Mobile Applications Lab	6	3	25	25	50
MCS3P2	Database Applications Development Lab	6	3	25	25	50

Total Number of Credits: 20

FOURTH SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS0122	Image Processing	4	4	50	50	100

CS0222	Advanced Operating System	4	4	50	50	100
PRACTICAL						
MCS4P1	Major Project /Internship	24	12	50	50	100

Total Number of Credits: 20

KEY WORDS: DE – Departmental Elective and OE – Open Elective

CORE COURSES (CC)	
Course Title	Code Number
Object Oriented Programming using JAVA	CS7121
Theory of Computation	CS7221
Design and Analysis of Algorithms	CS7321
Cyber Security	CS7421
Advanced Database Management System	CS8121
Machine Learning with Python	CS8221
Advanced Web Technologies	CS8321
Principles of Compiler Design	CS8421
Software Project Management	CS8521
Data Analytics with HADOOP	CS9122
Mobile Communication and Applications	CS9222
Seminar and Comprehensive Viva Voce	CS9522
Image Processing	CS0122
Advanced Operating System	CS0222

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)	
Course Title	Code Number
1) Internet of Things	CSDE9322
2) Cloud Computing and Information Storage Management	CSDE9422

SKILL ENHANCEMENT COURSE (SEC) –	
Any practical oriented and software based courses offered by departments to be listed below	
Course Title	Code Number
Object Oriented Programming JAVA Lab	MCS1P1
Design and Analysis of Algorithm Lab	MCS1P2
ML with Python lab	MCS2P1
Advanced Web Technologies &ADBMS Lab	MCS2P2
Mobile Applications Lab	MCS3P1
Database Applications Development Lab	MCS3P2
Major Project /Internship	MCS4P1

INTERNAL AND EXTERNAL ASSESSMENT FOR THE THEORY PAPERS.

INTERNAL ASSESSMENT (50 Marks)

ACTIVITY: 20 Marks

At least four activities will be conducted.

MID SEMESTER EXAMINATION: 25 Marks

The MSE for PG will be conducted two times for 25 marks for 4 credit courses, and is for 1 hour duration, marks of both activity and MSE will be brought down to 50. 50% of the portion in the syllabus must be covered for the MSE.

Activity + MSE = 70 which is converted to 50

Question Paper pattern:

Part A

5 questions, each carries one mark ($5 * 1=5$ marks)

Part B

Five questions out of seven, each carries 3 marks ($5 * 3 =15$ marks)

Part C

Three questions out of four (include subparts), each carries 10 marks ($3 * 10=30$ marks)

INTERNAL AND End Semester Practical Exam FOR THE PRACTICAL PAPERS.

PRACTICAL INTERNAL ASSESSMENT:

Every session will be evaluated for 25 marks – Writing 10, Execution 5, Record 5 and Viva 5 marks

End Semester Practical Exam will be 25 marks – Writing 2 programs 10 marks, Execution 10 marks, Viva 5 marks.

PRACTICAL QUESTION PAPER FORMAT

Scheme of valuation:

- | | | |
|----|--|----------|
| 1. | Writing two programs | 10 marks |
| 2. | Execution of the programs | 10 marks |
| 4. | Viva voce related to practical topics only | 5 marks |

Total **25 marks**

Semester	III
Paper Code	CS9122
Paper Title	DATA ANALYTICS with HADOOP
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives:

The Student should be made to:

- Be Exposed To Big Data
- Learn The Different Ways Of Data Analysis
- Be Familiar With Data Streams
- Learn The Mining And Clustering
- Be Familiar With The Visualization

UNIT I

(12)

INTRODUCTION TO BIG DATA

Introduction To Big Data Platform – Challenges Of Conventional Systems – Web Data – Evolution Of Analytic Scalability, Analytic Processes And Tools, Analysis Vs Reporting – Modern Data Analytic Tools.

UNIT II

(12)

DATA ANALYSIS

Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule Induction – Neural Networks: Learning And Generalization, Competitive Learning.

UNIT III

(12)

FREQUENT ITEMSETS AND CLUSTERING

Mining: Frequent Item sets – Market Based Model – Apriori Algorithm – Handling Large Data Sets In Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets In A Stream – Clustering Techniques – Hierarchical – K- Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern Based Clustering Methods.

UNIT IV

(12)

HADOOP and MapReduce

Hadoop Fundamentals: Data, Data Analysis and storage, Comparison with other systems – Relational Database Management Systems, Grid Computing, Volunteer Computing, History of Apache Hadoop The Hadoop Distributed File system The Design of HDFS, HDFS Concepts – Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, Map Reduce: Data format, Analyzing the data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out Working of Map Reduce – Anatomy of a Map Reduce Job Run, Failures, Shuffle and Sort

UNIT V

(12)

Pig Environment and Hive

Pig Environment: Execution types, Running Pig programs, Grunt, Pig Latin Editors An Example – Generating Examples, Comparison with databases Pig Latin – Structure, Statements, Expressions, Types, Schemas, Functions, Macros

Hive: Installing Hive – The Hive shell, An Example; Running Hive – Configuring hive, Hive services, the Meta store , Comparison with Traditional Databases – Schema on Read Versus Schema on Write, Updates, Transactions and Indexes

REFERENCES

- Cielen, D., Meysman, A., & Ali, M. (2016). Introducing data science: big data, machine learning, and more, using Python tools. Manning Publications Co.
- Tom White, “Hadoop – The Definitive Guide; Storage and Analysis at Internet scale”, O’Reilly, Shroff Publishers & Distributers Pvt. Ltd., 4th Edition, 2015, ISBN – 978-93-5213-067-2
- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
- Anand Rajaraman And Jeffrey David Ullman, Mining Of Massive
- Datasets,Cambridge University Press, 2012.
- Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge
- Data Streams with Advanced Analytics, John Wiley & Sons, 2012.
- Glenn J. Myatt, Making Sense Of Data, John Wiley & Sons, 2007 Pete Warden,
- Big Data Glossary, O Reilly, 2011.
- Jiawei Han, Micheline Kamber “Data Mining Concepts And Techniques”, Second
- Edition, Elsevier, Reprinted 2008.

BLUEPRINT

Code number: **CS9122**

Title of the paper: **DATA ANALYTICS with HADOOP**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	14
Unit II	12	20
Unit III	12	20
Unit IV	12	16
Unit V	12	10
TOTAL	60	80
Maximum marks for the paper (Excluding bonus question)= 70		

Semester	III
Paper Code	CS9222
Paper Title	MOBILE COMMUNICATION AND APPLICATIONS
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives

- To provide student with fundamental design paradigm and technologies of mobile communication and application.
- Features of 3G, 4G and its comparison.
- Knowledge of mobile application in software intensive systems.
- Synthesize knowledge in the area of mobile communication and application.
- Implementing the Android Studio in developing mobile application.

UNIT I (12)

INTRODUCTION

Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmission, Signals, Antennas, Multiplexing-SDM, FDM, TDM, CDM, Medium Access Control-SDMA, FDMA, TDMA, CDMA.

UNIT II (12)

GSM

Telecommunications System – GSM – System Architecture, Localization and calling, Hand over and Security, Satellite System, Wireless LAN, Bluetooth, Mobile IP-Goals, Packet Delivery, Registration – Tunneling and Reverse Tunnelling.

UNIT III (12)

ANDORID OVERVIEW

A little background about mobile technologies, Different mobile technologies Android, Windows, IOS, Black Berry, series 40, Bada Nokia, Benefits and drawbacks of Smartphone programming, Overview of Android, How it all got started, Why Android different and important, Android Stack overview, Linux kernel, native libraries, App framework, Apps, SDK overview, platforms, tools, versions. Creating and setting up custom Android emulator.

UNIT IV (12)

ANDROID INSTALLATION

Install the android SDK, Install base tools, install SDKs and Addons, Install apache Ant, Emulator and Device. Get know Eclipse, Build, install and Run the Application in your Emulator or Device, Project Structure.

UNIT V

(12)

DESIGNING USER INTERFACE

Designing by declaration, creating the opening screen, using alternate resources, implementing an about box, applying a theme, adding a menu, adding settings, debugging with log messages, debugging with debugger.

Self-Study: IPV4 Features and Ten Interactive Mobile application development with various design tools.

REFERENCES

- Jochen Schiller, Mobile Communication, Addison Wesley, 2003. (Unit 1,2 and3)
- Grant Allen, Beginning Android 4, Apress, 2012. (Unit 4 and 5)
- Akash Bhardwaj, Mobile communication Design Fundamentals, Random Publications, 2017
- William Stallings, Wireless Communication and Networks, Pearson Education, 2003
- Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.

BLUEPRINT

Code number: **CS9222**

Title of the paper: **MOBILE COMMUNICATION AND APPLICATIONS**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	14
Unit II	12	20
Unit III	12	20
Unit IV	12	16
Unit V	12	10
TOTAL	60	80
Maximum marks for the paper (Excluding bonus question)= 70		

Semester	III
Paper Code	CSDE9322
Paper Title	Internet of Things
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives:

This paper Internet of Things (IoT) focuses on interconnection and integration of the physical world and the cyber space. It helps the student to relate the trends of future networking and leads the third wave of the IT industry revolution. In this paper, first introduces some background and related technologies of IoT. Later the challenges and key scientific problems involved in IoT development are implemented for future research directions.

UNIT I

(12)

Internet of Things overview

History of IoT:

Evolution of Internet, IoT for the general world, IoT for technology professionals, Tools and techniques needed for IoT, Embedded Systems, Manufacturing 4.0(IIoT), Application of IoT: Agriculture, Smart City and Automobile.

Open source and hardware

Different open source and hardware, Arduino, Raspberry Pi, Beaglebone, Intel Galileo, ESP8266

UNIT II

(12)

Setting up first Raspberry Pi and Communication Protocols

Setting of IoT Hands on Practice:

Installing Raspbian in SD card, Making essential connections, Booting up the Raspberry Pi

Running simple programs, Programming and Interfacing LED with Raspberry Pi, Interfacing Sensor with Raspberry Pi and analyzing the data

Overview of Communication protocols used in IoT:

Bluetooth, WiFi, Zigbee, Xbee, NFC, LoRaWAN

UNIT III

(12)

Advance technologies and application layer protocols:

Technologies used to build IoT:

IPv6, Sensor networks, Cloud computing, M2M, Wearables, Complex Event Processing (CEP)

Application layer protocols for IoT (Overview and detailed discussion on MQTT)

HTTP, MQTT, HTTP v/s MQTT, Quality of Service, Retain Flag, CoAP, XMPP, AMQP

Hands on Practice:

Writing a Python Code for MQTT Publishing Client

Publishing sensor data from Raspberry Pi using MQTT analyzing data on Smartphone

Writing a Python Code for MQTT Subscribing Client

Controlling devices/appliances connected to Raspberry Pi over MQTT from Smartphone

UNIT IV

(12)

IoT Cloud Services

AWS IoT :

Understanding AWS IoT Architecture and components, AWS IoT Device registry, policy and security certificates

Hands on Practice- registering a device, creating security certificates and building policy for device

Hands on Practice on Sensors:

Connecting Raspberry Pi to Publish sensor data to AWS IoT

IBM Watson IoT Overview

Microsoft Azure IoT Overview

Integrating different services of AWS to our existing module.

Applying Rule based SQL Query to sensor based data to trigger another service on AWS

UNIT V

(12)

Security in IoT

Hardware Security:

Challenges in maintaining sensor devices, monitoring and upgrading the resources.

System enhancement with new features.

Software and Data Security:

Security level in preserving data, Maintaining and monitoring the data. Enhancement of data size and sorting the data required.

Project Guideline:

Project Plan and approach for IoT projects.

REFERENCES:

- The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World
- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

BLUEPRINT

Code number: **CSDE9322**

Title of the paper: **Cloud Computing & Information Storage**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	14
Unit II	12	20
Unit III	12	20
Unit IV	12	16
Unit V	12	10
TOTAL	60	80
Maximum marks for the paper (Excluding bonus question) = 70		

Semester	III
Paper Code	CSDE9422
Paper Title	Cloud Computing & Information Storage
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives:

- The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure.
- Overview of cloud computing, cloud systems, Cloud Service Administration, Accessing the Cloud parallel processing in the cloud, distributed storage systems, virtualization, cloud standards, and Migrating to the Cloud.
- Knowledge about the state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

Unit – 1

(12)

Introduction

Evolution of Cloud Computing, Cloud Essentials, Business and IT Perspectives, Cloud Computing Definition, The vision of Cloud Computing, Characteristics of Cloud Computing, Paradigm Shift, Benefits of Cloud Computing, Advantages and Disadvantages of Cloud Computing, Cloud Components, Historical developments: Distributed systems, Virtualization, Web 2.0, Service oriented computing, Utility computing. Building Cloud Computing Environments: Application development, Infrastructure and system development, Computing platforms and technologies, Cloud Consumers and Cloud Providers, Horizontal Scaling, Vertical Scaling, Cloud Service, Cloud Service Consumer.

Unit – 2

Cloud Computing Architecture

(12)

Introduction, The Cloud Computing Reference Model, Types of Cloud services: Software as a Service, Platform as a Service, Infrastructure as a Service. Cloud Deployment Models: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Economics of the Cloud, Open challenges, Virtualization and Cloud Computing, Using

Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors

Unit – 3

Information Storage in Cloud Computing (12)

Cloud Storage : Cloud Storage Concepts, Storage as a Service, Cloud Storage Device, Cloud Storage Levels, Network Storage Interfaces , Object Storage Interfaces, Database Storage Interfaces, Relational Data Storage, Non-Relational Data Storage, Working with Cloud-Based Storage, Cloud storage in the Digital Universe, Provisioning Cloud Storage, Creating Cloud Storage Systems, Virtual Storage Containers, Exploring Cloud Backup Solutions, Cloud Storage Interoperability, Cloud Storage Providers : Amazon S3, Nirvanix, Google Bigtable Datastore, MobileMe Live Mesh,

Unit – 4

Cloud Security (12)

Cloud Security Challenges, Cloud Data Security, Network security, Host Security, Risk Tolerance in Cloud, Threat Agents, Cloud Security Threats, Cloud Security Mechanics : Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images, Disaster Recovery Planning, Disaster Management.

Unit – 5

Cloud Platforms in Industry: (12)

Amazon web services: Compute services, Storage services, Communication services, Additional services.

Google AppEngine: Architecture and Core Concepts, Application Life Cycle, Cost Model. **Microsoft Azure:** Azure Core Concepts, SQL Azure, Windows Azure platform appliance.

Self-Study

Cloud Applications: Scientific Applications, Business and Consumer Applications, Social Networking, Media Applications, Multiplayer Online Gaming.

References

- Rajkumar Buyya , James Broberg , Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, First Edition, 2011, willey
- Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGraw Hill Edition, Fourth Reprint, 2010
- Barrie Sosinsky (2011) Cloud Computing Bible, Wiley, India
- Thomas Erl, Zaigham Mahmood, and Ricardo Puttini,” Cloud Computing Concepts, Technology & Architecture”, PRENTICE HALL, 2013
- Bloor R., Kanfman M., Halper F. Judith Hurwitz “Cloud Computing for Dummies”, Wiley India Edition,2010
- John Rittinghouse & James Ransome, “Cloud Computing Implementation Management and Strategy”, CRC Press, 2010.
- Michael Miller, “Cloud Computing: “Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.

BLUEPRINT

Code number: **CSDE9422**

Title of the paper: **Cloud Computing & Information Storage**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	14
Unit II	12	20
Unit III	12	20
Unit IV	12	16
Unit V	12	10
TOTAL	60	80
Maximum marks for the paper (Excluding bonus question)= 70		

Semester	III
Paper Code	CS5222
Paper Title	Seminar and Comprehensive Viva Voce
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives:

- 1.The objective of comprehensive viva-voce is to assess the overall knowledge of the students' in the relevant field of MSc Computer Science have been acquired over three semesters of study in the postgraduate program.
2. The key objective of this course is to prepare students to face interviews both technical/non-technical and academic/industrial field's.
- 3.This course will also help students in comprehending their knowledge and refreshing fundamental concepts of all the papers what they have studied in the previous semesters.
4. The students are advised to apply their own intellectual ability in preparing the research article on any one of the current trends in the field of Computer Science.

Learning Outcomes:

At the end of this course, students will be able to:

1. Improve their understanding of various topics learnt in previous semesters.
2. Recall and Refresh fundamental concepts which they learn in various topics.
3. Enhance their interview facing skills.
4. Identify a research topic, collect literature, Present seminar & discuss the queries.

Contents:

- The viva shall normally cover the subjects taught in all the previous semesters of MSc Programme
- There is a provision of 50 marks seminar in which students have to give a presentation. In place of seminar, it is decided that, students can prepare a Research Article on any one of the topics from recent trends. They are requested to bring the file carrying research article on the same day, when they will come to give viva voce exam in the department.

Examination :

Every student will be required to undergo comprehensive viva voce at the end of 3rd semester of MSc Programme. The duration of the viva will range from 15-30 min. The examination committee will be constituted by the HOD and consist of at least three faculties.

Assessment plan with Marks Distribution:

- 50% weightage internal exam will be based on the research article.
- 50% weightage End semester exam will be based on Viva Voce.
 1. Viva Voce exam will be conducted in the form of an Interview.
 2. Minimum 2 faculty members will be forming the panel to assess candidate during their Viva voce exam.
 3. Minimum 10 questions need to be asked to a student during Viva Voce. Preferably those questions should be as per below given weightage (20 % Questions from recent trends in the industry + 20% Questions on Soft skills + 60 % Questions based on Domain knowledge.)
 4. Grading of the candidates can be done on basis of Rubrics. – 50 Marks

TITLE : MOBILE APPLICATION LAB**CODE : MCS3P1****Hours / Week: 3 Hrs****Credits: 3****List of programs**

1. Design an activity that contains user id and password.
2. Creating an Application that displays message based on the screen orientation.
3. Create an application that displays custom designed Opening Screen.
4. Create menu in Application.
5. Play an audio, based on the user event.
6. Read/ write the Local data.
7. Display Map based on the Current location.
8. Create / Read / Write data with database (SQLite).
9. Hello world – windows app
10. Design a Lock Screen in the existing app.

11. Learn to deploy both android Mobile Applications window application (Any 3 programs).
12. Develop an application that uses GUI components, Font and Colours
13. Develop an application that uses Layout Managers and event listeners.
14. Write an application that draws basic graphical primitives on the screen.

TITLE : DATABASE APPLICATION DEVELOPMENT LAB

CODE : MCS3P2

Hours / Week: 3 Hrs

Credits: 3

List of programs

1. Task Management Application

To develop a dedicated task management app that allows users to

- Create personal profiles,
- Log in to their accounts securely with a proper authentication process,
- Add multiple tasks within the app,
- Manage multiple task lists, and
- Mark tasks as completed.

2. Railway System

A railway system, which needs to model the following:

- Stations
- Tracks, connecting stations. All the tracks put together to form a graph.
- Trains, with an ID and a name
- Train schedules recording what time a train passes through each station on its route.
- For each train, for each station on its route, you store Time in, Timeout (same as time in if it does not stop), a sequence number so the stations in the route of a train can be ordered by sequence number.
- Passenger booking consisting of train, date, from-station, to station, coach, seat and passenger name.

3. Blood Donation System

- A system in which data of patient, data of donor, data of blood bank would be saved and will be interrelation with each other
- DATA OF PATIENT – Patient Name, Patient Id, Patient Blood Group, Patient Disease
- DATA OF DONOR – Donor Name, Donor Id, Donor Blood Group, Donor Medical report, Donor Address, Donor Contact number
- DATA OF BLOOD BANK – Blood Bank Name, Blood Bank Address, Blood bank Donor's name, Blood Bank Contact Number, Blood Bank Address

- Normalize the tables

4. Salary Management System

- Employee list to be maintained having id, name, designation, experience
- Salary details having employee id, current salary
- Salary in hand details having employee id, CTC salary, PF deduction or any other deduction and net salary to be given and also maintain details of total savings of employee
- Salary increments to be given by next year if any depending upon constraints
- Deduction in monthly salary if any depending upon any discrepancy in work and amount to be deducted.

5. College Timetable Manager

The timetable is needed to be scheduled in such a way that the number of different courses with a number of subjects in each, handled by a limited faculty provided with their slots and timings does not overlap.

- Admin Module
Responsible for taking all the details of the faculty, course, subject, semester and how many hours a day the classes last. The admin generates the timetable according to all these factors.
- Faculty Module
The faculty gives all of their details to the admin. In the case, at times the faculty could take a leave as well. In such a situation, the faculty is responsible to send the reason, date and on which period the leave is to be taken. The substitute faculty gets the request. The substitute faculty has the facility to either accept or reject the substitute hour. Then this is sent back to the faculty informing about the request. Accordingly, the timetable is modified.
- Time Table Generation Module
In this module, time table generation is done by considering the maximum and minimum workload for each faculty. This will be generated by the admin and viewed by the faculty who are the users of this system.

6. Develop a basic Chatbot with spreadsheet as a database for your chatbot.

7. Develop any one database application of your choice.

Semester	IV
Paper Code	CS0122
Paper Title	IMAGE PROCESSING
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study image segmentation techniques
- To study feature extraction techniques
- To study the image compression procedures.

UNIT I

(10)

Introduction: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system.. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels .

DIGITAL IMAGE PROPERTIES

Topological Properties of Digital Images-Histograms, Entropy , Eigen Values-Image Quality Metrics-Noise in Images – Sources, types.

UNIT II

(10)

OPERATIONS ON DIGITAL IMAGES

Arithmetic operations - Addition, Subtraction, Multiplication, Division-Logical operations – NOT, OR, AND, XOR-Set operators-Spatial operations – Single pixel, neighborhood,geometric-Contrast Stretching-Intensity slicing-Bit plane slicing
Power Law transforms

UNIT III

(12)

IMAGE ENHANCEMENT

Spatial and Frequency domain-Histogram processing-Spatial filtering-Smoothing spatial filters-Sharpening spatial filters Discrete Fourier Transform-Discrete Cosine Transform-Haar Transform -Hough Transform-Frequency filtering-Smoothing frequency filters-Sharpening frequency filters-Selective filtering

DIGITAL IMAGE RESTORATION

Noise models - Degradation models-Methods to estimate the degradation-Image de-blurring-Restoration in the presence of noise only spatial filtering-Periodic noise reduction by frequency domain filtering-Inverse filtering-Wiener Filtering

UNIT IV

(14)

IMAGE SEGMENTATION

Discontinuity detection-Edge linking and boundary detection Thresholding-Region oriented segmentation- Histogram based segmentation Object recognition based on shape descriptors

MORPHOLOGICAL IMAGE PROCESSING

Dilation and Erosion-Opening and Closing-Medial axis transforms-Objects skeletons-Thinning boundaries

UNIT V **(14)**

FEATURE EXTRACTION

Region of interest (ROI) selection - Feature extraction: Histogram based features - Intensity Features-Color, Shape features-Contour extraction and representation-Homogenous region extraction and representation-Texture descriptors - Feature Selection: Principal Component Analysis (PCA)

IMAGE CODING AND COMPRESSION

Lossless compression versus lossy compression-Measures of the compression efficiency- Huffman coding- Bitplane Coding-Shift Codes-Block Truncation Coding-Arithmetic Coding-Predictive coding techniques-Lossy compression algorithm using the 2-D, DCT transform-The JPEG 2000 standard – Baseline lossy JPEG, based on DWT

REFERENCES

- Digital Image Processing: Rafael C.Gonzalez & Richard E. Woods
- Digital Image Processing and Analysis: B. Chanda, D. Mutta Majumder
- Digital Image Processing: Anil K Jain
- William K. Pratt, Digital Image Processing, John Wiley, 4th Edition, 2007
- Sonka, Fitzpatrick, “Medical Image Processing and Analysis”, 1st Edition, SPIE,2000

BLUEPRINT

Code number: **CS0122**

Title of the paper: **IMAGE PROCESSING**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	10	14
Unit II	10	16
Unit III	12	20
Unit IV	14	20
Unit V	14	20
TOTAL	60	80

Maximum marks for the paper (Excluding bonus question)= 70

Semester	IV
Paper Code	CS0222
Paper Title	ADVANCED OPERATING SYSTEM
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

Course Objectives

- To make the student understand with various function of Operating system.
- The knowledge of resources management of Operating system.
- The knowledge about various problems and solution is distributed system.
- The knowledge about fault tolerance.

UNIT I

(12)

INTRODUCTION

Overview - Functions of an Operating System – Design Approaches – Types of Advanced Operating System - Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs - Process Deadlocks - Preliminaries – Models of Deadlocks, Resources, System State – Necessary and Sufficient conditions for a Deadlock – Systems with Single-Unit Requests, Consumable Resources, and Reusable Resources.

UNIT II

(12)

DISTRIBUTED OPERATING SYSTEMS

Introduction – Issues – Communication network and Primitives, – Theoretical Foundations: Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion Non-Token Based Algorithms – Lamport's Algorithm - Token-Based Algorithms Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols – Classification(two)- Solutions(two) –Applications.

UNIT III**(12)****DISTRIBUTED RESOURCE MANAGEMENT**

Distributed File systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm(two) – Protocols - Design Issues. Distributed Scheduling – Issues – Components(two) – Algorithms (two).

UNIT IV**(12)****FAILURE RECOVERY AND FAULT TOLERANCE**

Basic Concepts-Classification of Failures – Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Nonblocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.

UNIT V**(12)****MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS**

Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory Management – Reliability / Fault Tolerance(two); Database Operating Systems – Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms(two).

Self Study – Analysis of any open source operating system and study of algorithms in the chapters.

REFERENCES

- Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
- Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, McGraw- Hill, 2001
- Abraham Silberschatz, Peter B. Galvin, G. Gagne, “Operating System Concepts”, Sixth Edition, Addison Wesley Publishing Co., 2003.

BLUEPRINTCode number: **CS0222**Title of the paper: **ADVANCED OPERATING SYSTEM**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)

Unit I	12	14
Unit II	12	20
Unit III	12	20
Unit IV	12	16
Unit V	12	10
TOTAL	60	80
Maximum marks for the paper (Excluding bonus question)= 70		

TITLE : Major Project /Internship

CODE : MCS4P1

Hours / Week: 24 Hrs

Credits: 12

- The students should choose a Major Project/ Internship at the beginning of the semester with the approval of the HOD.
- The students will be evaluated by the lab in-charge on a weekly basis.
- The questions can be designed with real time application in mind.
- At the end the students should submit a documentation and prepare a presentation to explain the work that has been done.