MASTER OF COMPUTER APPLICATIONS

CURRICULUM FRAMEWORK AND SYLLABUS
FOR OUTCOME BASED EDUCATION
**(For the students joining in the
Academic Year 2020 - 2021 and afterwards)**

**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
Gandhigram - 624 302
Dindigul District
Tamil Nadu**

MASTER OF COMPUTER APPLICATIONS

Vision

To provide quality-assured academic, research and extension services in the domain of Computer Science and Applications, to promote dissemination of knowledge in Information and Communication Technologies for Rural Development.

Mission

Empower the rural youth by transforming them into proficient and socially responsible computer professionals and cater them to the envisaged demand in the operational and functional domains of the industries and service sectors.

Graduate Attribute

The graduates of our institute are expected to possess the following attributes.

1. *Informed*

   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

2. *Problem solver*

   The graduates of GRI have the ability to work on development issues. They are cable of creative, logical and critical thinking which in turn help them to respond to challenges and opportunities effectively. They are also capable of making and implementing decisions.

3. *Active learners and critical thinkers*

   Graduates of this university are active learners and are capable of critically analyzing issues. They are capable of undertaking critical enquiry and reflection, find and evaluate information using a variety of sources and technologies. They do possess the attitude of acknowledging the works and ideas of others.

4. *Effective communication*

   The graduates have good communication skills and are capable of articulating their ideas effectively. They can negotiate and engage with people in varied settings.

5. *Rural Minded*

   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

The Gandhigram Rural Institute
(Deemed to be University)
Gandhigram – 624 302
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

OBE Elements for <u>Master of Computer Applications</u> Programme

<u>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</u>

PEO 1: To produce graduates with strong technical competence to progress in their career ladder as a computing professional.

PEO 2: To create an academic ambience for the students to gain fundamental understanding of computing technologies for pursuing higher studies.

PEO 3: To harness managerial skills to become successful entrepreneurs in Information Technology (IT) enabled ventures.

PEO 4: To inculcate the process of lifelong learning through professional activities that contribute to personal and social development.

PEO 5: To foster creativity among the students to expand the frontiers of knowledge and develop novel solutions for the betterment of the society.

PEO 6: To imbibe strong human, professional and ethical values to become a socially responsible citizen.

<u>PROGRAMME OUTCOME (PO)</u>

PO 1: Accomplish proficiency in Computer Science discipline and provide value added services catering to the needs of the Employer/Institution/ Stakeholders/ Society

PO 2: Gain Analytical skills in the field/area of Computer Science and Applications.

PO 3: Apply modern computing tools to develop and deploy cost-effective ICT based solutions for societal problems..

PO 4: Practice professional ethics, community living and Nation Building initiatives.

PO 5: Disseminate the knowledge in Information and Communication Technologies for Rural Development.

PO 6: Foster skills to communicate effectively among the IT community.

PO 7: Kindle interests to critically review, analyse and develop solutions through active research.

PO 8: Execute the imbibed skills to become a successful entrepreneur.

\

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO 1: Apply the knowledge of Computer Science in the domain of Academic/ Industry/ Institutions/ Society.

PSO 2: Solve the real-time complex problems with an understanding of the societal, legal, cultural impacts of the solution.

PSO 3: Cultivate research aptitude to become active researcher in the field of Computer Science.

PSO 4: Develop feasible solutions for integrated rural development through Information and Communication Technologies.

PS0 5: Empower with self-sustainable computing skills for rewarding career opportunities in IT and IT enabled service sectors

.

Mapping of PEOs with PSOs & POs:

PEO/PO/PSO	PO								PSO				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**
PEO1	3	3	3	1	3	2	3	2	3	3	3	3	3
PEO2	3	3	3	1	3	1	3	-	3	3	3	2	1
PEO3	3	3	3	2	2	3	3	3	3	3	-	3	2
PEO4	3	3	3	2	3	2	3	1	3	3	3	2	2
PEO5	3	3	3	2	3	2	3	2	3	3	3	3	3
PEO6	-	-	-	3	1	1	-	2	-	1	-	-	3
Mean												**2.58**	

Strongly Correlating (S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

CO & PO Attainment Rubrics

Direct Assessment:

i)   CFA & ESE   - 30 %

ii) Assignment/Reports/Case Study   - 40%

Indirect Assessment:

i)   Exit Survey   - 30 %

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)

Ministry of Human Resource Development (MHRD), Govt. of India
Accredited by NAAC with A Grade (3rd Cycle)
Gandhigram
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

MASTER OF COMPUTER APPLICATIONS PROGRAMME (TWO YEAR)
(Under Choice Based Credit System)

SUBJECTS OF STUDY AND SCHEME OF EXAMINATION
(For the students joining in 2020-2021 and afterwards)

Code No.	Subject	Credits	Lecture Hrs/Week	Lab Hrs/Week	Evaluation CFA	Evaluation ESE	Total
SEMESTER I							
20MCAP0101	Core I: OOPs using C ++	4	4	-	40	60	100
20MCAP0102	Core II: Data Structures and Algorithms	4	4	-	40	60	100
20MCAP0103	Core III: Mathematical Foundation for Computer Science	4	4	-	40	60	100
20MCAP0104	Core VI: Computer Architecture and Microprocessors	4	4	-	40	60	100
20MCAP0105	Core V: Python Programming	4	4	-	40	60	100
20MCAP0106	Lab I: C ++ Programming + DS&A	1	-	2	60	40	100
20MCAP0107	Lab II: Python Programming Lab	1	-	2	60	40	100
20GTPP0001	Gandhiji in Everyday Life	2	2	-	50	-	50
---	SWAYAAM/Spoken Tutorial/MOOC-I: Industry 4.0*	--					
Total Credits / Theory / Practical		24	22	4			
SEMESTER II							
20MCAP0208	Core VI: Computer Vision	4	4	-	40	60	100
20MCAP0209	Core VII: Computer Networks	4	4	-	40	60	100
20MCAP0210 (18COPP01A1)	Core VIII: Accounting & Financial Statement Analysis	4	4	-	40	60	100
20MCAP0211	Core IX Advanced Java Programming	4	4	-	40	60	100
20MATP02A1	Non-Major Elective: Numerical and	4	4	-	40	60	100

	Statistical Methods					
20MCAP0212	Lab III: Computer Vision Lab	1	-	2	60	40	100
20MCAP0213	Lab IV: Advanced Java Programming Lab + Networks	1	-	2	60	40	100
	Value-Added Course: Human Values & Ethics for Harmony	2	2	-	50	-	50
-----	SWAYAAM/Spoken Tutorial/MOOC-II: Ethical Hacking	---	---	---	---	---	---
Total Credits / Theory / Practical		24	22	4			
SEMESTER III							
20MCAP0314	Core X: Advanced Database Management System	4	4	-	40	60	100
20MCAP0315	Core XI: Software Engineering	4	4	-	40	60	100
20MCAP0316	Core XII: Web Programming	4	4	-	40	60	100
20MCAP0317	Core XIII: Optimization Techniques	4	4	-	40	60	100
20MCAP03EX	Elective I	4	4	-	40	60	100
20MCAP0318	Lab V: Advanced DBMS Lab (SQL, NoSQL, Neo4J)	1	-	2	60	40	100
20MCAP0319	Lab VI: Web Programming Lab 1	1	-	2	60	40	100
20MCAP03F1 Extension/Field Visit	Extension/Field Visit	--	-	1	50	-	50
20EXNP03V1	Village Placement Programme 2	2	-	-	50	-	50
20MCAP03MX	Modular Course I: Android Programming	2	2	-	50	-	50
20MCAP0320	Mini Project: Mobile Apps for Rural Development	1	-	1	50	-	50
-----	SWAYAAM/Spoken Tutorial/MOOC-III: R Programming	---	---	---	---	---	---
Total Credits / Theory / Practical		27	22	6			

SEMESTER IV							
20MCAP0421	Core XIV: Operating Systems Concepts	4	4	-	40	60	100
20MCAP0422	Core XV: Data Analytics & Machine Learning	4	4	-	40	60	100
20MCAP04MX#	Modular Course II: Open Source Software	2	2	-	50	-	50
--	Communication Skills for Computer Technocrats	--	2	-	50	-	50
20MCAP0423**	Project	10	-	10	75	75+50	200
	SWAYAAM/Spoken Tutorial/MOOC-IV: Linux Programming	---	---	---	---	---	---
Total Credits / Theory / Practical		20	12	10			
Total Credits for MCA Programme		95					

CFA – Continuous Formative Assessment (Internal Evaluation)
ESE – End Semester Examination (External Evaluation)

** Evaluated for 200 marks as below:
75 marks for the valuation of the Dissertation by the Internal Examiner
75 marks for the valuation of the Dissertation by the External Examiner
50 marks for the Viva-Voce jointly by the Internal and External Examiners

Elective I	
A. Complier Design	E. Computer Graphics and Animation#
B. Network Security and Cryptography	F. GPU Architectures and Parallel Computing#
C. Virtual Reality	G. Natural Language Processing#
D. Could Computing and IoT	H. Blockchain Architecture
	I. Robotics#
	J. Neural Networks and Deep Learning#

 # Syllabus under preparation
*SWAYAM / MOOCS Courses: The courses are suggestive.

20MCAP0101	Core I: OOPs using C++	L	T	P	C
		4	-	-	4

Course Objectives:

The Course aims to

- Demonstrate the difference between traditional imperative design and object-oriented design
- Discuss the usage of function in C++ and usage of user defined data type class to create objects
- Explain the efficient usage of memory through operators and providing new meaning to existing operators
- Identify the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
- Explain the storage of data into file forms
- Understand the handling of errors and strings

Course Outcomes:

On completion of the course, students should be able to do

CO1: Apply class structures as fundamentals' and modular building blocks for real time applications

CO2: Develop solutions for the problem using basic oops concepts

CO3: Interpret the difference between static and dynamic binding. Apply both techniques to solve problems.

CO4: Analyse generic data type for the data type independent programming which relate it to reusability.

CO5: Apply file forms to handle large data set.

SYLLABUS

Unit I: Principles of Object–Oriented Programming, C++ Introduction, Basic Elements for C++ Programming, Functions in C++

Unit II: Classes and Objects, Constructors and Destructors **Unit III:** Operator Overloading, Inheritance, Polymorphism **Unit IV:** Console I/O Operations, C++ files handling

Unit V: Exception Handling, Strings

Text Books:

1. Object Oriented Programming with C++, 7/e, E. Balagurusamy, Tata McGraw Hill publishing Company Limited, New Delhi, 2018.

Reference Books:

1. The C++ Programming Language, Bjarne Stroustrup, Addision – Wesly Publishing Company, New York, 1994.
2. C++ How to Program, 7/e, HM Deitel and PJ Deitel, Prentice Hall, 2010.
3. Let Us C++, Yashavant P. Kanetkar, BPB Publications, 1999.

E-Resource:

1. https://beginnersbook.com/2017/08/c-plus-plus-tutorial-for-beginners/

20MCAP0102	Core II: Data Structures and Algorithms	L	T	P	C
		4	-	-	4

Cognitive Level	K-1 Describe the elementary data structures and fundamental strategies of algorithm design K-2: Apply the appropriate algorithm strategy for finding efficient solution to a given problem K-3: Analyse and compare the performance of different algorithms.
Course Objectives	**The Course aims to** • Demonstrate the procedures for analyzing and comparing the performance of different algorithms. • Impart an overview of the elementary data structures and their applications • Describe the basic algorithm design strategies. • Prepare the students to write effective algorithms for solving a given problem
Course Outcomes	**On successful completion of the course, the students should be able to** CO1: Analyze the time and space complexity of given Algorithms. CO2: Demonstrate operations like searching, insertion, and deletion on elementary data structures. CO3: Use the various graph representations and sorting techniques CO4: Apply the procedure of Greedy method and its application in solving problems. CO5: Illustrate and apply the Dynamic Programming technique to solve the problems. CO6: Demonstrate the principle of Backtracking and its application in solving typical problems like 8-Queens problem and Sum of Subsets problem

UNIT	Content	No. of Hours
I	Introduction: Definition – Algorithm Specification –Recursive Algorithms - Performance Analysis – Space Complexity – Time Complexity – Asymptotic Notations	**12**
II	Elementary Data Structures: Stacks And Queues – Trees - Binary Trees–Tree Traversals- Dictionaries - Binary Search Trees– Priority Queues – Heaps – Heap sort –- Graphs – Introduction – Definitions – Graph Representations.	**13**
III	Divide and Conquer: General Method-Binary Search – Merge Sort, Quick Sort The Greedy Method: General Method -Knapsack Problem, Minimum Cost Spanning Trees: Prim's Algorithm -Kruskal's Algorithm - Single Source Shortest Paths	**13**
IV	Dynamic Programming: The General Method – Multistage Graphs – All Pairs Shortest Paths – Optimal Binary Search Trees – The Traveling Salesperson Problem	**12**

V	Backtracking: The General Method – The 8 Queens Problem – Sum of Subsets - Graph Coloring -Hamiltonian Cycles.	12
	Total Contact Hours	**64**

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, 2nd Edition, University Press, 2017.

REFERENCES

1. Design and Analysis of Algorithms, Prabhakar Gupta, Vineet Agarwal, Manish Varshney, Phi learning Pvt.Ltd, New Delhi, 2012.
2. Algorithm and Data Structures, Levitin, Anany, 2nd Edition, Pearson Publication, Delhi, 2013.
3. Algorithm and Data Structures, M. M. Raghuwanshi, Narosha Publishing House, 2016.

E-References

▪ https://www.tutorialspoint.com/data_structures_algorithms/index.htm

https://onlinecourses.nptel.ac.in/noc20_cs70/preview

****

20MCAP0103	Core III: Mathematical Foundation for Computer Science	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To teach the fundamental concepts of Mathematics which are essential for mathematical thinking.
- To correlate the logical thinking in application development with mathematics

LEARNING OUTCOMES

- Students will be able to demonstrate understanding of the mathematical basis of common algorithms, and the ability to calculate accurately and efficiently.
- Students will have the capacity to demonstrate the ability to solve problems, including applications outside of mathematics, by means of intuition, creativity, guessing, and the experience gained through the study of particular examples and mathematical models.
- Students will demonstrate the ability to communicate mathematical ideas clearly. They will use correct mathematical terminology and proper mathematical notation.
- Students will be able to design and write computer programs that are correct, simple, clear, efficient, well organized, and well documented.
- Students will be able to understand basic concepts in graphs which has lot of applications in computer science.
- Students can understand the different Technique to solve matrix theory problem in an effective and efficient manner.

UNIT	CONTENTS	Lecture Schedule
	Mathematical Logic	**12**
I	• Mathematical Logic – Statements and Notations–Connectives.	3
	• Normal Forms-The Theory of Inference for the Statement Calculus	3
	• The Predicate Calculus	3
	• Inference Theory and Predicate Calculus	3
	Set Theory	**12**
II	• Set Theory: Basic Concepts of Set Theory, Notation, Inclusion and Equality of Sets	3
	• The Power Set, Some Operations of Sets, Venn Diagrams, Some Basic Set Identities, The Principles of Specification	3
	• Cartesian Products – Relations and Ordering – Relations, Properties of Binary Relations in a Set, Relation Matrix and the Graph of aRelation,	3
	• Partition and Covering of a Set, Equivalence Relations, Compatibility Relations, Composition of Binary Relations.	3

		Functions	**13**
III	•	Definition and Introduction, Composition ofFunctions	4
	•	Inverse Functions, Binary Operations	3
	•	Characteristic Function of a Set, HashingFunctions	3
	•	Natural Numbers - Peano'sAxioms and Mathematical Induction	3
IV		**Matrices**	**13**
	•	Matrices: Matrix Operations - Rules of Matrix Arithmetic-	4
	•	Eigen Values and Eigen Vectors	4
	•	Cayley Hamilton theorem-Problems	5
V		**Graph Theory**	**14**
	•	Graph as Models – Vertex degrees Subgraph – Path	5
	•	Cycle - Matrix Representation of graphs- Fusion – Trees	5
	•	Bridges – Spanning Trees – Connecter Problem	5
		Total Contact Hours	**64**

Text Books:

1. Discrete Mathematical Structures with Application to Computer Science, J.B.Tremblay and R.Manohar, McGraw– Hill International Edition,1987
2. Elementary Linear Algebra, Howard Anton, 4/e, John Wiley & Sons,1984.
3. Modern Algebra, Arumugam S Issac, SCI Tech Publications, 2008.(For Unit II, III)
4. A First Look at Graph Theory, by John clark, Allied Publisher's Ltd.(For unit V, Section 1.1 to 1.8 & 2.1 to2.4)

References:

1. Applied Discrete Structures for Computer Science, D.Alan, L.Lenneth, Galgotia Publications, 1983.
2. Formal Languages and their Relations to Automata, J.E. Hopcroft and J.D. Ullman, Addison – Weslay Publishing Company,1969.
3. Elements of Discrete Mathematics, C.Liu and D. Mohapatra, McGraw Hill.2008.

20MCAP0104	Core VI: Computer Architecture and Microprocessors	L	T	P	C
		4	-	-	4

Cognitive Level	**K-1:** Define the basic concepts, Circuit Diagrams and truth tables and Describe the working of various Gates and operations, **K-2:** Apply and analyze the operations performed by circuits, Define the basic elements of Microprocessors **K-3:** Describe the working principles and interfaces of Microprocessors , Apply the concepts and write simple programs to solve computational problems using Assembly Language Programming
Course Objectives	**The Course aims to** • Describe the basics of designing a computer system, Explain their working principles using logic circuits, Evaluate the hardware of a computer, its logic design and organization. • List the various types of Memory and their management, Discuss digital logic and functional design of arithmetic and logic units, • List different types of Microprocessors, Write Programmes using Assembly language programming (ALP) • Explain the Interconnection of Microprocessor with other devices, Describe the functionalities of internal units Explain the operations in the interfacing
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Identify the basic functional units of a computer, Explain working of a flip flops, registers and counters of computer. **CO2:** Define the functional details of CPU and other processors, Describe the nature of data transfer among peripherals and computer through interface units **CO3:** Differentiate types of Microprocessors, Recognize the basics of Assembly language programming (ALP) and Write simple programmes in ALP **CO4:** Explain the Architecture of advance Microprocessors **CO5:** Describe the interconnection of Microprocessor with other Device

UNIT	CONTENTS	Lecture Schedule
I	**COMBINATIONAL AND SEQUENTIAL CIRCUITS** Design of Circuits –Adder / Subtracter – Encoder – Decoder – MUX /DEMUX – Comparators, Flip flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters - Registers	13
II	**BASIC STRUCTURE OF COMPUTER** Functional Units - Basic Operational Concepts – Bus structures – Performance and Metrics – instruction and instruction sequencing – Hardware Software Interface – Addressing modes – Instruction Sets – RISC and CISC – ALU Design – Fixed point and Floating point operations	19
III	**PROCESSOR DESIGN** Processor basics –CPU Organization – Data Path Design – Control Design – Basic concepts – Hardwired control – Micro Programmed control – Pipe control – Hazards super scale operations	14

	8086 ARCHITECTURE AND BUS STRUCTURE	
IV	Introduction - Overview of Microcomputer Systems - Addresses - Microprocessors in Digital System Design - 8086 CPU Architecture - Machine Language Instructions - Addressing Modes - Instruction Execution Timing - System Bus Structure - Basic 8086 Configurations - System Bus Timing - Bus Standards.	8
	ASSEMBLY LANGUAGE PROGRAMMING	
V	Instruction Format - Data Transfer Instructions - Arithmetic Instructions - Branch Instructions - Loop Instructions - Logical Instructions - Other Instructions - Directives and Operators - Assembly Process - Translation of Assembler Instructions.	10
	Total Contact Hours	64

Text Books:

1. Moris Mano and Rajib Mall, Computer System Architecture, 3/e, Pearson Education, 2017.
2. M. Moris Mano, Computer System Architecture, 3/e, Prentice Hall of India, New Delhi, 2003.
3. D.V. Hall, Microprocessors and Interfacing - Programming and Hardware, Seventh Reprint, Tata McGraw Hill Edition, New Delhi, 1995.

References:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", 6/e, Tata McGraw Hill, 2012.
2. Charles H. Roth, Jr., "Fundamentals of Logic Design", Jaico Publishing House, Mumbai, 4/e, 1992.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Second Edition, Morgan Kaufmann , 2002.
4. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998
5. Sunil Mathur, "Microprocessor 8086: Architecture, Programming and Interfacing", Prentice Hall of India, 2011.
6. Douglas V Hall, SSSP Rao, "Microprocessors and its Interfacing", Third Edition, TMH, 2012.
7. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium,and Pentium Pro Processor Architecture, Programming, and Interfacing", 7/e, Prentice Hall of India, 2006.

E-Resources:

1. https://www.studytonight.com/computer-architecture/architecture-of-computer-system
2. https://www.computersciencedegreehub.com/faq/what-is-computer-architecture/
3. https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm
4. https://electrosome.com/microprocessor/

		L	T	P	C
20MCAP0105	**Core V: Python Programming**	4	-	-	4

Course Objectives

- ✓ To develop logical thinking and problem solving and implementation skills using Python
- ✓ To augment the knowledge on object oriented programming and methodology using Python.
- ✓ To understand the usage and applications of the data structures in Python namely lists, dictionaries and tuples.
- ✓ To familiarize the usage of Python Libraries for data analysis.

Course Outcomes

On successful completion of this course, students shall be able to

- ✓ Understand the core elements of the Python Programming
- ✓ Resolve on the ideal usage of complex data structures as well as exceptions.
- ✓ Apply the Python libraries NumPy and Pandas for problem solving
- ✓ Develop solutions for real-time problems through Data manipulation, analysis and visualization.

SYLLABUS

Unit I
Introduction to Python: Introduction – Python overview – Getting started – Comments – Python identifiers – Reserved keywords – Variables – Standard data types – Operators – Statements and Expressions – String operations – Boolean expressions.

Classes and Objects in Python: Overview of OOP – Data encapsulation – Polymorphism – Class definition – Creating objects – *Inheritance* – Multiple inheritances – Method overriding – Data encapsulation – Data hiding.

Unit II
Control Statements: The *for* loop – *while* statement – *if-elif-else* statement – Input from keyboard.
Functions: Introduction – Built-in functions – User defined functions – Function Definition –
Function Call - Type conversion – Type coercion – Python recursive function.
Strings: Strings – Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions.

Unit III
Tuples: Tuples – Creating tuples – Accessing values in tuples – Tuple assignment – Tuples as return values – Basic tuple operations – Built-in tuple functions.
Lists: Values and accessing elements – Traversing a list – Deleting elements from list – Built-in list operators & methods.
Dictionaries: Creating dictionary – Accessing values in dictionary – Updating dictionary – Deleting elements from dictionary – Operations in dictionary - Built-in dictionary methods.
Files and Exceptions: Introduction to File Input and Output - Using loops to process files-Processing Records - Exception.

Unit IV

Data Manipulation Tools &Softwares: Numpy: Installation - Ndarray - Basic Operations - Indexing, Slicing, and Iterating - Shape Manipulation - Array Manipulation - Structured Arrays - Reading and Writing Array Data on Files.

Pandas: The pandas Library: An Introduction - Installation - Introduction to pandas Data Structures - Operations between Data Structures - Function Application and Mapping - Sorting and Ranking - Correlation and Covariance - "Not a Number" Data - Hierarchical Indexing and Leveling - Reading and Writing Data: CSV or Text File - HTML Files - Microsoft Excel Files.

Unit V

Data Analysis with Python: Importing Datasets: Cleaning and Preparing the Data: Identify and Handle Missing Values, Data Formatting - Dimension Reduction - Feature Extraction.

Data Visualization: Matplotlib Architecture - pyplot - Plotting with pandas and seaborn: Line, Bar, Histogram, Density, Scatter charts - Python visualization tools.

Use Cases on Regression and Classification

Text Books:
1. Python: The Complete Reference, Matrin C Brown, McGrraw-Hill, 2018.
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinny, 2nd Edition, O'Reilly Media, 2017.
3. Python for Everybody: Exploring Data Using Python3, Dr. Charles R. Severance, 2016.
4. Data Analytics Using Python, Bharti Motwani, Wiley, 2020

Reference Books:
1. E Balagurusamy, "Introduction to computing and problem solving using Python", McGraw Hill Publication, 2016.
2. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, 2nd Ed., Addison-Wesley Professional, 2010.
3. Mark Lutz, "Learning Python", 5th Ed., 2013.
4. Welsey J. Chun, "Core Python Programming", Prentice Hall, 2001.

E-Resources:
1. https://freepdf-books.com/impractical-python-projects-playful-programming-activities-to-make-you-smarter-book-of-2019/
2. https://freepdf-books.com/fundamentals-of-python-first-programs-second-edition-book-of-2019
3. https://docs.python.org
4. http://www.diveintopython.org
5. https://www.learnpython.org/
6. https://www.javatpoint.com/python-tutorial
7. http://nptel.ac.in/

* * * * * *

20MCAP0106	Lab I: C++ Programming + DS&A	L	T	P	C
		-	-	2`	1

Lab 1: C++ Programming and DS&A

COURSE OBJECTIVES:

This course aims to train the students for developing C++ programs for general applications, data structures and algorithms

LEARNING OUTCOMES:

On completion of the course, students should be able to

CO1: Understand the salient features of C++ programming
CO2: Develop programs using object oriented programming concepts
CO3: Design real-time applications using files and exception handling
CO4: Demonstrate data structures formation
CO5: Design algorithms for real-time applications

SYLLABUS

A. C++ Programs with

1. Functions
2. Classes and objects creation
3. Constructor and destructor usage
4. Operator Overloading
5. Type conversion
6. Inheritance – Single and Multiple
7. Pointers
8. Virtual Functions
9. Console I/O operations
10. Files and Streams
11. Exception Handling
12. String Operations

B. Facts Structures & Algorithms
13. Heap Sort,
14. Merge Sort
15. Stack –Creation, push and pop
16. Queues- Creation, Insertion, Deletion
17. Binary Trees - Creation and Tree traversals.
18. Knapsack Problem

* * * * * *

20MCAP0107	Lab II: Python Programming Lab	L	T	P	C
		-	-	2	1

Course Objectives

- ✓ To develop higher-order programming skills in core Python.
- ✓ To apply the theoretical elements of Python for problem solving
- ✓ To provide hands-on training to solve data-intense real-world problems

Learning Outcomes

On successful completion of this course, students shall be able to

- ✓ Contextually apply Python Programming for problem solving.
- ✓ Apply the potential of Python for data processing and visualization
- ✓ Develop programming solutions using Python libraries and tools in applications domains

1. If and If-Else Statements.
2. For and While Looping Statements.
3. Arithmetic and Relational Operators on Strings.
4. Built-In String Functions.
5. Create and Access Strings and Substrings (using Indexing and Slicing).
6. Create and Access Lists.
7. Built-In List Functions.
8. Function Definition & Function call.
9. Create and Access Tuples.
10. Built-In Tuple Functions.
11. Create and Access Dictionaries.
12. Built-In Dictionary Functions.
13. Files and Exceptions.
14. Numpy Arrays.
15. Pandas Libraries
16. Data analysis and visualization
17. Use cases on data analytics

* * * * * * *

20GTPP0001	Gandhiji in Everyday Life	L	T	P	C
		2	-	-	-

	SWAYAM/Spoken Tutorial/MOOC-I : Industry 4.0*	L	T	P	C
		-	-	-	-

20MCAP0208	Core VI: Computer Vision	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- To introduce the basics of digital image acquisition and formation
- To describe the basics of digital image acquisition, formation and processing
- To develop knowledge on the principles & procedures of image processing elements.
- To provide foundation to learn about video processing

LEARNING OUTCOMES
On successful completion of this course, students shall
- Explain the fundamentals of digital image and video processing
- Analyse the image and video processing algorithms
- Understand the applications of Image and Video processing
- Apply the theoretical knowledge to real-time applications

Syllabus:

Unit I : Basics of Image Processing and Image Operations
Introduction and motivation to computer vision – Digital image representation and file formats – Basic image processing operations – Light, Color, and Electromagnetic Spectrum – Image Acquisition – Image Digitization - Arithmetic Operations: Fundamentals and Applications – Logic Operations: Fundamentals and Applications - Geometric Operations – Mapping and Affine Transformations – Other Geometric Operations and Applications .

Unit II : Transformations, Histograms and Image Filtering
Gray-level (Point) Transformations – Other Linear and Non-linear Point Transformations – Computing and interpreting Image Histograms - Histogram Equalization – Histogram Modification Techniques - Convolution and Correlation – Image Smoothing (Low-pass Filters) – Image Sharpening (High-pass Filters) – Frequency Domain Filtering: Fourier Transform: the Mathematical Foundation – Low-pass Filtering – High-pass Filtering - Image Restoration

Unit III :Morphological Operations, Edge Detection and Image Segmentation
Morphological Operations : Fundamental Concepts – Erosion and Dilation – Compound Operations-Morphological Filtering – Basic Morphological Algorithms- Edge Detection: First-order and Second-order Derivative Edge Detection – Canny Edge Detector, Edge Linking and Boundary Detection Intensity-based Segmentation – Region-based Segmentation and Watershed Segmentation.

Unit IV : Color Images, Compression and Feature Extraction, Representation
Color Models – Pseudocolor Image Processing – Full-color Image Processing – Basic Concepts of Image Compression – Lossless and Lossy Compression Techniques – Image Compression Standards and Quality Measures – Feature Vectors and Vector Spaces – Binary Object Features Boundary Descriptors – Histogram-based (Statistical) and Texture Features.

Unit V : Video Processing: Sampling and motion estimation
Monochrome Analog Video and Color Video – Digital Video Basics – Digital Video Formats and
Standards – Video Processing in MATLAB – Video Sampling and Basics - Standards Conversion –
Fundamentals of Motion Estimation and Motion Compensation – General Methodologies in Motion
Estimation – Motion Estimation Algorithms – Video Enhancement and Noise Reduction.

Text Book:

1. **Davies ER, "**Computer vision: Principles, Algorithms, Applications, Learning", Elsevier, 5/e., 2018.

References Book(s):

1. **Rafael C Gonzalez; Richard E Woods,** Digital Image Processing, Pearson NY, 4/e., 2019.
2. **Mark Nixon, Alberto Aquado**, Feature Extraction and Image Processing for Computer Vision, 2019
   (ISBN-13: 978-0128149768).

E-Resources:

1. https://www.researchgate.net/publication/328120952_Understanding_Digital_Image_Processing
2. https://lecturenotes.in/download/material/30278-digital-image-video-processing
3. https://kishorekumarbooks.blogspot.com/2019/05/digital-image-video-processing-notes.html

* * * * * *

20MCAP0209	Core VII: Computer Networks	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

      This course aims to provide the basic understanding of the modern computer networks, with different types and models of protocol stacks. It also aims to provide the working of the various transmission media and understand and analyze the working of the protocols in data-link and network levels. At the Transport Layer, the various methods for building end-to-end reliability are discussed and application protocols are elaborated.

COURSE OUTCOMES

CO1: To remember the basic terminologies and concepts in computer networks.

CO2: To understand the various types of communication media.

CO3: Recognize the different functionalities of data-link layer

CO4: Identify and analyze the functionalities of network layer.

CO5: Apprise the working of the transport layer and applications layer.

SYLLABUS

UNIT I

Uses of computer networks - Network hardware - Network – software - Reference models - Example networks - Network standardization

UNIT II

 Communication Media: Guided transmission media - Wireless transmission - Communication satellites - The public switched telephone network- The mobile telephone system

UNIT III

 Data link layer: Data link layer design issues - Error detection and correction - Elementary data link protocols - Sliding window protocols - Multiple access protocols – Wireless LANs - Bluetooth

UNIT IV

Network Layer: Network layer design issues - Routing algorithms - Congestion - control algorithms - Quality of service - Internetworking

UNIT V

Transport Layer: Transport service - Elements of transport protocols – DNS- Electronic mail – The World Wide Web

Text Book :

Andrew S.Tannenbaum and David J. Wetherall, "Computer Networks" 5/e, Pearson Education 2011

Reference:

1. Douglas E. Comer, "Computer Networks and Internet", Sixth Edition, Pearson, 2018

2. William Stallings "Network Security Essentials: Applications and Standards", Sixth Edition, Pearson 2018.

E-Resources:

1. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf
2. https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
3. https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/02/Computer-Networking-Principles-Bonaventure-1-30-31-OTC1.pdf
4. http://www.svecw.edu.in/Docs%5CCSECNLNotes2013.pdf
5. http://www.tmv.edu.in/pdf/Distance_education/BCA%20Books/BCA%20II%20SEM/BCA-221%20Network%20Fundamentals.pdf

* * * * * *

20MCAP02 10 (18COPP01A1)	Core VIII: Accounting & Financial Statement Analysis	L	T	P	C
		4	-	-	4

Cognitive Level	K-1: K-2: Explain the principles, concepts and conventions of accounting. K-3: K-4: Preparing the final accounts and balance sheet of business and service organisations, Analyse the Financial Statements using appropriate accounting tools and draw accounting based information, Prepare the cost sheets from the accounting data and information and draw cost accounting information K-5: Analyse the Financial Statements using appropriate accounting tools and draw accounting based information, Prepare the cost sheets from the accounting data and information and draw cost accounting information, Apply accounting in computerized environment
Course Objectives	**The Course aims to** • Understand the principles, concepts and conventions of Account ion • Prepare and analyse the Financial Statements using appropriate accounting tools • Prepare cost sheets and make cost analysis • Apply the accounting concepts in a computerized environment

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Accounting & Accounting Principles**	
	Definition, Meaning and Objects of Accounting, Systems of Accounting, Branches of Accounting, Accounting Cycle, Functions of Accounting, Advantages and Disadvantages of Accounting, Accounting Principles : Concepts and Conventions, Computerisation of Accounting, Advantages and Limitations	
II	**Recording of Business Transactions & Journal and Subsidiary Books**	
	Identification & Analysis of Transactions, Journal and Subsidiary Books, Journalizing, Posting, Balancing and Preparation of Trial Balance, The concept of Error and their Rectification	
III	**Financial Statements**	
	Meaning and Nature of Financial Statements, Final Accounts and Balance Sheet, Limitations of Financial Statements, Analysis and Interpretation of Financial Statements, Meaning and Purpose, Tools and Methods of Financial Statement Analysis, Comparative Statements, Common size Statements	
IV	**Ratio Analysis**	
	Ratio Analysis, Funds flow statements, Cash flow statements.	

	Cost Accounting	
V	Cost Accounting: Meaning and Purpose of Costing, Labour and Overheads, Classification of Costs, Preparation and Analysis of Cost Sheet	
Total Contact Hours		

Reference Books:

1. Arora M.N, (2010) Cost and Management Accounting: Theory and Problems, Himalaya Publishing House, Mumbai.
2. Jain, S.P. K.L, (2009). Narang and Simi Agarwal, Accounting for Management, Kalyani Publishers, New Delhi.
3. Maheswari S.N and S.K. Maheswari ()2005 Financial Accounting, Vikas Publishing House, New Delhi.
4. Nagarathinam S, (1989) Financial Management and Holding Company Accounting, S. Chand Co., New Delhi.

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Explain the principles, concepts and conventions of accounting.
	CO2: Preparing the final accounts and balance sheet of business and service organisations
	CO3: Analyse the Financial Statements using appropriate accounting tools and draw accounting based information
	CO4: Prepare the cost sheets from the accounting data and information and draw cost accounting information
	CO5: Apply accounting in computerized environment

* * * * * *

		L	**T**	**P**	**C**
20MCAP0211	**Core IX Advanced Java Programming**	**4**	**-**	**-**	**4**

Course Objectives:

The course aims

- To make learners a good Java programmer for developing advanced applications
- To import skills and knowledge to create and run Java programs for solving real time problems

Learning outcomes:

On completion of the course, students should be able to do

CO1: Interactive applications by capturing events activities

CO2: GUI oriented applications by using several graphical components

CO3: database connectivity and handling

CO4: server-side programming

CO5: web applications in a client-server architecture

Syllabus:

Unit I: Event Handling- Model, Event, Event Listeners, Registering Listener with Source, Example programs, Adapter Classes. Swing-1 (Graphics) – JComponent, JFrame

Unit II: Swing-2 (GUI Components) – Jbutton, JLabel, JToggleButton, JCheckBox, JRadioButton, JList, JScrollBar, JScrollPane, JTextField, JPasswordField, JTextArea, JComboBox, JMenuItem, JMenu, JMenuBar, Jdialog, JOptionpane, JFileCheck, JProgressBar, LayoutManager.

Unit III: JDBC- Introduction, DriverManager, Connection Interface, Statement Interface, PreparedStatement Interface, CallableStatement Interface, ResultSet Interface.

Unit IV: Servlet – Introduction, HTML, Interface Servlet, HttpServlet Class, Servlet Programs, Servelet with I/O Files, Servelet with JDBC, Session Handling, Session Tracking.

Unit V: JSP – Introduction, JSP Working Model, Syntax of a JSP Page with Sample Programs.

Text Book:
1. Advanced Programming in Java2, K.Somasundaram, Jaico publishing Company Limited, New Delhi, 2008.

Reference Books:
1. Herbert Schildt, Java 2-The complete reference, 7th Edition McGraw Hill, 2018.
2. Naughton and Herbert Schildt, Java The complete reference, 7th Edition McGraw Hill, 2007.
3. Jim Keogh, The Complete Reference J2EE, Tata McGraw Hill Edition, New Delhi, 2002.
4. Marty Hall, and Larry Brown, Core Servlets and Java Server Pages, 2nd Edition, Pearson Education, 2004.

E-Resources:
1. Advanced Programming in Java2, https://www.researchgate.net/publication/315894230_Advanced_Programming_in_Java2
2. JDBC, Java Database Connectivity, K.Somasundaram, Jaico Publishing House, Mumbai, India, First Edition, 2013. https://www.researchgate.net/publication/263808284_JDBC_Java_Database_Connectivity
3. JSP, Java Server Pages, In book: Server Side Programming Chapter: Chapter 25,K.Somasundaram, 2012, DOI: 10.13140/2.1.1715.9365 https://www.researchgate.net/publication/268076772_Java_Server_Pages

******

20MATP02A1	Non-Major Elective: Numerical and Statistical Methods (Offered by Dept. of Mathematics)	L	T	P	C
		4	-	-	4

20MCAP0212	Lab III: Computer Vision Lab	L	T	P	C
		-	-	2	1

COURSE OBJECTIVES:

1. To practice on the implementation of standard Digital Image and video processing techniques
2. To provide practical training on the development of computation solutions for the problems related to digital Image/video processing

LEARNING OUTCOMES

On Completion of this course, the students shall be able to:

1. Design and Develop simple solutions for the elements of digital image and video processing
2. Apply the acquired practical knowledge on the application domains such as medical images and satellite images
3. Synthesize new algorithmic solutions for image and video processing applications

1. Image Transformation
2. Image Enhancement
3. Image Restoration
4. Edge/Boundary Detection
5. Morphological Operations
6. Image Segmentation
7. Image Compression
8. Color Image Processing
9. Video enhancement
10. Video Restoration
11. Motion detection in videos
12. Segmentation in videos

* * * * * *

20MCAP0213	LAB IV: ADVANCED JAVA PROGRAMMING LAB + NETWORKS	L	T	P	C
		-	-	2	1

Course Objectives:

This course aims to train the students for developing Java programs for advanced concepts such as GUI based applications, database handling, server-side programming and client-server applications

Learning outcomes:

On completion of the course, students should be able to do

CO1: Develop programs using delegation event models
CO2: Design GUI based applications
 CO3: Develop application using packages and store the data in the database.
CO4: Demonstrate server-side programming
CO5: Design client-server based applications for all real-time problems.

SYLLABUS

I. Swing-1 (+Graphics)

1. Create applet with default Panel in Japplet
2. Create applet on JFrame
3. Applet with data
4. Draw, line, rectangle, filled rectangle
5. Draw oval, arc, polygon, polyline
6. Event handling- MouseEvent,KeyEvent, ActionEvent, WindowEvent
7 Swing with JFrame
8. JButton,JText,JTextfield (on JApplet and JFrame)

II.Swing-2

9. JLabel, JCheckBox, JRadioButton and using them
10. JList and using it
12. JScrollBar,JScrollPane,
13. JTexField, JPassword, JTextArea
14. JComboBox, JMenuItem, JMenu, JMenuBar
15. JDialog, JOptionPane, JFileChooser,JProgressBar
16. BorderLayout, FlowLayout,GridLayout, CardLayout

III. JDBC

17. Configuring ODBC in the system
18. Creating connection and identifying Drivers
19. Creating and using a database
20. Use of Statement interface and database
21. Use of PreparedStatement and database
22. Use of Callable Statement and database
23. Use of ResultSet interface and database

IV Servlet

24. Simple Servlet
25. Servlet - HTML form with GET and Servlet with doGet() method
26. Servlet - HTML form with POST and Servlet with doPost() method
27. Servlet with doGet() and doPost() methods
28. Servlet receiving numbers and processing and sending the result(Factorial, Sum of numbers)
29. Servlet with JDBC
30. Creating cookies and reading them

V. JSP

31. Creating HTML with various formats,superscript, subscript
32. HTML with Tables, images, link to other page
33. HTML with different forms-input, button,select, text area
34. Creating a simple JSP with welcome note
35. JSP with page directive
36. JSP with Scriptlet- finding factorial, JSP with expression
37. JSP with declaration
38. JSP with implicit object
39. JSP with action element- Javabeans

VI. Networking

40. Implementation of Client and Server
41. Implementing Bellman Ford Routing algorithm
42. Implementing Greedy routing algorithm
43. Implementing shortest path routing
44. Implementing Distance Vector Routing algorithm
45. Understand working of ARP and IP forwarding within LAN
46. Simulate and study the spanning tree protocol
47. Understanding the connection establishment in TCP
48. Performance evaluation of Packet loss probability and TCP
49. Evaluation of Throughput and error in wireless LAN
50. Implementation of congestion control algorithm
51. Implementing the Queuing model.

* * * * * *

		L	T	P	C
---	**Value-Added Course: Human Values & Ethics for Harmony**	2	-	-	2

Course Objectives:

This course aims to

1. Facilitate students to distinguish between values and skills; understand the need, and understand the basics of value education.
2. Sensitize and familiarize students on the process of intra-personal negotiating skills
3. Help them to understand the meaning of happiness and prosperity of a human being.
4. Promote harmony at all the levels of human living, and live accordingly.
5. Ensure harmony in their profession and lead an ethical life.

Learning Outcome:

On completion of this course, the students will be able to

1. Apply the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education,
2. Appraisethe means of happiness and prosperity
3. Appreciate the distinction between the Self and Body; meaning of Harmony in the Self the Co-existence of Self and Body.
4. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
5. Analyse the nature and existence of elements of harmony
6. Distinguish between ethical and unethical practices,
7. Design the strategies to actualize a harmonious climate in workplace.

UNIT-1: Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT 2: Understanding Harmony in the Human Being - Harmony in Self

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT 3: Harmony in Human-Human Relationship, Family and Society

Understanding harmony in the Family - the basic unit of human interaction, Understanding values in human-human relationship; meaning of (Justice) and program for its fulfillment to ensure mutual happiness; Trust and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of trust & respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as Comprehensive Human Goals, Visualizing a universal harmonious order in society - Undivided Society, Universal Order - from family to world family!.

UNIT-4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Text Books:
1. Human Values, Kshitiz Jain, Neelkanth Publishers Pvt. Ltd.., 2018.
2. Human Values and Professional Ethics,TanuShukla , AnupamYadav, Gajendra Singh Chauhan, Cengage 2017.
3. Human Values and Professional Ethics, R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Books:
1. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
2. The Story of Stuff, Annie Leonard, Free Press,2011.
3. Small is Beautiful, E. F Schumacher, Blond & Briggs, 1973
4. Slow is Beautiful, Cecile Andrews, New Society Publishers, 2006.

****

---	SWAYAM/Spoken Tutorial/MOOC-II: Ethical Hacking*	L	T	P	C

		L	T	P	C
20MCAP0314	**Core X: Advanced Database Management System**	4	-	-	4

The Course aims to

- Explain the concepts of database management systems
- Demonstrate the various data models and database systems
- Manipulate real time data and elicit useful information using database concepts
- Explain the concept and techniques in transaction and recovery system
- Outline the latest database design models and database languages.

Course Outcome:

CO1: Revise the components, functions and various database design
 techniques used for modelling the databases management system.
CO2: Examine the clauses and functions of SQL and write optimal queries in
 the above languages.
CO3: Design entity-relationship diagrams to represent simple database
 application scenarios and can apply the database schema normalization
 rules and techniques to criticize and improve the database design.
CO4: Analyse the concept of transaction processing, concurrent transaction
 processing and recovery procedures
CO5: Employ the advanced database models viz. object-Relational databases and
 distributed databases and languages viz. NoSQL and Neo4j

UNIT I
Introduction: Database System Applications – Purpose of Database Systems -View of Data – Database Languages - Relational Databases – Database Design - Data Storage and Querying - Transaction Management, Database Architecture - Data Mining and Information Retrieval, Specialty Databases - Database Users and Administrators, History of Database Systems
Relational Model: Structure of Relational Database - Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT II
Introduction to SQL:
SQL Data Definition, Basic Structure of SQL Queries -
Additional Basics Operations, Set Operations - Null Values, Aggregate Functions - Nested Subqueries, Modification of the Database
Intermediate SQL: Join Expression, Views - Transactions, Integrity Constraints - Data Types and Schemas, Authorization
Advanced SQL: Accessing SQL from Programming Language, Functions and Procedures, Triggers

UNIT III
Transactions and Recovery:
Transactions: Transaction Concept– Simple Transaction Model – Storage Structure - Transaction Atomicity and Durability
Transaction Isolation – Serializability - Transaction Isolation and Atomicity – Transaction Isolation Levels – Implementation of Isolation Levels – Transactions as SQL Statements

Recovery Systems: Failures Classification – Storage Recovery and Atomicity – Recovery Algorithm Buffer Management – Failure with Loss of Nonvolatile Storage - Early Lock Release and Logical Undo Operations - Remote Backup Systems

UNIT IV

Distributed Database: Distributed Database Concept - Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design - Overview of Concurrency control in Distributed Databases.
NoSQL Database and Big Data Storage System: Introduction to NoSQL Systems - The CAP Theorem - Document Based NoSQL Systems and MangoDB - NoSQL key value Stores - Column based or Wide Column NoSQL Systems - NoSQL graph Databases and Neo4j

UNIT V

Object–Based Databases: Overview – Complex Data Types - Structured Types and Inheritance in SQL–Table Inheritance - Array and Multiset Types in SQL–Object Identity and Reference Types in SQL - Implementing O-R Features –Persistent Programming Languages - Object Relational Mapping – Object-Oriented versus Object-Relational

Enhanced Data Models : Active Database Concepts and Triggers - Temporal Database Concepts - Spatial Database Concepts - Multimedia Database Concepts - Introduction to Deductive Databases

Text Books:
1. Database System Concepts, 6/e, AviSilberchartz, Henry F. Korth and S.Sudarshan, McGraw–Hill Higher Education, International Edition, 2013.
2. RamexElmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, New Delhi, 2016

Reference Books:
1. Database Principles, 2/e, Peter Rob, Carlos Coronol, Steven A. Morris, Keeley Crokett, Cengage Learning, 2013
2. Fundamentals of Database Systems, 6/e, RamezElamassri and Shankant B–Navathe, Pearson Education Delhi, 2010.
3. Database System Concepts, Peter Rob, Carlos Coronel, Cengage Learning, 2008.
4. Database Development and Management, Lee Chao, Auerbach Publications, 2010
5. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Sadalage, P. & Fowler, Pearson Education, 2013
6. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 1st Edition, Luc Perkins, Eric Redmond, et al. O'Reilley Publishers, 2018

E-Resorces:
www.w3schools.com
https://www.db-book.com/db6/
http://www.uoitc.edu.iq/images/documents/informatics-institute/Competitive_exam/Database_Systems.pdf
http://www.r-5.org/files/books/computers/languages/sql/nosql/Eric_Redmond_Jim_R_Wilson-Seven_Databases_in_Seven_Weeks-EN.pdf

****

20MCAP0315	Core XI: Software Engineering	L	T	P	C
		4			

COURSE OBJECTIVES

This course aims at introducing basic concepts, schemes, principles and techniques applicable for professional software development. It also aims at explaining its importance to discuss the concepts of software products development and software processes. It describes the various models, methods and techniques in the various phases of the software development. This course explains the testing techniques and project management concepts.

COURSE OUTCOMES

CO1: Remember and understand the basic concepts in software development models
CO2: Understand and analyze the basic requirements and issues in design
CO3: Analyze the issues in Software quality and decide the Testing strategies
CO4: Develop and maintain Tested software systems for different applications
CO5: Analyze various risk and management issues in software projects

Core VIII: SOFTWARE ENGINEERING

UNIT I
The Nature of Software – Software Engineering – Software Process Structure – Process Models – Agile Development

UNIT II
Principles that Guide Practice – Understanding Requirements – Requirements Modeling: Scenario Based Methods – Class Based Methods – Design concepts

UNIT III
Quality concepts - Review Techniques – Software Quality Assurance - Software Testing Strategies

UNIT IV
Software Testing Techniques - Conventional Applications – Object Oriented Applications –Web Applications.

UNIT V

Project Management Concepts – Process and Project Metrics - Estimation for software projects – Project scheduling – Risk Management – Maintenance and Reengineering.

Text Book

Roger S. Pressman, Bruce R. Maxim "Software Engineering: A Practitioner Approach", Eighth Edition, Tata McGraw – Hill International Edition, 2015.

References:

1. Richard Fairley "Software Engineering Concepts", First Edition, Tata McGraw Hill, 2017.

2. Ian Sommerville "Software Engineering", Tenth Edition, Pearson, 2017.

E-Resorces:

1. https://www.tutorialspoint.com/software_engineering/software_engineering_tutorial.pdf

2. https://dinus.ac.id/repository/docs/ajar/Sommerville-Software-Engineering-10ed.pdf

3. http://web.firat.edu.tr/mbaykara/softwareengineering.pdf

4. http://index-of.co.uk/Engineering/Introduction%20to%20Software%20Engineering.pdf

5.https://doc.lagout.org/science/0_Computer%20Science/Software%20Engineering%2C%208th%20Edition.pdf

****

		L	T	P	C
20MCAP0316	**Core XII: Web Programming**	**-**	-	2	1

The Course aims to
- Provide insight into the basics of the Web Programming
- Design and implement a dynamic web applications using HTML, JavaScript, PHP, MySQL and AJAX

Course Outcome:
On completion of the course, students should be able to

CO1: Analyze the essentials of client-server communications and internet protocols.

CO2: Design webpages using HTML and have practical experience in working with XML

CO3: Generate dynamic content to webpages using JavaScript and PHP

CO4: Develop online web applications with database connectivity using PHP and MySQL

CO5: Design and update web pages using PHP, MySQL and AJAX

CO6: Outline the basics of TCP/IP Protocols and IP address

Syllabus

Unit I

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers

Unit II

Introduction to HTML & CSS
Introduction to HTML: Headings - Linking- Internal linking -Images- Special Characters and horizontal Rules-Lists- Tables- Forms- Meta elements Cascading Style sheets: Inline Styles-Embedded Style Sheets-Conflicting Styles - Linking External Style Sheets
XML: Introduction -XML Basics-Structuring Data- Document Type Definitions

Unit III

Java Script, Objects & Dynamic HTML
Java Script: Introduction to Scripting -Control Statements –Functions
Objects: Math object –Array Object-String Object Document object - Boolean and Number objects - .Window object
Dynamic HTML: Events-Using cookies

Unit IV

PHP Scripting - Using Variables in PHP- Operators and Expressions -Conditional and Branching Statements. Loops and Arrays - HTML Form fields and PHP - Working with Files

Advanced PHP and MySQL : PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail

Unit V

Introduction to AJAX

AJAX Basics- Limitations of Traditional web Applications - Items for Implementing AJAX Web Forms - Get Wet in AJAX : Understanding DOM – Steps to Place Asynchronous Request to the Server – Accessing Form Elements – XMLHttp Post Request – Separating JavaScript Code in Another File – Accessing JavaScript Functions Using Hyperlink – Specifying Our Functions in .js File – Converting a String into Uppercase p CSS – Sending Data from Combobox to Server Asynchronously – Sending Multiple Items Selected from Radio and Check Box to Server Asynchronously - AJAX, PHP and MYSQL All combined for Accessing Databases

Text Books:

1. Jeffery C Jackson, Web Technologies – A Computer Science Perspective, Pearson Prentice Hall, 2009
2. Internet and World Wide Web –   How to Program, Deitel, , Pearson Prentice Hall, 2011
3. Beginning PHP5, Dave W.Mercer, Allen Kent, Steven, Wiley– Dreamtech Publications 2004.
4. Web Technologies, TCP/IP Architecture and Java Programming, Achyut S Godole & Atul Kahate, Second Edition, Tata Mc Graw Hill, 2010
5. Developing Web Applications in PHP and AJAX, B.M.Harwani, McGrawHill, 2010

Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Chris Bates, Web Programming – Building Intranet Applications, 3 rd. Edition, Wiley Publications, 2009.
3. UttamK. Roy, "Web Technologies", Oxford University Press, 2011.
4. PHP &MYSQL TimConverse, Joyce Park, Alark Morgan, 2004
5. PHP: The Complete Reference, Steven Holzner, Tata McGraw-Hill, 2017
6. JavaScript: Programming Basics for Absolute Beginners
 (Step-By-Step JavaScript Book 1), Nthan Clark, Kindle Edition, 2018

E-Resource:
   1. www. w3schools.com
   2. https://www.seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies% 20-%20A%20Computer%20Science%20Perspective.pdf
   3. https://www.pearson.ch/HigherEducation/Pearson/EAN/9780273764021/Internet-and-World-Wide-Web-How-to-Program
   4. https://download.e-bookshelf.de/download/0000/5864/10/L-G-0000586410-0002361771.pdf
   5. https://www.pdfdrive.com/atul-kahate-books.html
   6. https://books.google.co.in/books/about/Developing_Web_Applications_in_PHP_and_A.html?id=rb5VX DLjFOoC&redir_esc=y
   7. http://feedebook.blogspot.com/2016/11/developing-web-applications-in-php-and.html

****

20MCAP0317	Core XIII: Optimization Techniques	L	T	P	C
		4	-	-	4

OPTIMIZATION TECHNIQUES
(Derivation of results and proofs of theorems are not expected)

OBJECTIVE:

• To get the knowledge about mathematical formulation, decision making and optimizing the output of many real-life problems

COURSE OUTCOMES

Students will be

- Able to formulate and solve the LPP in their real life
- Able to find the shortest path to get minimum transportation cost and optimum job assignment problems
- Able to identify best strategic game models and its characteristics.
- Handle inventory theory gives economic orders of quantity in stock of production or sales problems**.**
- Identifycritical time and best path of a project to complete in minimum time, using PERT & CPM

UNIT	CONTENTS	Lecture Schedule
I	**Formulation and Solution of Linear Programming Problem (LPP)**	**14**
	• Introduction, Mathematical Formulation of the LPP	**2**
	• Graphical Solution Method	**3**
	• General LPP, Canonical and Standard Forms of LPP	**3**
	• Simplex Method Big M Method	**4**
	• Two Phase Method	**2**
II	**Transportation & Assignment Problems**	**13**
	• LP formulation, Existence and Solution of TP	2
	• Finding IBFS of TP by NWC, Matrix Minima and VAM	3
	• Optimal Solution of TP (MODI Method)	3
	• Mathematical Formulation of AP	2
	• Solution Methods of AP	3
III	**Games and Strategies**	**13**
	• Introduction, Two-Person Zero-Sum Games	2
	• Some Basic Terms, MaxMin-MiniMax Principle	3
	• Games without Saddle Points – Mixed Strategies	3
	• Graphic Solution of 2xn and mx2 Games	3
	• Dominance Property	2
IV	**Replacement & Inventory Problems**	**12**
	• Replacement of Equipment/Asset that Deteriorates Gradually	3
	• Replacement of Equipment/Asset that Fail Suddenly	3
	• Deterministic Inventory Problems with no shortages	3
	• Deterministic Inventory Problems with Shortages	3

V	Network Scheduling by CPM & PERT	12
	• Network: Basic Components, Logical Sequencing & Rules of Network Construction	3
	• CPM Analysis	4
	• PERT Analysis	4
	• Distinction between PERT & CPM	1
	Total Contact Hours	64

Text Book:

1. Operations Research, Kanti Swarup, P.K. Gupta & Man Mohan, 17/e, S. Sultan Chand & Sons, New Delhi, 2014

References:
1.   Introduction to Operations Research, F. Hiller and G. J. Lieberman, Holden Day Inc., 1980.
2.   Operations Research: An Introduction, M.A. Taha, McMillan Publ. Co, 1982.
3.   The Critical Path Method, L.R. Shaffer J.B. Filtter and W.L.Meyer, McGraw Hill, 1965.
4.   Ravindran A, Philips D.T &Solbery. J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.

****

20MCAP03EX	Elective I	L	T	P	C
		4	-	-	4

20MCAP0318	Lab V: Advanced DBMS Lab (SQL, NoSQL, Neo4J)	L	T	P	C
		-	-	2	1

LAB: ADVANCED DBMS

The Course aims to
- · Prepare the students to design VB forma for real-time applications
- · Design database schema considering the normalization rules
- · Write PL/SQL programs using Triggers, Cursors and Exception
- · Use the database from an front-end applications

CONTENTS

- **SQL:**
  — Tables : Creations, Sorting, Setting relation between tables
  — Queries using single and multiple tables
  — Exception Handling, Cursor and Triggers
  — Importing Tables from Electronic Spreadsheet and Text File
  — Report from usage

- **NOSQL, MySQL and Neo4j**
  — CreatingNew table
  — Modify table
  — Concatenating tables
  — Creating Big Tables
  — Creating Web Frameworks using MySQL as a NoSQL
  — Developing Web Application with NoSQL
  — Handling graph databases using Neo4j

****

		L	T	P	C
20MCAP0319	**Lab VI: Web Programming Lab**	**-**	**-**	2	1

LAB: WEB PROGRAMMING

The Course aims to
- Explore the designing of web applications
- Design and implement a dynamic web applications using HTML, JavaScript , PHP, MySQL and AJAX

Course Outcome:

On completion of the course, students should be able to

CO1: Design webpages using HTML, CSS and XML
CO2: Write scripts using PHP and JavaScript to develop dynamic
      webpages
CO3: Develop online web applications with database connectivity
       using PHP, AJAX and MySQL
CO4: Develop web application project using web designing tools and
      Techniques
CO5: Hosts the web application in the internet

	CONTENTS

1	Web page design using HTML Tags
	    • Web Page Creation – Ordered List, Unordered List, Tables, Frames, Links, Image Anchor, Image Maps
	    • Using Form Controls with Input Tag, Cascading Style Sheets

2	XML • Creating XML Document with Internal DTD and External DTD
3	JavaScript • Programs in JavaScript Using Control Structures, Arrays, Strings, Objects, Event Handlers, Form Validation

4	PHP
	    • Programs on Arrays using PHP Array Functions
	    • Validation of HTML Form Inputs and Processing Using Global Variables
	    • Programs based on PHP and MySQL Database Connectivity

5	AJAX • Developing web applications using AJAX, PHP and MySQL
6	Project on Web Applications

****

20MCAP03F1	Extension/Field Visit	L	T	P	C
		--			

20EXNP03V1	Village Placement Programme	L	T	P	C
					2

20MCAP03MX	Modular Course I: Android Programming	L	T	P	C
		2			

(Under Preparation)

20MCAP0320	Mini Project: Mobile Apps for Rural Development	L	T	P	C
		-	-	1	1

(Under Preparation)

--	SWAYAM/Spoken Tutorial / MOOC-III: R Programming*	L	T	P	C
		--	-	-	-

20MCAP0421	Core XIV: Operating System Concepts	L	T	P	C
		4	-	-	4

Course Objectives:

- To provide knowledge on the objectives, services & design of an operating system.
- To acquaint with the concepts of Process, Threads, CPU & Memory Management
- To offer an exposure to elements of distributed OS
- To offer a platform to understand the association between the design of OS and System performance

Learning Outcomes:

On successful completion of this course, students shall be able to

- Appreciate the conceptual framework of Operating System and its Structures, Operations and Services
- Delineate the principles of Process Scheduling & Multithreading.
- Analyze the concepts of CPU scheduling and deadlocks.
- Describe the mechanics of Main memory and Virtual Memory Management
- Compare the functional features of traditional, modern and distributed OS.

Unit 1: Operating Systems Overview:
Computer System Organization - Computer System Architecture - Operating System Operations - Resource Management - Security and Protection - Virtualization - Distributed Systems - Kernel Data Structures - Computing Environments - Free and Open Source Operating Systems.
Operating System Structures: Services - User Operating System Interface - System Calls - System Services - Linkers and Loaders - Operating System Structure - Building and Booting - Operating-System Debugging.

Unit 2 Process Management
Process: Concept - Process Scheduling - Operations on Processes – Inter-Process Communication - Shared-Memory Systems - Message-Passing Systems. Threads and Concurrency: Overview - Multicore Programming - Multithreading Models - Thread Libraries - Implicit Threading - Threading Issues.

Unit 3 CPU Scheduling and Deadlocks
CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multiple-Processor Scheduling - Real-Time CPU Scheduling - Algorithm Evaluation.
Deadlocks: System Model - Multithreaded Applications - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.

Unit 4 Main Memory and Virtual Memory

Main Memory - Background - Swapping - Contiguous Memory Allocation - Segmentation - Paging - Structure of the Page Table.

Virtual Memory - Background - Demand Paging - Page Replacement - Allocation of Frames - Thrashing - Memory Compression.

Unit 5 Distributed Systems

Distributed Systems- Advantages of Distributed Systems - Network Structure - Communication Structure - Network and Distributed Operating Systems - Design Issues - Distributed File Systems - DFS Naming and Transparency.

Text Book:

1. Operating System Concepts, 10th Ed, Silberschatz , Galvin & Gagne, John Wiley & Sons, Inc., 2018.

Reference Books:

1. Cracking The Operating Systems Skills, Sundaram RMD, Shriram K.Vasudevan, Abhishek S. Nagarajan, B Chella Prabha, 2018, DreamTech Press.2020.
2. Operating System Concepts, Ekta Walia, 2nd Ed., Khanna Publishing, 2019.
3. Modern Operating Systems, 4th Ed., Andrew S. Tanenbaum, Pearson Education, Global Edition, 2015.

E-Resources:

1. https://www.tutorialspoint.com/operating_system/os_useful_resources.htm
2. http://www.freebookcentre.net/ComputerScience-Books-Download/Introduction-to-Operating-Systems-by-Dr.-Mark-Humphrys.html
3. https://www.tutorialspoint.com/operating_system/index.htm
4. https://www.os-book.com/OS10/slide-dir/index.html
5. https://youtu.be/vBURTt97EkA
6. https://www.javatpoint.com/os-tutorial
7. http://nptel.ac.in/

****

20MCAP0422	Core XV: Data Analytics & Machine Learning	L	T	P	C
		4	-	-	4

20MCAP0422 - Data Analytics and Machine Learning			
Semester	IV	**Credits**	4
Cognitive Level	Define Big Data Analytics. Describe architecture of Hadoop and YARN. Design Machine Learning algorithms for real time applications.		
Course Objectives	**The Course aims to** • Explain the basic concepts of Big Data and Data Analytics • Provide a deep insight into Hadoop environment and YARN • Illustrate programming using Map Reduce • Describe the different types of Learning paradigms and Machine Learning algorithms .		
Course Outcomes	**On successful completion of the course, the students should be able to** CO1: Understand the key issues in big data management and its associated applications in intelligent business and scientific computing. CO2: Acquire fundamental ideas on using scalable algorithms like Hadoop, and YARN in big data analytics. CO3: To apply Map Reduce methods for data analysis. CO4: Choose the appropriate learning paradigm to find solution to a problem. CO5: Apply the suitable machine learning algorithm for an application CO6: Identify real time applications suitable for different types of Machine Learning		

UNIT	Content	No. of Hours
I	Introduction to Big Data: Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – What is Big Data – Other Characteristics of Data– Why Big Data – Traditional Business Intelligence(BI) versus Big Data. Big Data Analytics: Where do we Begin – What is Big Data Analytics –	12

	Classification of Analytics Terminologies Used in Big Data Environments – Top Challenges Facing Big Data – Why is Big Data Analytics Important Data Science -Few Top Analytics Tools.		
II	Introduction to Hadoop: Introducing Hadoop – Why Hadoop – Why not RDBMS – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator) – Interacting with Hadoop Ecosystem.	13	
III	Introduction to MAPREDUCE Programming: Introduction – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression	12	
IV	Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms	12	
V	SUPERVISED LEARNING : Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Common Classification Algorithms – k-Nearest Neighbor – Decision Trees – Random Forest model – Support Vector Machines. UNSUPERVISED LEARNING : K-Means Clustering – Hierarchical Clustering – Dimensionality Reduction – Principal Component Analysis.	13	
	Total Contact Hours	64	
	TEXT BOOKS 1. Big Data and Analytics, Seema Acharya and Subhashini Chellappan, 2nd Edition ,Wiley India Private Limited, 2017. 2. Big Data Analytics with R, Simon Walkowiak, Packt Publishing, 2016 3. EthemAlpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015 **REFERENCES** 1. Big Data Strategies , Pam Baker ,1st edition , Cengage Learning India Private Limited, 2016. 2. Big Data, Dr. Anil Maheshwari, 1st edition , Published by McGraw Hill Education (India) Private Limited, 2017. **3.** Big Data Fundamentals Concepts, Driver & Techniques, Thomas Erl,WajidKhattak and Paul Buhler, 3rd Edition, Pearson publication,2018. **E-References** ▪ https://www.tutorialspoint.com/big_data_analytics/index.htm ▪ https://onlinecourses.nptel.ac.in/noc20_cs73/preview ▪ Github.com ▪ analyticsvidhya.com ▪ aws.amazon.com/machine-learning/amis ▪ towardsdatascience.com		

****

20MCAP04MX	**Modular Course II: Open Source Software**	L	T	P	C
	(Under Preparation)	**2**	-	-	2

Course Code & Title	20MCAP04MX	OPEN SOURCE SOFTWARE		
Class	MCA		Semester	IV

Cognitive Level	**K-1:** To identify the framework to learn the Latex, Scilab, Perl and, Tableau. **K-2:** Describe the elements of Latex, Scilab, Perl and, Tableau. **K-3:** To apply the effectiveness of OSS for text processing, scientific problem solving and data visualization
Course Objectives	**This Course aims to** ✓ To understand and apply the components of LaTeX ✓ To comprehend the basics of Scilab programming and problem solving using scilab ✓ To learn programming elements of Perl and its applications ✓ To train the basics of Tableau and its potential for data visualization

UNIT	CONTENTS	No. of Hours
	Latex	
I	Installation of the software LaTeX - Understanding Latex compilation - Basic Syntax, Writing equations, Matrix, Tables - Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation - List making environments - Table of contents, Generating new commands, Figure handling - numbering, List of figures, List of tables, Generating index - Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing.	8
	Scilab	
II	Installation of the software Scilab - Basic syntax, Mathematical Operators, Predefined constants -Built in functions - Complex numbers, Polynomials, Vectors, Matrix - Handling these data structures using built in functions – Programming – Functions - Loops- Conditional statements - Handling .sci files - Installation of additional packages e.g. 'optimization' - Graphics handling - 2D, 3D - Generating .jpg files - - Function plotting - Data plotting.	8
	Perl	
III	Introduction - Environment - Syntax Overview - Data Types - Variables - Scalars - Arrays - Hashes - IF...ELSE - Loops - Operators - Date & Time - Perl – Subroutines - References – Formats - File I/O – Directories - Error Handling - Special Variables - Coding Standard - Regular Expressions - Sending Email	8

	Tableau	
IV	Introduction Tableau - Connecting to Excel, CSV Text Files - Connecting to Databases - Working with Data – Analyzing - -Formatting - Introduction to Calculations - Dashboard Development – Sharing –Calculations: Data, Aggregate, User, Table, Logical, String, Number - Type Conversion – Parameters - Filtering Conditions - Filtering Measures – Histograms – Sorting –Grouping – Sets -Tree maps, word clouds and bubble charts -Pareto Charts -Waterfall Charts - Bump Charts - Funnel Charts - Bollinger Bands	8
	Total Hours	32

Text Books:

1. Firuza Karmali Aibara: A Short Introduction to Latex: A Book for Beginners, CreateSpace Independent Publishing Platform, 2019.
2. Rajan Goyal, Mansi Dhingra: Programming in Scilab, Alpha Science International, Limited, 2019
3. Nathan Metzler: Perl Programming for Beginners: An Introduction to Learn Perl Programming with Tutorials and Hands-On Examples, Amazon Digital Services LLC - KDP Print US, 2020
4. Joshua N. Milligan: Learning Tableau 2020: Create effective data visualizations, build interactive visual analytics, and transform your organization, 4th Edition, Packt Publishing Ltd, 2020.

References:

1. https://spoken-tutorial.org/watch/LaTeX/LaTeX+on+Windows+using+TeXworks/English/
2. https://www.scilab.org/tutorials
3. https://freevideolectures.com/course/2308/internet-technology/21
4. https://www.coursera.org/learn/analytics-tableau

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: To obtain the essential knowledge on the features of Latex, Scilab, Perl and, Tableau
	CO2: Appreciate the uniqueness & applications of Latex, Scilab, Perl and, Tableau
	CO3: Apply the theoretical knowledge acquired on Latex, Scilab, Perl and, Tableau for suitable real-time applications
	CO4: Analyse the potentials of open source software for text formatting, problem solving and data visualization

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	2	1
CO2	2	1	2	3	2
CO3	3	2	1	2	2
CO4	2	3	2	1	3

P. Shakti

	Communication Skills for Computer Technocrats (Non-Credit)	L	T	P	C
--		**2**	-	-	-
20ENGP00C1	**Communication Skills for Computer Technocrats**				

OBJECTIVES:

- To develop inter personal skills and be an effective goal oriented team player.
- To develop professionals with idealistic, practical and moral values.
- To develop communication and problem solving skills.
- To re-engineer attitude and understand its influence on behavior.

LEARNING OUTCOMES:

Students should be able to

- Good communication and soft skills.
- Improved inter personal skills.
- Ability of self-analysis.

UNIT	CONTENTS	Lecture Schedule
I	**SELF ANALYSIS**	**4**
	SWOT Analysis, Who am I, Attributes	2
	Importance of Self Confidence, Self Esteem	2
II	**ATTITUDE**	**4**
	Factors influencing Attitude, Challenges and lessons from Attitude	2
	Change Management Exploring challenges, Risking Comfort Zone, Managing Change	2
III	**MOTIVATIONS**	**6**
	Factors of motivation, Self-Talk	3
	Intrinsic & Extrinsic Motivators	3
I V	**GOAL SETTING**	**6**
	Wish List, SMART Goals, Blue print success, Short Term, Long Term	2
	Life time Goals, Time Management Value of time, Diagnosing Time Management	2
	Weekly Planner to do list, Prioritizing work.	2
V	**CREATIVITY**	**10**
	Out of box Thinking	5
	Lateral Thinking Presentation	5
	Total Contact Hours	**30**

20MCAP0423	Project	L	T	P	C
		-	-	10	10

** Evaluated for 200 marks as below:

75 marks for the valuation of the Dissertation by the Internal Examiner

75 marks for the valuation of the Dissertation by the External

Examiner

50 marks for the Viva-Voce jointly by the Internal and External Examiners

	SWAYAM/Spoken Tutorial/ MOOC-IV: Linux Programming	L	T	P	C

20MCAP03EX	Elective I	L	T	P	C
		4			

Compiler Design

Course Code & Title	**PRINCIPLES OF COMPILER DESIGN**		**Credits: 4**
Class	**MCA**	**Semester**	**III**
Cognitive Level	**K-1:** Recall the basic elements of Compiler **K-2:** Identify with the working principles and interfaces of Compilers **K-3:** Apply and analyze the operations performed by compiler		
Course Objectives	**The Course aims to** • Define the design and intrinsic functioning of compilers • Identify the purpose and functions of phases of the compiler • Describe the Contents and data structures for Symbol table with errors • Identify the Problems in code generation and register allocation and assignment • Explain the process of compilation of a source program with reference to common programming languages.		
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Explain the fundamentals of a compiler. **CO2:** Discuss about the context-free grammars and various parsing techniques. **CO3:** Describe the lexical analyzer and syntax analyzer of Compiler. **CO4:** Explain about the types and sources of errors, from the compilers perspective. **CO5:** Criticize the procedures and principles involved in the machine code generation.		

UNIT	CONTENTS	Lecture Schedule
I	**INTRODUCTION TO COMPILERS**	13
	Compilers - Analysis - Synthesis model of compilation - Analysis of the source program - The phases of a compiler - Cousins of the compiler - Compiler construction tools - Error handling.	
II	**LEXICAL ANALYZER**	19
	Lexical analysis - Role of lexical analyzer - Tokens, Patterns and lexemes - Input buffering - Specification of tokens - Regular expressions - Recognition of tokens - Transition diagrams - Implementing a transition diagram - Finite Automata - Regular expression to NFA - Conversion of NFA to DFA - Applications of finite automata for recognizing tokens.	
III	**SYNTAX ANALYZER**	14
	Syntax analysis - Role of parser - Context-free grammars - Derivations - Writing a grammar - Top Down parsing -	

	Recursive descent parsing - Predictive parsers - Non-recursive predictive parsers - Construction of predictive parsing tables - Bottom up parsing - Handles - Shift reduce parser - Operator-precedence parsing. LR parsers - Canonical collection of LR (0) items - Constructing SLR parsing tables.		
IV	**INTERMEDIATE CODE GENERATION**		8
	Syntax directed translation - Syntax directed definitions - Synthesized attributes - Inherited attributes - Intermediate code generation - Intermediate language - Construction of syntax trees - DAG - Bottom-Up evaluation of S attributed definitions - Implementations - Assignment statements - Boolean expressions - Back patching.		
V	**CODE OPTIMIZATION and CODE GENERATION**		
	Principle sources of optimization - Optimization of basic blocks - Loops in flow graphs - Introduction to global data flow analysis. Issues in design of code generator - Target machine - Time storage management - Basic blocks and flow graphs - Code generation algorithm - DAG representation - Peephole optimization.		10
	Total Contact Hours		**64**

Text Book:

Principles of Compiler Design, Alfred V. Aho& Jeffrey D. Ullman, Narosa Publishing House, 1985.

References:

1. Compiler Construction Principles and Practice – D.M.Dhamadhere, McMillan India Ltd., Madras, 1983.
2. Compiler Design Theory, Lewis. P.M., Rosenkrantz D.J., Stearn R.E., Addison–Wesley, 1976.
3. *Alfred V. Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers, Principles, Techniques and Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.*
4. *Alfred V. Aho, Jeffrey D Ullman, "Principles of Compiler Design", Addison Wesley, 1988.*
5. *Jean Paul Tremblay, Paul G Sorenson, "The Theory & Practice of Compiler Writing", International student edition, 1985.*
6. *David Gries, "Compiler Construction for Digital Computers", Wiley International Edition, 1971.*
7. *William A Barrett, Rodney M Bates, David A Gustafson, John D Couch, "Compiler Construction, Theory & Practice", Galgotia publications Pvt. Ltd., New Delhi, 2nd edition, 1986.*
8. *David Galles, "Modern Compiler Design", Pearson Education, 2008*
9. *Steven S. Muchnick, "Advanced Compiler Design & Implementation", Morgan Kaufmann Publishers, 2000.*
10. *Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008*

Website:
https://www.tutorialspoint.com/compiler_design/index.htm
https://www.geeksforgeeks.org/introduction-of-compiler-design/
https://www.javatpoint.com/compiler-tutorial

COURSE OBJECTIVES

This course surveys the various types of security algorithms starting the classical techniques to modern algorithms. It tries to provide the detailed overview of the different block cipher algorithms. It also aims at evaluating the Public Key cryptography algorithms. This course also describes the various key management techniques and hash functions. This course provides the understanding of transport layer and application layer security.

COURSE OUTCOMES

CO1: To remember the basic terminologies and recognize the nature of algorithms
CO2: To understand the different block cipher algorithms.
CO3: Recognize the different Public Key Infrastructure.
CO4: Analyze the different key management and hash functions.
CO5: Evaluate the transport layer and application layer security systems.

UNIT I

Introduction–Overview – Attacks – Types of services - Classical Encryption techniques – Block ciphers and Data Encryption –SDES – DES.

UNIT II

AES – Block cipher operation – Public Key cryptography and RSA - Other public key cryptosystems – Diffie-Hellman Key Exchange – ElGamal Cryptosystem – Elliptic Curve Cryptography

UNIT III

Cryptographic Hash Functions - Applications – Two Simple Hash Functions – Secure Hash Algorithm (SHA) - Message Authentication Codes – Digital Signatures

UNIT IV

Key Management and Distribution – X. 509 certificates – Public Key Infrastructure - User Authentication Protocols – Kerberos

UNIT V

Transport Level Security – Wireless Network Security – Electronic Mail Security – IP Security.

.

Text Book:

William Stallings "Cryptography and Network Security – principles and practice ", Seventh
   Edition, Pearson 2017.

References:

1. Charles P.Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies "Security in Computing"
Fifith Edition , Pearson 2018

2. William Stallings, "Cryptography and Network Security: Principles and Practices", Fifth Edition, Prentice
Hall, 2011.

Online Materials:

1. https://www.tutorialspoint.com/cryptography/cryptography_tutorial.pdf

2. https://faculty.nps.edu/dedennin/publications/Denning-CryptographyDataSecurity.pdf

3. https://www.akadia.com/download/documents/intro_to_crypto.pdf

4. https://www.mathematik.uni-kl.de/~ederc/download/Cryptography.pdf

5. https://crypto.stanford.edu/~dabo/cryptobook/draft_0_2.pdf

****

VIRTUAL REALITY

COURSE OBJECTIVES

This course aims to provide the history and evolution of Virtual Reality and provide the understanding of the modern virtual reality techniques. With different models and concepts of design in the development of applications and guidelines, this course offers the detailed overview of the interactions and patterns in human interventions.

COURSE OUTCOMES

CO1: To remember the basic terminologies and concepts in Virtual Reality.
CO2: To understand the various types of modalities in application development.
CO3: Recognize the different functionalities guidelines and overview of techniques
CO4: Identify and analyze the interactions and patterns in human intervention.

UNIT-1

What is Virtual Reality? – A History of VR – An Overview of Various Realities – Immerse, Presence and Reality Trade off's – The Basics: Design Guidelines

UNIT-2

Objective and Subjective Reality – Perceptual Models and Processes – Perceptual Modalities – Perception of Space and Time – Perceptual Stability, Attention and Action – Design Guidelines

UNIT-3

High Level Concepts of Content Creation – Environmental Design – Affecting Behavior - Transitioning to VR Content Creation – Content Creation: Design Guidelines

UNIT-4

 Human Centered Interaction – VR Interaction Concepts – Input Devices – Interaction Patterns and Techniques – Interaction: Design Guidelines

Text Book:

M.TamerOzsu, "The VR Book Human-Centered Design for Virtual Reality", ACM BOOK, ACM Book, 2016

References:

1. Erin Pangilinan, Steve Lukas and Vasanth Mohan "Creating Augumented and Virtual
   Realities", O-Reilly, 2019

2. Celine Tricart, "Virtual Reality Filmmaking Techniques and Best Practices for VR

****

COURSE OBJECTIVES

The objective of this course is to provide the comprehensive and detailed knowledge of Cloud Computing concepts, technologies, architecture and applications. Another objective is to expose the students to frontier areas of IoT Eco system, applications, architecture and Information gathering.

COURSE OUTCOMES

CO1: Remember the basic concepts and implications in cloud computing
CO2: Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
CO3: Analyze the trade-offs inherent in Cloud Computing
CO4: Understand the IoT eco system, applications and architecture
CO5: Analyze some of the information gathering and analysis in IoT

Syllabus

UNIT – 1

Cloud Computing – Evolution – Defining Cloud Computing – Principles of Cloud Computing – Cloud Eco System – Requirements for Cloud Services – Cloud Application – Benefits and Drawbacks - Cloud Architecture – Anatomy of Cloud – Network Connectivity in Cloud Computing – Applications on the Cloud

UNIT – 2

Managing the Cloud – Migration Application to Cloud – Deployment Model Introduction – Private Cloud – Public Cloud – Community Cloud – Hybrid Cloud – Infrastructure as a service – Platform as a Service – Software as a Service.

UNIT – 3

Technological Drivers – SOA and Cloud – Virtualization - Multicore Technology – Memory and Storage Technologies – Networking Technologies

UNIT – 4

The IoT Landscape - IoT system Architecture – IoT Devices -Event Driven System Analysis - IoT Network Model – IoT Event Analysis

UNIT – 5

Network Layer – Transport Layer – Monitoring and Actuating – Business Process and Data Analysis – Information Gathering and Collaborative Consumption Applications of IoT

Text Book :

1. K.Chandrasekaran "Essentials of Cloud Computing", CRC PRESS: A Taylor and Francis Group, 2015

2. Rajkumar Buyya, James Broberg, Andrzej Goschinski "Cloud Computing Principles and Paradigms", Willey Publications 2011.

3. BorkoFurht, Armando Escalante "Handbook of Cloud Computing", Springer 2010.

4. DimitriosSerpanos, Marilyn Wolf "Internet of Things (IoT) Systems ", Springer 2018

5.Rajkumar Buyya and Amir Vahid Dastjerdi "Internet of Things Principles andParadigms", Elsevier 2016.

6.David Hanes, Gonzalo Salguerio, Patrick Grossetete, Robert Barton, Jerome Henry "IoT Fudamentals Networking Technologies, Protocols and use cases for the Internet of Things ", Cisco Press 2017

Online Materials:

1. https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf

2. https://solutionsreview.com/cloud-platforms/free-cloud-computing-ebooks/

3. https://solutionsreview.com/cloud-platforms/free-cloud-computing-ebooks/

4. https://www.iotforall.com/iot-ebooks/

5. https://www.qorvo.com/design-hub/ebooks/internet-of-things-for-dummies

****