Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)



Structure and Curriculum of Two-Year Degree Programme

Postgraduate Programme of Computer Science M. Sc. in Computer Science

Board of Studies in Computer Science Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)

> शिव छत्रपती शिक्षण संस्था लातर

w.e.f. June, 2023 (In Accordance with NEP-2020)

Academic Year: 2023-24

Review Statement

The NEP Cell reviewed the Curriculum of **M.Sc. in Computer Science** Programme to be effective from the **Academic Year 2023-24.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 09/08/2023 **Place:** Latur

> NEP CELL Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)

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CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the curriculum of **M**. Sc. in Computer Science Programme to be effective from the Academic Year 2023-24.

Date: 14.07.2023 Place: Latur



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(**Dr. Renuka R Londhe**) Board of Studies in Computer Science Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)

। आरोह तमसो ज्योतिः।।

Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



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Members of Board of Studies in the Subject Computer Science

Under the Faculty of Science and Technology

Sr.	Name	Designation	In position
No.			u p
1	Dr Renuka R. Londhe	Chairperson	HoD
	Head, Department of Computer Science,		
	Rajarshi Shahu Mahavidyalaya (Autonomous),		
	Latur		
2	Dr. Girish Choudhari	Member	V.C. Nominee
	Professor and Head of Department School of		
	Computational Sciences, SRTMU, Nanded		
3	Dr. Ramesh R. Manza	Member	Academic Council Nominee
	Professor, Department of Computer Science and		
	IT, BAMU, Aurangabad		
4	Dr. Shriram Raut	Member	Academic Council Nominee
	Associate Professor		
	Department of Computer Science, PAHU,		
	Solapur		
5	Dr. Poorna Shankar	Member	Expert from outside for Special
	Professor, Indira College of Engineering, Pune		Course
6	Mr N. D. Jagtap	Member	Expert from Industry
	Technical Trainer OHI-IITC, Muscat Oman	शिक्षमा :	गंद्रशा
7	Dr. Santosh Shrikhande	Member	P.G. Alumni
	Assistant Professor, School of Technology,	חותא	
	SRTMU Subcenter Latur		
8	Mrs. Suchi <mark>tra K.</mark> Kasbe	Member	Faculty Member
9	Mrs. Pooja <mark>S. Laturiya</mark>	Member	Faculty Member
10	Mr. Arun S. Shinde	Member	Faculty Member
11	Mrs. Sunita M Jadhav	Member	Faculty Member
12	Ms. H F Maniyar	Member	Faculty Member
13	Dr. Mahesh Wavare	Member	Member from same Faculty

From the Desk of the Chairperson...

With the tremendous growth of IoT, Data Science, Artificial Intelligence, and Machine Learning technologies over the past ten years, computers have been influencing the future of humanity. Any student taking B.Sc. (Computer Science) program should be able to understand the philosophy, architecture, and mathematics behind the technologies that advance our modern society. The evergrowing discipline of computer science has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular domain. Computer science has a wide range of specialties. These include Computer Programming, Software Systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data Science, Computational Science, and Software Engineering.

A real genuine attempt has been made while designing the new curriculum of four-year B.Sc. (Computer Science) program under NEP-2020 by Board of Studies in Computer Science of Rajarshi Shahu Mahavidyalaya, Latur (Autonomous) with an aim to develop the core competence in computing and problem solving amongst its graduates. After successful completion of B.Sc. (Computer Science), students can fetch employment directly in companies as programmer, Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The curriculum focuses on building theoretical foundations in Computer Science to enable its students to think critically when challenged with different and new problems. It includes the learner-centric features of NEP-2020 including Multiple Entry and Multiple Exit, Employability, Flexibility to Choose, Multidisciplinary, Research, Advance Courses, etc.

The Computer Science BoS states that the B.Sc. (Computer Science) Honors & M. Sc. (Computer Science) program gives students a strong foundation and exposure to the basics, advanced, and emerging trends of the subject. The program helps students to comprehend the principles of computer science and enhance skills such as programming, networking, and database management. The program also stresses the ethics of creating and using new technologies by making compelling arguments for secure computing, user privacy protection, and green computing. The program trains students for a career in Software industry and inspires them towards further studies and research opportunities. We sincerely thank all of the experts who provided their insightful comments and recommendations in



order to improve the contents; we have made every effort to take each of them into consideration.

(**Dr. Renuka R Londhe**) Board of Studies in Computer Science



Rajarshi Shahu Mahavidyalaya, Latur

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Department of English

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Department of Computer Science

PG Skeleton in Accordance with NEP-2020

Illustrative Credit Distribution Structure for Two Year M.Sc. Degree

LevelMandatoryElectiveCourseMMCNANA20CrIMMC I 3CrMEC ILC-I 1Cr4CrACrNANA20CrMMC II 3Cr3CrLC-II 1CrLC-II 1Cr4CrACrACrACrACrMMC III 3Cr3CrLC-II 1CrLC-II 1CrACrACrACrACrACrMMC III 3CrMEC ILC-VI 1CrLC-IV 1CrACrACrACrACrMMC III 3CrMEC IILC-VI 1CrACrACrACrACrACrMMC V3Cr3CrLC-VI 1CrLC-VI 1CrACrACrACrACrMMC VI 3CrMECLC-VII 1CrLC-VIII 1CrACrACrACrACrTotalMMCMECLC-8Cr0JT/FPNA40CrExit Option: PG Diploma with 40 Credits After 03 Year B.Sc. DegreeExit Option: PG Diploma with 40 Credits After 03 Year B.Sc. Degree	Theory: 1Cr=25M Lab Course: 1Cr=50M OJT/FP: 1Cr=25M	PG Diploma (After 03 Year B.Sc. Degree)
MandatoryElectiveRMCNANA20CrIMMC I 3CrMEC ILC-I 1Cr4Cr	Theory: 1Cr=25M Lab Course: 1Cr=50M OJT/FP: 1Cr=25M	PG Diploma (After 03 Year B.Sc. Degree)
IMMC I 3CrMEC ILC-I 1Cr4CrMMC II 3Cr3Cr3CrLC-II 1CrLC-III 1CrLC-III 1CrLC-III 1CrLC-III 1CrLC-III 1CrMMC III 3CrMEC IILC-V 1CrNAOJT-IMMC V 3CrMEC IILC-V 1CrACrMMC V 3Cr3CrLC-VI 1CrACrMMC V 3Cr3CrLC-VI 1CrACrMMC V 3Cr3CrLC-VI 1CrACrMMC VI 3CrMECLC-VII 1CrACrTotalMMCMECLC-8CrRMCOJT/FPNA40CrExit Option: PG Diploma with 40 Credits After 03 Year B.Sc. DegreeIIIMMC VII 3CrMECLC-IX 1CrNANARP-I20Cr	1Cr=25M Lab Course: 1Cr=50M OJT/FP: 1Cr=25M	PG Diploma (After 03 Year B.Sc. Degree)
IMMC II 3Cr MMC III 3Cr3CrLC-II 1Cr LC-III 1Cr LC-IV 1CrNAOJT-I ACrNA6.0IIMMC IV 3Cr MMC VI 3CrMEC II 3CrLC-VI 1Cr LC-VI 1Cr LC-VI 1Cr LC-VII 1Cr LC-VIII 1CrNAOJT-I 4Cr FPI 4CrNA20Cr6.0MMC V 3Cr MMC VI 3CrMEC II 3CrLC-VI 1Cr LC-VII 1Cr LC-VIII 1CrACr FPI 4CrNA20Cr7 TotalMMC 18CrMEC 06CrLC-8Cr 04CrRMC 04CrOJT/FP 04CrNA40CrExit Option: PG Diploma with 40 Credits After 03 Year B.Sc. DegreeIIIMMC VII 3CrMEC MECLC-IX 1CrNANARP-I20Cr	Lab Course: 1Cr=50M OJT/FP: 1Cr=25M	PG Diploma (After 03 Year B.Sc. Degree)
I MMC III 3Cr MEC II LC-III 1Cr LC-IV 1Cr NA OJT-I NA 20Cr MMC V 3Cr MEC II LC-V 1Cr ACr HCC-VI 1Cr LC-VI 1Cr LC-VI 1Cr LC-VII 1Cr LC-VII 1Cr LC-VIII	Course: 1Cr=50M OJT/FP: 1Cr=25M	PG Diploma (After 03 Year B.Sc. Degree)
IMMC IV 3CrMEC IILC-IV 1CrNAOJT-INA20Cr6.0MMC V 3CrMEC IILC-V 1CrNA4Cr4	1Cr=50M OJT/FP: 1Cr=25M	Diploma (After 03 Year B.Sc. Degree)
I MMC IV 3Cr MEC II LC-V 1Cr NA OJT-I NA 20Cr 6.0 MMC V 3Cr 3Cr CLC-VI 1Cr LC-VI 1Cr LC-VII 1Cr LC-VII 1Cr LC-VIII 1Cr LC-VII	OJT/FP: 1Cr=25M	(After 03 Year B.Sc. Degree)
Image: Second system of the	OJT/FP: 1Cr=25M	03 Year B.Sc. Degree)
0.0 MMC VI 3Cr LC-VII 1Cr /FPI 4Cr MMC VI 3Cr LC-VIII /FPI 4Cr 1Cr ICr /FPI 4Cr Total MMC MEC 18Cr 06Cr LC-8Cr 04Cr 04Cr NA 40Cr Exit Option: PG Diploma with 40 Credits After 03 Year B.Sc. Degree III MMC VII 3Cr MEC LC-IX 1Cr NA NA RP-I 20Cr	OJT/FP: 1Cr=25M	B.Sc. Degree)
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Image: Model of the system Image: Model of the system <th>ICr=25M</th> <th></th>	ICr=25M	
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III MMC VII 3Cr MEC LC-IX 1Cr NA NA RP-I 20Cr		
MMC VIII III LC-X 1Cr 4Cr	1	
3Cr 3Cr LC-XI 1Cr		
MMC IX 3Cr LC-XII 1Cr		
	RPI &	DC
IV MMC X 3Cr MEC LC-XIII NA NA RP-II 22Cr	RPII [.]	PG
II MMC XI 3Cr IV 1Cr 6Cr	1Cr=25M	(After
65 MMC XII 3Cr 3Cr LC-XIV		03 Year
1Cr		UG
LC-XV 1Cr		Degree)
LC-XVI		
1Cr		
TotalMMC 18CrMECLC-8CrNANARP42Cr		
06Cr 10		
Rajarshi Shahu Mahavid Cria /a,		
Cum. Total ofMMCMECLC-16CrRMCOJT/FPRP40+42		82
I & II Year 36Cr 12Cr 04Cr 04Cr 10Cr =82		Credits
Cr		
Exit Option: Two Years 04 Sem. PG Degree with 82 Credits After 03 Yea	ur UG Degre	e

Abbreviations:

- 1. MMC : Major Mandatory Course
- 2. MEC : Major Elective Course
- 3. RMC : Research Methodology Course
- 4. OJT : On Job Training (Internship/Apprenticeship)
- 5. FP : Field Project
- 6. RP : Research Project
- 7. Cum. Cr : Cumulative Credit



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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Computer Science

Department of Computer Science

M.Sc. in Computer Science

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
		601COS1101 (MMC I)	Design and Analysis of Algorithm	03	45
			L <mark>ab Cours</mark> e-I	01	30
		601COS1102	Computer System Architecture	03	45
		(MMC II)	La <mark>b Course-II</mark>	01	30
	T	601COS1103 (MMCIII)	Object oriented Programming Using Python	03	45
	I		Lab Course-III	01	30
		601COS1 <mark>201</mark>	Mobile Application Development	03	45
		MEC-I <mark>(A)</mark> Or	Computer Graphics	7	
		ME <mark>C-I(B)</mark>	Lab Course-IV	01	30
		601COS1301	Research Methodology Course	04	100
Ι		(RMC)			
6.0		Tota	ll Credits	20	
		601COS2101	Advanced DBMS	03	45
		(MMC IV)	Lab Course-V C C C C C C C C C C C C C C C C C C C	01	30
		60 <mark>1COS</mark> 2102	Compiler design	03	45
		(MMCV)	Lab Course-VI	01	30
		601COS2103	Web Programming	03	45
	II	(MMC VI)	Lab Course-VII	01	30
		MEC-I (A) Or	Internet Of Things OR Information Security	03	45
		MEC-I(B)	Lab Course-VIII	01	30
	r tu	OJT-I/Field Project (FP) 601COS2401	OJT/ Field Project	04	120
		Tota	l Credits	20	
Total Credits (Semester I & II)				40	

Rajarshi Shahu Mahavidyalaya, Latur

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(Autonomous)

Faculty of Science

Programme Outcomes (POs) for M.Sc. Programme			
PO1			
PO2			
PO3			
PO4			
PO5			
PO6			
PO7			





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Programme Specific Outcomes (PSOs) for M.Sc. Computer Science			
PSO No.	Upon completion of this programme the students will be able to		
PSO 1	Transfer the knowledge gained in the different computer science fields such as Soft computing, Information Security, programming languages, advanced database concepts & big data analytics to solve real world problems.		
PSO 2	Design small executable software, useful mobile application by implementing analytical and thinking skills and deliver it in the form of report and presentations.		
PSO 3	Acquire jobs in Data Science and Machine Learning areas, Grab job opportunities in teaching / research units.		
PSO 4	Apply skills learnt in the field of Digital Imager Processing, Data mining, Machine learning, Cloud Computing, Networking and Security, Software Quality Assurance in specific areas related to health, education, banking etc.		



Semester - I



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Rajarshi Shahu Mahavidyalaya, Latur

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Department of Computer Science

Course Type: MMC I

Course Title: Design and Analysis of Algorithm

Course Code: 601COS1101

Credits: 03

Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To analyze performance of algorithms.
- LO 2. To choose the appropriate data structure and algorithm design method for a specified application.
- LO 3. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
- LO 4. To understand & implement tractable and intractable problems

Course Outcomes:

- CO 1. Learn good principles of algorithm design.
- CO 2. Learn how to analyze algorithms and estimate their complexity
- CO 3. Implement fundamental data structures.
- CO 4. Become accustomed to the description of algorithms in both functional and procedural ways.
- CO 5. Apply their theoretical knowledge in practice (Via the practical component of the course).

Unit No.	Title of Unit & Contents	Hrs.
Ι	Introduction & Overview of Data Structure	12
	A simple example of design using insertion sort, pseudo code for insertion	
	sort, time complexity. Performance Analysis – Space complexity and Time	
	complexity (posteriori testing, and priory approach), Asymptotic Notations	
	(O, Ω, Θ) , Examples on Asymptotic Notations, Polynomial vs. Exponential	
	Algorithms. Average, Best- and Worst-case complexity. Arrays, Linked	
	List, Stack, Queue, Trees & Graphs	
	Unit Outcomes: atur (Autonomous)	
	UO 1. Comprehensive overview of various sorting algorithms, their time	
	and space complexities	
	UO 2. performance analysis techniques, asymptotic notations, and data	
	structures like arrays, linked lists, stack, queue, trees, and graphs.	

II	Divide and Conquer Algorithms, Greedy Algorithms	13
	Introduction to Divide and Conquer Algorithms, Binary Search, Finding	
	the Maximum and Minimum, Merge- Sort, Quick sort, Strassen's Matrix	
	Multiplication.	
	Introduction to Greedy Algorithms – Fractional Knapsack problem,	
	Minimum cost spanning trees, Kruskal's Algorithm and Prim's Algorithm,	
	Optimal Merge Patterns, Single-Source Shortest Paths.	
	Unit Outcome:	
	UO 1. Comprehensive understanding of various divide and conquer	
	algorithms, sorting techniques, greedy algorithms, and their	
	applications in solving real-world problems.	
	UO 2. Readers will gain insights into when and how to apply these	
	algorithms effectively, making informed decisions in algorithm	
	design and optimization.	
III	Dynamic Programming, Back Tracking and Branch &Bound	10
	Algorithms	
	Dynamic Programming Definition – Multistage Graphs, All-pairs shortest	
	paths, Single-Source Shortest Paths, Optimal Binary search Trees,	
	Traveling salesman problem	
	Back tracking and Branch and Bound Algorithms Introduction: 8-Queens	
	Problem, Sum of Subsets problem using Back tracking algorithms.	
	Traveling Salesman problem.	
	Unit Outcomes:	
	UO 1. Comprehensive understanding of dynamic programming and its	
	applications to various graph problems	
	UO 2. Grasp the concepts and apply these algorithms to real-world	
	scenarios effectively.	
IV	Lower bound Theory	10
	Lower bound Theory – A brief introduction to comparison trees, Ordered	
	Searching, Sorting & Selections.	
	Lower bounds through reductions, techniques for algebraic problems.	
	Introduction to NP-hard and NP-Complete Problems	
	Unit Outcomes:	

UO 1. Understand lower bound theory and its applications in various algorithmic problems.
 UO 2. Gain insights into how comparison trees and reduction techniques help establish lower bounds.

Learning Resources:

- 1. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Publications, 1996.
- 2. The Art of Computer Programming, Volume 3 by Donald E. Knuth
- 3. Sorting and Searching, Second Edition, Pearson Education.
- 4. Data structures A Pseudocode Approach with C, by Richard F. Gilberg, Behrouz A, Forouzan.
- 5. Introduction to the Design and Analysis of Algorithms by Anany Levitin
- 6. Design & Analysis of Algorithms 4Th Edition by Gajendra Sharma
- Design And Analysis of Algorithms 2021 Edition by Michael T. Goodrich, Roberto Tamassia, Wiley





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Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course -I (Based on MMC-I)

Course Code: 601COS1104

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives:

- LO 1. Understand the principles and working of the various algorithms.
- LO 2. Learn how to implement the greedy algorithm for job sequencing in Python.
- LO 3. Learn how to implement DFS in Python to explore the nodes of a graph.
- LO 4. Understand the concept of backtracking and its application in solving the 8-queens problem.
- LO 5. Learn how to implement the backtracking algorithm in Python to find valid queen placements.
- LO 6. Gain proficiency in finding the optimal binary search tree using dynamic programming.
- LO 7. Learn how to implement Kruskal's algorithm in Python to generate the minimum cost spanning tree & gain proficiency in finding the minimum cost spanning tree using Kruskal's algorithm.

Course Outcomes:

- CO 1. Demonstrate proficiency in understanding the Quick sort algorithm and its implementation in Python. Analyze the time complexity and performance in sorting a list of integers.
- CO 2. Comprehend the Bubble Sort algorithm and its Python implementation. Identify scenarios where it might be suitable for sorting tasks.
- CO 3. Implement BFS to explore graphs in a breadth-first manner using Python. Analyze the differences between DFS and BFS and apply them appropriately based on problem requirements
- CO 4. Understand Strassen's matrix multiplication algorithm and its implementation in Python. Compare the efficiency of Strassen's algorithm with traditional matrix multiplication
- CO 5. Understand Kruskal's algorithm for finding minimum cost spanning trees in graphs. Implement Kruskal's algorithm in Python to generate minimum cost spanning trees

Practical No.	Unit

1	Program in Python to implement Quick sort algorithm for sorting a list of integers
	in ascending order
2	Program in Python to implement Merge sort algorithm for sorting a list of integers
	in ascending order.
3	Program in Python to implement Bubble Sort algorithm
4	Program in Python to implement sorting of numbers in ascending and Descending
	order
5	Program in Python to implement greedy algorithm for job sequencing with deadlines
6	Program in Python to implement the DFS algorithm for a graph
7	Program in Python to implement the BFA algorithm for a graph.
8	Program in Python to implement Binary Search with Divide and conquer approach.
9	Program in Python to multiply matrix using Strassen's matrix multiplication.
10	Program in Python to implement backtracking algorithm for the 8-queens problem.
11	Program in Python to implement the backtracking algorithm for the sum of subsets
	problem.
12	Program in Python to implements Prim's algorithm to generate minimum cost
	spanning tree.
13	Program in Python to Kruskal's algorithm to generate minimum cost spanning tree
14	Program in Python to implement Dynamic Programming algorithm for the 0/1
	Knapsack problem.
15	Program in Python to implement Dynamic Programming algorithm for the Optimal
-	Binary Search Tree Problem

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Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)



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(Autonomous)

Department of Computer Science

Course Type: MMC -II Course Title: Computer System Architecture Course Code: 601COS1102 Credits: 03 Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives

- LO 1. To understand the structure, function of computer systems
- LO 2. To acquire the basic knowledge of microprocessor and application to understand electronics circuits
- LO 3. To acquire the basic knowledge of microprocessor and application to understand electronics circuits.
- LO 4. To identify the elements of instruction sets and their impact on processor Design
- LO 5. To perform the analysis and design of various combinational and sequential logic circuits

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Explain the basics of architectural issues of a digital computer and classify and compute the performance of machines, Machine Instructions.
- CO 2. Analyze the performance of various classes of Memories, build large memories using small memories for better performance and analyze arithmetic for ALU implementation.
- CO 3. Understand and examine the structure of various microprocessor and its application in real world.
- CO 4. Understand the basics of hardwired and micro-programmed control of the CPU.

CO 5. Develop assembly language programs using various programming tools.

Unit No.	Title of Unit & Contents	Hrs.
Ι	Design Methodology and Processor Design	12
	Introduction to Design Methodology, The Gate Level- Combinational	
	circuits, Sequential circuits, The Register level - Register level	
	components, design methods The Processor level - components, design	
	techniques Queuing models. Introduction to Processor Design, Instruction	
	sets, Fixed Point Arithmetic, ALU Design.	
	Unit Outcome:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. Learners will develop a solid foundation in digital circuit and	
	processor design methodologies.	
	UO 2. Additionally, learners will be capable of making informed	
	decisions in selecting appropriate design techniques and	
	components to optimize the performance and efficiency of digital	
	systems and processors.	
II	Control Design and Memory Organization	13
	General model of control unit, Hardwired control unit, Micro-	
	programmed control unit, Micro-programmed Computers.	
	Memory Technology - Memory Device Characteristics, Random Access	
	Memories, Serial Access Mem <mark>ories. Virtual Memory</mark> - Memory	
	Hierarchies, Main Memory Allocation, Segments, Pages & Files. High	
	Speed Memories- Interleaved memories, Caches and Associative	
	memories.	
	Unit Outcome:	
	UO 1. Learners will gain a comprehensive understanding of the control	
	unit, memory technology, virtual memory, and high-speed	
	memory systems in computer architecture.	
	UO 2. Additionally, learners will be able to compare and evaluate	
	different memory technologies and control unit designs to select	
	appropriate components for specific computing requirements.	
III	Introduction to Microprocessor 8085	11
	Introduction to Microprocessor 8085, Instruction Cycle, Timing Diagram,	
	RISC and CICS processors. Instruction set- Instruction and data formats,	
	addressing modes, Intel 8085 Instructions, Assembly Language	
	Programming	
	Unit Outcomes:	
	UO 1. Learners will develop a strong foundation in microprocessor	
	architecture and programming.	
	UO 2. Additionally, learners will be able to compare different	
	microprocessor architectures and understand the trade-offs	
	between RISC and CISC designs.	
IV	Introduction to Other Microprocessors & Peripheral Devices	09
	Features of Intel 8086, Architecture of Intel 8086, Functional Pin	
	Diagram of Intel 8086, Addressing Modes of Intel 8086, Instruction Set	

Unit No.	Title of Unit & Contents	Hrs.
	of Intel 8086, Assembly Language Programming of 8086, Introduction to	
	80386 Microprocessor, Features of 80836, Architecture of 80836.	
	Address space partitioning, memory & I/O Interfacing, Interfacing Devices	
	& I/O Devices.	
	Unit Outcome:	
	UO 1. Learners will develop a comprehensive understanding of the Intel	
	8086 and 80386 microprocessors, including their architecture,	
	instruction set, and memory interfacing.	
	UO 2. Additionally, learners will understand the key features and	
	advantages of the Intel 8086 and 80386 microprocessors, making	
	informed decisions in selecting the appropriate processor for	
	specific computing requirements.	

Learning Resources:

- 1. Computer Architecture & Organization -John. P. Hayes (MGH II Edition)
- Fundamentals of Microprocessors & Microcomputers Badri Ram (Dhanpat Rai Publications (P) Ltd. Fourth Revised & Enlarged Edition)

ाव छत्रपती

ण संस्था

- 3. Computer System Architecture by Mano M Morris
- 4. Computer System Architecture & Organization by Sps Saini
- 5. Computer Organization & Architecture by Dr. Lalit K. Arora & Dr. Anjali Arora



Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



Learning Objectives

- LO 1. To explore derived gates like NAND, NOR, and XNOR and their logical behavior.
- LO 2. To create and validate truth table for a multiplexer with multiple inputs and a single output through logic simulations or practical experimentation.
- LO 3. To acquire the basic knowledge of microprocessor and application to understand electronics circuits.
- LO 4. To Understand the concept of a demultiplexer and its function in data distribution. Create a truth table for a demultiplexer with a single input and multiple outputs.
- LO 5. To Gain proficiency in programming in Assembly Language for the 8086 Microprocessor & implement algorithms for addition and subtraction of 8-bit and 16bit numbers in Assembly Language.
- LO 6. To Understand the concept of a lookup table and its usage in computing square values & implement an ALP that utilizes a lookup table to find the square of a number.

Course Outcomes:

- CO 1. Learners will develop practical skills in digital logic, microprocessor programming, and problem-solving using Assembly Language for the 8086 microprocessors.
- CO 2. Additionally, learners will gain insights into the logical behavior of digital components and their applications in computer arithmetic and data manipulation.
- CO 3. Implement algorithms to find the smallest and largest numbers in an array using the 8086 microprocessors.
- CO 4. Understand the working principles of multiplexers and demultiplexers. Create and verify truth tables for multiplexer and demultiplexer operations.

Practical No.	Unit
1	To perform and verify the truth tables of basic gates and derived gates
2	To perform and verify the truth table of half adder and half subtractor

3	To perform and verify the truth table of multiplexer
4	To perform and verify the truth table of demultiplexer
5	To perform and verify the truth table of encoder
6	To perform and verify the truth table of decoder
7	Write an ALP for addition & subtraction of two 8-bit ,16-bit numbers
8	Write an ALP for multiplication & division of two 8-bit ,16-bit numbers
9	Write an ALP to find smallest & largest number from array for 8086
10	Write an ALP to find square from lookup table
11	Write an ALP to find one's complement & two's complement of 8-bit number &
	16- bit number.
12	Write an ALP to shift an 8-bit number left by one bit.
13	Write an ALP to shift an 8-bit number left by two bits
14	Write an ALP to find square root of a number
15	Write an ALP to find multibyte addition.







Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MMC-III

Course Title: Object Oriented Programming Using Python

Course Code: 601COS1103

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To understand how to write program in Python
- LO 2. To learn how to use lists, tuples, and dictionaries in Python programs
- LO 3. To learn how to build and package Python modules for reusability
- LO 4. To learn how to design object-oriented programs with Python classes.
- LO 5. To learn how to read and write files in Python
- LO 6. To implement inheritance, exception handling & RegEx in Python
- LO 7. To learn create GUI application using Python

Course Outcomes:

- CO 1. Implement programming skills in core Python.
- CO 2. Apply Object Oriented Skills in Python.
- CO 3. Design & develop application with Graphical User Interfaces in Python
- CO 4. Use the ability to handle exceptions, write regular expression & database applications in Python

Unit No.	Title of Unit & Contents	Hrs.
Ι	Introduction& Working with Python	10
	Installation and Working with Python, Understanding Python variables,	
	Python Shell, Python IDLE, Different Python IDEs (VS-Code, Py-charm,	
	Sub-lime text etc). Python Data types, Python Operators, Python blocks,	
	Control & looping Statements	
	Built in methods/functions on: String, List, Tuples, Dictionary	
	Functions, Modules in Python, organizing Python projects into modules,	
	importing own module as well as external modules, Understanding	
	Packages, Powerful Lambda function in Python,	

Unit No.	Title of Unit & Contents	Hrs.
	Modules: The from import statement, A module's name, Making your	
	own modules, The dir function, packages. Brief Tour of the Standard	
	Library: math, date time, turtle, NumPy, SciPy, Panda.	
	Unit Outcome:	
	UO 1. Learners will develop a strong foundation in Python.	
	UO 2. Additionally, learners will learn how to organize Python projects	
	into modules and packages for better code organization and	
	reusability.	
II	OOPs Concept, & File Handling in Python	10
	Concept of class-object/instance, Constructor & its types, Destructor in	
	Python,	
	Types of Variables: Instance Variable, Class Variables, Static Variables,	
	Types of Methods: Instance Method, Class Method, Static Method,	
	Passing Members of One class to Another Class, inner class. Inheritance:	
	Single, Multiple, Multilevel, Hierarchical, Hybrid, Python Constructor in	
	Inheritance, Constructor/ Method Overriding, Method Overloading,	
	Operator Overloading	
	Abstract Classes & Interfaces: Abstract Method & Class, Interfaces in	
	Python, Abstract Class Vs Interface. File Handling in Python: Types of	
	Files, Reading, Writing Files using Python, With Statement. Understanding	
	read functions, read (), readline() and readlines(), Understanding write	
	functions, write() and writelines(), Manipulating file pointer using seek,	
	Programming using file operations.	
	UO 1. Understand the OOPs concepts Using Python.	
	UO 2. Explain the file handling using Python	10
111	Graphical User Interface in Python	10
	GUI in Python, The Root Window, Fonts and Colors, Working with	
	in the Frame Lokal Widgets Manage Widgets Tract Widgets	
	Widget CheckButton Widget PediePutton Widget Entry Widget	
	Spinboy Widget ListPoy widget Mony Widget Crosting Tables	
	Unit Outcomes:	
	Unit Outcomes:	
	001. Implementing GOI programming in Python.	

Unit No.	Title of Unit & Contents	Hrs.
	UO 2. Writing & executing program using Frames, Widgets, Buttons,	
	Label, Message widgets radio button etc	
IV	Python Regular Expression, Exception Handling & Database	15
	Interaction	
	Powerful pattern matching and searching, Power of pattern searching using	
	regex in Python, Real time parsing of networking or system data using	
	regex, Password, email, URL validation using regular expression, Pattern	
	finding programs using regular expression, Exception Handling:	
	Avoiding code break using exception handling, Safe guarding file	
	operation using exception handling, Handling and helping developer with	
	error code, Programming using Exception handling. Database	
	Connection: SQL Database connection using Python, Creating and	
	searching tables, Reading and storing config information on database,	
	Programming using database connections.	
	Unit Outcome:	
	UO 1. Using pattern matching & searching using Regex.	
	UO 2. Connecting MySQL database with Python to access table data	

Learning Resources:

- 1. Core Python Programming- Dr. R Nageswara Rao (Dreamtech Press)
- 2. Learning Python- Mark Lutz, O'Reilly, 5th edition.
- 3. Starting Out with Python plus My Programming Lab- Tony Gaddis, Pearson
- 4. Python: The Complete Reference by Martin C. Brown
- 5. Python Programming: Using Problem Solving Approach by Reema Thareja
- 6. Programming In Python 3 A Complete Introduction to The Python Language by Mark Summerfield
- 7. https://www.w3schools.com/python
- 8. <u>https://www.python.org/community/</u>

Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course -III (Based on MMC-III)

Course Code: 601COS1106

Credits: 03

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To understand how to write program in Python
- LO 2. To learn how to use lists, tuples, and dictionaries in Python programs
- LO 3. To learn how to build and package Python modules for reusability
- LO 4. To learn how to design object-oriented programs with Python classes.
- LO 5. To learn how to read and write files in Python
- LO 6. To implement inheritance, exception handling & RegEx in Python
- LO 7. To learn create GUI application using Python

Course Outcomes:

- CO 1. Implement programming skills in core Python.
- CO 2. Apply Object Oriented Skills in Python.
- CO 3. Design & develop application with Graphical User Interfaces in Python
- CO 4. Use the ability to handle exceptions, write regular expression & database applications in Python

Practical No.	Unit
1	Study of Datatypes in Python
2	Study of Control /Looping statements
3	Study of Functions in Python (Variables-Local Global, Type of Arguments)
4	Study of Modules & Packages
5	Study of Lambda Function
6	Study of List & Dictionary Manipulation (List, Dictionary Methods)
7	Study of Constructor, Destructor in Python (Simple Class & Object, Constructor &
	its types, Destructor)
8	Study of types of variables & methods in class
9	Study of Inheritance & its types

10	Study of Constructor & Method Overriding
11	Study of Method & Operator Overloading
12	Study of Database Connectivity
	Testing MySQL Database connection & Creating Cursor
	Create Database, Tables & Insert, Read records from it
	Update, Delete Records from MySQL Database using Python
	Parameterized Query
13	Any Five Program To implement GUI using tkinter





Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MEC I (A)

Course Title: Mobile Application Development

Course Code: 601COS1201

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To learn Kotlin Programming Language
- LO 2. To use Kotlin Programming Language for the development of Android Applications
- LO 3. To Learn Kuddo & Nutrilicious Tools for development of Applications
- LO 4. Use of DSLs for complex Application Development

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Describe the basic concepts and principles to develop the mobile application.
- CO 2. Develop the Android Applications using Kotlin Programming Language.
- CO 3. Use Kuddo & Nutrlicious tool for the development of Android App

CO 4. Develop the complex Application Development

Unit No.	Title of Unit & Contents	Hrs.
Ι	Learning & Diving into Kotlin	11
	Introducing Kotlin, Diving into Kotlin- Variables & datatypes, Conditional	
	Code, Loops & Ranges, Functions, Null Safety m Equality Checks,	
	Exception Handling, Purpose of Functional programming, Functions,	
	Working with Collections, Scoping Functions, Lazy Sequences.	
	Unit Outcome:	
	 UO 1. Understand features and benefits of Kotlin as a modern programming language, Declare and initialize different types of variables and constants in Kotlin, use data types, operators, and expressions to manipulate data in Kotlin UO 2. Apply conditional statements and loops to control the flow of execution in Kotlin, Define and invoke functions with parameters and return values in Kotlin, handle null values and exceptions using Kotlin's null safety and try-catch-finally features. Understand the 	
	purpose and principles of functional programming in Kotlin.	

Unit No.	Title of Unit & Contents	Hrs.	
II	Object Orientation in Kotlin & Interoperability with JAVA	11	
	Classes & Object Instantiation, Properties, Method, Primary & Secondary		
	Constructors, Inheritance & Overriding rules, Type Checking & Casting,		
	Visibilities,		
	Data classes, Enumerations, Objects & Companions, Generics.		
	Interoperability with JAVA – Using JAVA Code from Kotlin,		
	Using Kotlin Code from JAVA, Best Practices for Interoperability.		
	Unit Outcome:		
	UO 1. Understand the conce <mark>pt of cl</mark> asses and objects in Kotlin and how		
	to create and use them.		
	UO 2. Implement inheritance and polymorphism in Kotlin and override		
	the methods and prope <mark>rties of a superclass.</mark>		
III	Android App Development with Kotlin: Kudoo App, Nutrilicious	13	
	Setting up Kotlin for Android, using Kotlin in Android Studio,		
	Autogenerated Gradle Configuration, adapting your Gradle Configuration		
	using Annotation Processors, Converting java code to Kotlin. Kuddo, a To		
	Do List App: Creating the project, Adding the Recycler View, adding a		
	Room Data Base, using a View Model, Integrating Livedata, Adding New		
	To-Do Items, Enabling Checking off To Do items. Nutrilicious: Setting up		
	the Project, Adding RecyclerView to the home screen, Fetching Data from		
	the USDA nutrition API, Mapping JSON Data to Domain Classes,		
	Introducing ViewModel for Search, letting users search Foods, Store user's		
	favorite foods in room database,		
	Unit Outcomes:		
	UO 1. Set up and use Kotlin for Android development in Android Studio		
	and understand the Gradle configuration.		
	UO 2. Create a To Do List app using Kotlin, RecyclerView, Room,		
	ViewModel, and LiveData,		
IV	Kotlin DSLs and Migrating to Kotlin	10	
	Introducing DSLs, creating a DSL in Kotlin, DSL for Android Layouts		
	with Anko, DSL for Gradle Build Scripts		
	On Software Migrations, Leading the Change, Partial or Full Migration,		
	where to start, Tool Support.		
	Unit Outcome:		

Unit No.		Title of Unit & Contents	Hrs.
	UO 1.	Create and use DSLs in Kotlin using features such as infix notation,	
		extension functions, lambdas with receivers, and type-safe	
		builders.	
	UO 2.	Use Gradle, a build automation tool that supports Kotlin as a DSL,	
		to configure and manage projects using Kotlin	

Learning Resources:

- 1. Android Application Development (With Kitkat Support), Black Book by Pradeep Kothari
- 2. Learn To Program With Kotlin From The Basics To Projects With Text And Image Processing by Lavers
- 3. Programming Android with Kotlin: Achieving Structured Concurrency with Coroutines by Pierre-Olivier Laurence
- 4. Android Application Development with Kotlin Paperback by Hardik Trived
- 5. Android Programming with Kotlin for Beginners: Build Android apps starting from zero programming experience with the new Kotlin programming language by John Horton
- 6. https://www.w3schools.com/KOTLIN/index.php
- 7. https://kotlinlang.org/community/



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MEC II (B) Course Title: Computer Graphics Course Code: 601COS1202 Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To learn the fundamentals of 3D graphics pipeline, 3D transformation, camera manipulation, lighting, texture mapping, frame buffer operations, etc.
- LO 2. To understand Graphics Processing Unit, shaders and shader programming.
- LO 3. To get familiar with fundamentals of 3D modeling and animation.

Course Outcomes:

- CO 1. Comprehend the various computer graphics hardware and display technologies
- CO 2. Implement the 2D and 3D viewing techniques.
- CO 3. Utilize various 2D and 3D objects transformation techniques
- CO 4. Implement various visible surface detection methods, such as back-face detection, depthbuffer method.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Computer Graphics	10
	A survey of computer graphics: Computer Aided Design, Presentation	
	graphics, Computer Art, Entertainment, Education and training,	
	Visualization, Image processing, Graphical User Interfaces. Overview of	
	graphics Systems: Video display devices, Raster Scan Displays, Random	
	Scan Displays, Input devices, Hard-copy devices, Graphics software.	
	Output Primitives: Points and Lines, Line drawing Algorithms (DDA and	
	Bradenham's Line algorithm), Mid-point circle algorithm, Ellipse	
	generating algorithms, Filled-Area Primitives. Attributes of Output	
	Primitives: Line Attributes, Curve Attributes, Color and Grayscale Levels,	
	Area-Fill Attributes and Character Attributes, Bundled attributes and anti-	
	aliasing.	
	Unit Outcome:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. Describe the applications and benefits of computer graphics in	
	various domains.	
	UO 2. Explain the components and functions of a graphics system, such	
	as video display devices, raster scan displays, random scan	
	displays, input devices, hard-copy devices, graphics software, etc.	
II	Transformation and Clipping	15
	Two-dimensional geometric Transformation: Basic Transformation	
	(Translation, Rotation, Scaling), Matrix representation and Homogenous	
	Coordination, Composite Transformation, Reflection Shear,	
	Transformation between coordinate systems, two-dimensional viewing:	
	The Viewing Pipeline, viewing coordinate reference frame, window to	
	view port coordinate transformation,	
	Line Clipping: (Cohen-Sutherland & Liang-Barsky algorithm) and	
	Polygon Clipping (Sutherland-Hodgeman Algorithm).	
	Unit Outcome:	
	UO 1. Apply different geometric transformations, such as translation,	
	rotation, scaling, reflection, and shear, to manipulate two-	
	dimensional objects and shapes.	
	UO 2. Transform between different coordinate systems, such as world,	
	device, and normalized coordinates, using appropriate	
	transformation matrices.	
III	Three-Dimensional Graphics	10
	Three-dimensional object Representation: Polygon Surfaces, Quadratic	
	Surfaces, Spline Representation, Bezier Curves and Surfaces, B-Spline	
	Curves and Surfaces, Fractal Geometry Methods: Fractal Generation	
	Procedures, Classification of Fractals, Fractal Dimension, Geometric	
	Construction of Deterministic Self Similar Fractals, Self-Squaring fractals.	
	Three Dimensional Geometric and Modeling Transformations:	
	Translation, Rotation, Scaling, Reflections, Shears, Composite	
	Transformations, Modeling and coordinate Transformations.	
	Three-dimensional Viewing: Viewing Pipeline, Viewing Coordinates,	
	Projections (Parallel and Perspective) Clipping.	
	Unit Outcomes:	
	UO 1. Represent and manipulate three-dimensional objects using various	
	methods.	

Unit No.	Title of Unit & Contents	Hrs.
	UO 2. Apply different geometric and modeling transformations, such as	
	translation, rotation, scaling, reflection, shear, composite	
	transformations, modeling and coordinate transformations, etc.	
IV	Illumination and Color Models	10
	Visible Surface Detection Methods: Classification of Visible-Surface	
	Detection Algorithms, Back-Face Detection, Depth-Buffer Method, A-	
	Buffer Method, Scan line and Depth Sorting,	
	Illumination Models and Surface-Rendering Methods: Basic	
	Illumination Models, Displaying Light Intensities, Halftone Patterns and	
	Dithering Techniques. Polygon- Rendering Methods (Ground Shading,	
	Phong Shading). Light sources – basic illumination models-half tone	
	patterns and dithering techniques;	
	Properties of light–Standard primaries and chromaticity diagram;	
	Intuitive colour concepts-RGB colour model-YIQ colour model-CMY	
	colour model–HSV colour model–HLS colour model;	
	Colour selection.	
	Unit Outcome:	
	UO 1. Implement various visible surface detection methods, such as	
	back-face detection, depth-buffer method, A-buffer method, scan	
	line and depth sorting, etc., and classify them based on their	
	advantages and disadvantages.	
	UO 2. Apply different illumination models and surface-rendering	
	methods, such as basic illumination models, displaying light	
	intensities, halftone patterns and dithering techniques, polygon-	
	rendering methods etc., to create realistic and smooth shading	
	effects on the surfaces.	

Learning Resources:

- 1. Computer Graphics (Principles and Practice) by Foley, vanDam, Feiner and Hughes, Addison Wesley (Indian Edition).
- 2. Computer Graphics by D Hearn and PM Baker, Prentice Hall of India (Indian Edition).
- 3. Procedural Elements for Computer Graphics by D F Rogers, McGrawHill (Indian Edition).
- 4. Interactive Computer Graphics, A top-down approach with OpenGL by Edward Angele, Addison Wesley.



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course (A)

Course Title: Lab Course -III (Based on MEC I)

Course Code: 601COS1203

Credits: 03

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To learn Kotlin Programming Language
- LO 2. To use Kotlin Programming Language for the development of Android Applications
- LO 3. To Learn Kuddo & Nutrilicious Tools for development of Applications
- LO 4. Use of DSLs for complex Application Development

Course Outcomes:

- CO 1. Describe the basic concepts and principles to develop the mobile application.
- CO 2. Develop the Android Applications using Kotlin Programming Language.
- CO 3. Use Kuddo & Nutrlicious tool for the development of Android App
- CO 4. Develop the complex Application Development

Practical No.	Unit	
1	Implement the program of mutable and read only variables	
2	Implement the program of Conditional statement in Kotlin and Construct	
	Looping statements in Kotlin (While & For Loop)	
3	Declaring and calling a simple and extension function in Kotlin	
4	Implement the Nullable and Non nullable types and accessing members of	
	nullable variables in Kotlin	
5	Implement exception handling using try, catch, finally block	
6	Implement the program of Inheritance and Data class in Kotlin	
7	Implement the program of classes and objects in Kotlin and also implement the	
	program of constructers in Kotlin (Primary and Secondary)	
8	Create a Kuddo App – To do List in Android Studio	
9	Create a Nutrilicious App – in Android Studio	
10	Create Anko Layouts over hard Layouts using Kotlin in Android Studio	
11	Create Weather forecasting application using Kotlin in Android Studio	

12	Create a paint and calculator application using Kotlin in android studio
13	Create Quiz Application using Kotlin in Android Studio
14	Build a planet app using Kotlin in Android Studio
15	Create a chatting Application using Kotlin in Android Studio



Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course (B)

Course Title: Lab Course -IV (Based on MEC II)

Course Code: 601COS1203

Credits: 03

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To learn the fundamentals of 3D graphics pipeline, 3D transformation, camera manipulation, lighting, texture mapping, frame buffer operations, etc.
- LO 2. To recognize Graphics Processing Unit, shaders and shader programming.
- LO 3. To get familiar with fundamentals of 3D modeling and animation.

Course Outcomes:

- CO 1. Comprehend the various computer graphics hardware and display technologies
- CO 2. Implement the 2D and 3D viewing techniques.
- CO 3. Utilize various 2D and 3D objects transformation techniques.
- CO 4. Implement various visible surface detection methods, such as back-face detection, depth-buffer method.

Practical No.	Unit
1	Program to demonstrate line(), circle(), rectangle(), ellipse().
2	Program to demonstrate setlinestyle()and setfillstyle().
3	Program to draw the emoji faces.
4	Program to draw a car.
5	Program to implement DDA algorithm.
6	Program to implement Bresenham's integer line drawing algorithm.
7	Program to implement Bresenham's General line drawing algorithm.
8	Program to implement Translation Transformation
9	Program to implement Scaling Transformation.
10	Program to implement Rotation Transformation

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Rajarshi S	Shahu Mahavidyalaya, Latu	r
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रवापता - १९७० Depar	tment of Computer Science	
Course Type: RMC		
Course Title: Research Methodology		
Course Code: 601COS1301		
Credits: 04	Max. Marks: 100	Lectures: 60 Hrs.

Learning Objectives:

LO1. To enable to student to understand and work methods and concepts related Research.

LO2. To enable the student to develop research proposal and to work with research problem.

LO3. To develop broad comprehension of research area.

Course Outcomes:

After completion of course, the student will be able to-

CO1. Examine the basic aspects of Research methods

CO2. Apply and integrate the basic concepts Collection and analysis of data.

CO3. Know the of report writing and evaluation methods.

CO4. Examine the plagiarism by using various apps.

Unit No.	Title of Unit & Contents	Hrs.
Ι	Introduction and Methods of Research	15
	1. Meaning of Research, Objectives of Research, Types of Research,	
	2. Research Approaches, Significance of Research, Research Methods Versus	
	Methodology, Research and Scientific Methods,	
	3. Research Processes, Criteria for Good Research	
	4. Research Problem, Selecting the Problem, Necessity of Defining the	
	Problem, Techniques Involved in Defining a Problem	
	Unit Outcome:	
	UO1. Examine the basic aspects of Research methods	
II	Research Design and Sampling	15
	1. Meaning and Need for Research Design, Features of A Good Design.	
	2. Important Concepts Relating to Research Design: Dependent and	
	Independent Variables, Extraneous Variables, Control, Research	
	Hypothesis, Experimental and Non-Experimental Hypothesis -Testing	
	Research, Experimental and Control Group	

	3. Different Research Designs: Research Design in Case of Exploratory	
	Research Studies, Research Design in Case of Hypothesis- Testing	
	Research Studies, Basic Principles of Experimental Designs, Important	
	Experimental Designs	
	4. Sampling Design, Steps in Sample Design, Criteria of Selecting a Sampling	
	Procedure, Characteristics of A Good Sample Design, Different Types of	
	Sample Design	
	Unit Outcome:	
	UO1. Apply and integrate the basic concepts Collection and analysis of data.	
III	Data Collection and Data Processing	15
	1. Measurements in Research, Measurement Scales, Sources of Errors in	
	Measurement.	
	2. Collection of Primary Data: Observation Method, Interview Method,	
	Through Questionnaires, Through Schedules, Difference Between	
	Questionnaire and Schedule	
	3. Collection of Sec <mark>ondary Data, Selection of Approp</mark> riate Methods for Data	
	Collection, Case Study Method	
	4. Data Processing, Processing Operations: Editing, Coding, Classification,	
	Tabulation, Graphical Representation, Types of Analysis, Statistical Tools	
	and Techniques Of Data Analysis-Measures Of Central Tendency,	
	Dispersion.	
	Unit Outcome:	
	UO1. Know the of report writing and evaluation methods	
IV	Report Writing and Evaluations	15
	1. Principles of Report Writing and Guide Lines According to Style Manuals.	
	2. Writing and Presentation of Preliminary, Main Body and Reference Section	
	of Report.	
	3. Evaluation of Research Report.	
	4. Methods to Search Required Information Effectively, Reference	
	Management Software Like Zotero/ Mendeley, Software for Paper	
	Formatting Like Latex/ MS Office.	
	5. Software for Detection of Plagiarism.	
	Unit Outcome:	

Learning Recourses: -

- 1. Bajpai S. R. (1975) Methods of Social Survey and Research, Kitabghar, Kanpur.
- 2. Hans Raj (1988) Theory and Practice in Social Research, Surjeet Publication, Kolhapur.
- 3. Krishnaswami O. R. (1988) Methodology of Research in Social Science, Himalaya Pub. House.
- 4. Sadhu, Singh, Research Methodology in Social Science Bhandarkar, Research Methodology
- 5. Kothari, C. R. (2005) Quantitative Technique, New Delhi, Vikas Publication House.
- 6. Gautam, N. C. (2004) Development of Research tools, New Delhi, Shree Publishers.
- 7. Gupta, Santosh (2005) Research Methodology and Statistical Techniques, Deep and Deep Publications.
- 8. Chandera A. and Sexena T. P. (2000) Style Manual, New Delhi, Metropolitan Book Comp. Ltd.
- 9. Shukla, J. J. (1999) Theories of Knowledge, Ahmadabad, Karnavati Publication.
- 10. Bhattacharya, D. K. (2004) Research Methodology, New Delhi, Excel Books.
- 11. Brymann, Alan and Carmer, D. (1995) Qualitative data analysis for social scientist, New York, Routledge Publication.
- 12. Best J. W. and Khan J. V. (2005) Research in Education New Delhi, Prentice Hall India.



Semester - II

शिव छत्रपती शिक्षण संस्था लातूर

।। आरोह तमसो ज्योतिः।।

Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MMC-IV Course Title: Advanced DBMS Course Code: 601COS2101 Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To impart the concepts of Centralized, Parallel and Distributed Databases.
- LO 2. To familiarize with Query transformation and optimization ideas
- LO 3. To educate on distributed database transaction management principles
- LO 4. To discuss the concurrency control concepts in distributed systems
- LO 5. To familiarize the basics concepts of reliability and inconsistency problems of distributed database systems

Course Outcomes:

- CO 1. Solve transforming a global query into local query using optimizing techniques
- CO 2. Summarize the distributed transaction management principles.
- CO 3. Explain various distributed concurrency control techniques
- CO 4. Evaluate the Non-blocking Commitment Protocols

Unit No.	Title of Unit & Contents	Hrs.
Ι	Relational Databases	15
	Structure of Relational Database, Database Schema, Keys, Schema	
	Diagrams, Relational Operations, Relational Algebra, Tuple Relational	
	Calculus, Domain Relational Calculus. Overview of the design Process,	
	Entity Relationship Model, Intraradical states, Removing Redundant	
	attri <mark>butes</mark> in entity sets, E-R Diagram, Entity Relationship Design Issues	
	Intermediate and Advanced SQL	
	Unit Outcome: Unit Olidi Unit and Unit and you	
	UO 1. Understand the relational database concepts - Tuple Relational	
	Calculus, Domain Relational Calculus	
	UO 2. Study of the components used Entity relational model.	
II	Query Processing and Optimization	15

Unit No.	Title of Unit & Contents	Hrs.
	Measures of Query Cost, Selection Operation, Sorting, Join Operations,	
	Other Operations	
	Transformation of Relational Expressions, Estimating statistics of	
	expression results, choice of evaluation plan, Materialized views,	
	advanced topics in Query optimization	
	Unit Outcome:	
	UO 1. Discussing Measures of Query Cost, Selection Operation, Sorting,	
	Join Operations, Other Operations	
	UO 2. Understanding Query Evaluation & query optimization.	
III	Transaction Management and Concurrency Control	15
	Transaction concept, simple transaction model, Storage Structure,	
	Transaction Atomicity and durability, Transaction isolation,	
	Serializability, Transaction isolation and atomicity, Transaction isolation	
	level and implementation, Transactions as SQL Statements Lock based	
	Protocol, Deadlock handling, Time stamp-based protocol, Validation	
	based protocol	
	Unit Outcomes:	
	UO 1. Implementing database transactions.	
	UO 2. Using various lock-based protocol, deadlock handling protocols.	
IV	System Architecture	15
	Data base system architecture-centralized and client server architecture,	
	Server system architecture, Parallel System and distributed systems	
	I/O Parallelism, interquery Parallelism, Intraquery Parallelism,	
	Intraoperation Parallelism, Interoperation Parallelism	
	Homogeneous and Heterogeneous databases, Distributed data storage,	
	Distributed transactions, commit protocols, Concurrency control and	
	distributed databases, Distributed query processing	
	Unit Outcome:	
	UO 1. Discuss various types of databases.	
	UO 2. Understand Centralized, distributed & parallel databases & Query	
	processing techniques.	

Learning Resources:

- 1. Database system Concepts, Abrahan Silberschatz, Henry F. Korth, S. Sudarshan, Mc Graw Hills Publication
- 2. An Introduction to Database Systems, Bipin C. Desai, Galgotia Publications

- 3. Advanced Database Management Systems (PB) by Yogesh Sharma
- 4. Fundamentals of Database System by Elmasri Ramez
- 5. Understanding MySQL Internals: Discovering and Improving a Great Database by Sasha Pachev
- 6. Learning MySQL: Get a Handle on Your Data by Vinicius M. Grippa
- 7. https://www.w3schools.com/MySQL/default.asp



Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course -V (Based on MMC IV)

Course Code: 601COS2104

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To impart the concepts of Centralized, Parallel and Distributed Databases.
- LO 2. To familiarize with Query transformation and optimization ideas
- LO 3. To educate on distributed database transaction management principles
- LO 4. To discuss the concurrency control concepts in distributed systems
- LO 5. To familiarize the basics concepts of reliability and inconsistency problems of distributed database systems

Course Outcomes:

- CO 1. Solve transforming a global query into local query using optimizing techniques
- CO 2. Summarize the distributed transaction management principles.
- CO 3. Explain various distributed concurrency control techniques
- CO 4. Evaluate the Non-blocking Commitment Protocols

Practical No.	Unit
1	Introduction SQL-SQL*Plus
	a. My SQL Installation
	b. Types of SQL Commands
	c. Various Data Types
	d. Database & Tables Creation
	e. Key Constrains-Normalization
	f. Update, Delete, Alter, Rename
1	g. where, In, not in, like, not like, distinct, is null, is not null
2	Working with sorting, grouping & Aggregate functions
	a. Order by Clause
	b. Group by Clause, Having Clause
	c. Single Row Functions: character, number, date etc.
	d. Multi-row Functions

3	Working with Table Join
	a. Cartesian Product
	b. ANSI Style
	c. Using Clause
	d. Theta Join
	e. Outer Join- Left, Right, Full Outer Join
	f. Self-join
	g. Set Operators – Union, Intersect, Minus
4	Working with Views in Oracle 10g
5	Programs on PL/SQL Block in ORACLE 10g
	a. Simple PL/SQL Block
	b. Looping in PL/SQ <mark>L Block</mark>
	c. Exception Handling in PL/SQL
6	Programs on Trigger, Procedure, Cursor in Oracle 10g
	a. Row Triggers and Statement Triggers
	b. Before and After Triggers
	c. Instead Of Triggers
	d. Implici <mark>t cursors</mark>
	e. Explicit cursors
	f. Procedures –In, Out, In Out
7	Working with Database Transactions in MySQL/ORACLE/ PostgreSQL
	a. Set transaction
	b. Begin transaction
	c. End transaction
	d. Commit, Rollback, Savepoint
8	Program on Distributed Transactions in PostgreSQL
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Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MMC-V Course Title: Compiler Design Course Code: 601COS2102 Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To get working knowledge of the MMC phases of compilation, like lexical analysis, parsing, semantic analysis and code generation.
- LO 2. To use the formal attributed grammars for specifying the syntax and semantics of programming languages
- LO 3. To understand the structure of a compiler, and how the source and target languages influence various choices in the design
- LO 4. To learn and use tools for compiler construction.

Course Outcomes:

- CO 1. Solve problem of parsing and compiling.
- CO 2. Design and develop simple compiler.
- CO 3. Use compiler tools in basic, concurrent, distributed and embedded environments.
- CO 4. Generate and optimize the code.

Unit No.	Title of Unit & Contents	Hrs.
Ι	Introduction to Compilers and Lexical Analysis	18
	Compilers and Translators, The Structure of Compiler, Lexical Analysis,	
	Syntax Analysis, Intermediate Code generation, Optimization, Code	
	Generation, Bookkeeping, Error Handling, Compiler writing Tools,	
	Programming Language Basics: Definition, The lexical and Syntactic	
	structure of a language, data elements, data structures, operators,	
	assignment, statements, program units, data environments, parameter	
	transmission, storage management. Lexical Analysis: Role of Lexical	
	Analyzer, A simple approach to the design of Lexical Analyzers, Regular	
	Expressions, Finite Automata, from regular expressions to finite automata,	
	Minimizing the number of states of a DFA, A language specifying lexical	

Unit No.	Title of Unit & Contents	Hrs.
	analyzers, Implementation of a lexical analyzer, The scanner generator as	
	Swiss army knife	
	Unit Outcome:	
	UO 1. Gain a deep understanding of the structure and components of a	
	compiler.	
	UO 2. Analyze the structure of the source code based on a formal	
	grammar.	

II	Syntax Analysis and Parsing Techniques	12
	Context free grammars, Derivations and Parse Trees, Capabilities of Role	
	of Context free grammars, Parser, shift reduce parsing, Operator	
	Precedence Parsing, top-down parsing, Predictive parsers – Computation	
	of FIRST & FOLLOW functions and construction of parsing table, LR	
	parsers, the canonical collection of LR (O) items, Constructing LALR	
	parser tables, Using Ambiguous Grammars, An Automatic parser	
	Generator, Implementation of LR parsing tables, Constructing LALR sets	
	of items	
	Unit Outcome:	
	UO 1. Gain a thorough understanding of context-free grammars and their	
	role in specifying the syntax of programming languages.	
	UO 2. Learn about different parsing techniques, including shift-reduce	
	parsing, operator precedence parsing, and top-down parsing	
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples,	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top-	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top- down parser. Symbol Tables: The Contents of Symbol Table, Data	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top- down parser. Symbol Tables: The Contents of Symbol Table, Data Structures for a Symbol Tables, Representing scope information	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top- down parser. Symbol Tables: The Contents of Symbol Table, Data Structures for a Symbol Tables, Representing scope information Unit Outcomes:	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top- down parser. Symbol Tables: The Contents of Symbol Table, Data Structures for a Symbol Tables, Representing scope information Unit Outcomes: UO 1. Gain practical experience in implementing syntax-directed	15
III	parsing, operator precedence parsing, and top-down parsing Syntax Directed Translation and Symbol Table Syntax-Directed Translation schemes, Implementation of syntax-directed translators, Intermediate code, Postfix notations, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top- down parser. Symbol Tables: The Contents of Symbol Table, Data Structures for a Symbol Tables, Representing scope information Unit Outcomes: UO 1. Gain practical experience in implementing syntax-directed translators.	15

		UO 2. Acquire the skills about intermediate code representations and	
		their role in translating high-level programming languages to	
		machine code.	
	IV	Code Optimization and Code Generation	15
		The principal sources of optimization, loop optimization - Basic blocks,	
		flow graphs, loops, code motion, induction variables, The DAG	
		representation of basic blocks- Application of DAGs, Value Numbers and	
		Algebraic Laws, Global Data Flow Analysis-Data Flow equations, Solving	
		Data Flow equations. Object programs: the environment of code,	
		generator, run-time addresses for names, Problems in code generation, A	
		machine model, a simple code generator, Register allocation and	
		assignments, Code generation from DAG's, Peephole optimization.	
		Introduction to Errors, Lexical Phase Errors, Syntactic Phase Errors,	
		Semantic Phase Errors	
		Unit Outcome:	
		UO 1. Learn about loop optimization techniques, including code motion,	
		induction variable elimination, and loop unrolling.	
		UO 2. To gain knowledge of basic blocks and flow graphs, and	
		understand their role in analyzing and optimizing code.	
Le	arning R	esources:	
1.	Principle	es of Compiler Design - Alfred V.Aho, Jeffey D. Ullman (Narosa Publishing	House)
2.	Compile	er Construction – Principles & Practices D. M. Dhamdhere,	
3.	Compile	ers Principles, Techniques and Tools Alfred V. Aho Second Edition (Pearson	Education)
4.	Compile	ers: Principles <mark>, Techniqu</mark> es, and Tools by Alfred V. Aho, Monica S. Lam, Ray	vi Sethi, and
	Jeffrey I	D. Ullman	
5.	Enginee	ring a Compiler by Keith D. Cooper and Linda Torczon	
5.	Parsing	Techniques: A Practical Guide by Dick Grune and Ceriel J.H. Jacobs	
7.	Modern	Compiler Implementation in C by Andrew W. Appel	
8.	Compile	er Design in C by Allen I. Holub	
9.	Introduc	tion to the Theory of Computation by Michael Sipser	
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10. Advanced Compiler Design and Implementation by Steven Muchnick

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course -VI (Based on MMC V)

Course Code: 601COS2105

Credits: 03

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To get working knowledge of the MMC phases of compilation, like lexical analysis, parsing, semantic analysis and code generation.
- LO 2. To use the formal attributed grammars for specifying the syntax and semantics of programming languages
- LO 3. To understand the structure of a compiler, and how the source and target languages influence various choices in the design
- LO 4. To learn and use tools for compiler construction.

Course Outcomes:

- CO 1. Solve problem of parsing and compiling.
- CO 2. Design and develop simple compiler.
- CO 3. Use compiler tools in basic, concurrent, distributed and embedded environments.
- CO 4. Generate and optimize the code.

Practical No.	Unit
1	Tokenizing a file using C.
2	Implementation of Lexical Analyzer using Lex Tool.
3	Study the LEX and YACC tool and evaluate an arithmetic expression with
	parentheses, unary and binary operators using Flex and Yacc (Calculator).
4	Using JFLAP, create a DFA from a given regular expression.
5	Create LL (1) parse table for a given CFG and hence Simulate LL (1) Parsing
6	Using JFLAP create SLR (1) parse table for a given grammar. Simulate parsing
	and output the parse tree proper format.
7	Write functions to find FIRST and follow of all the variables.
8	Read a regular expression in its standard form and find out an E-NFA from it. Need
	to use adjacency list data structure of graph to store NFA. Thompson's
	construction needs to be used too.

9	Read a regular expression in standard form and check its validity by converting it to postfix form. Scan a string and check whether the string matches against the given regular expression or not
10	Design predictive parser for the given language.
11	Implementation of shift reduce parsing algorithm.
12	Convert the BNF rules into YACC form and write code to generate abstract syntax tree.





Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MMC-VI Course Title: Web Programming Course Code: 601COS2103 Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. ASP.NET helps students to create their own web applications
- LO 2. To design & develop static and dynamic websites.
- LO 3. To develop web application with validation controls.
- LO 4. To train the students in creating dynamic web pages using ASP.NET
- LO 5. To facilitate the students, develop real time applications using database

Course Outcomes:

- CO 1. Develop web pages using HTML, CSS and JavaScript.
- CO 2. Create a Web form with server controls
- CO 3. Separate page code from content by using code-behind pages, page controls, and components.
- CO 4. Display dynamic data from a data source by using Microsoft ADO.NET and data binding.
- CO 5. Build web applications using ASP.NET and MySQL database / MS-Access.

Unit No.	Title of Unit & Contents	Hrs.
Ι	Introduction to Web Technology & Asp.net	15
	Web Support Languages, Types of .net Application: web, Desktop,	
	Mobile, Role of Web Browser and Web Server Understanding HTTP,	
	LAN, WAN, Client side and Server-side Scripting, Introduction to Ajax	
	and WCF, Introduction to .net, .net Framework, Installing visual studio.net,	
	Asp Vs Asp.net, Asp.net Web page life cycle, Asp.net Web form, Directive	
	Unit Outcome:	
	UO 1. Gain knowledge of the role of web browsers and web servers in	
	the context of web applications, and understand how they interact	
	with each other using HTTP protocols.	
	UO 2. Differentiate client-side and server-side scripting, and learn how to	
	use them effectively in web development	

Unit No.	Title of Unit & Contents	Hrs.
II	Asp.net Applications, CSS and Themes	15
	Creating Asp.net Web Application, Auto Post back property, HTML	
	controls Vs Web controls, Code Window & Design Window, Server-Side	
	controls, Exception Handling, what is CSS? Types of CSS, Theme, Name	
	skin within a Theme.	
	Unit Outcome:	
	UO 1. Create an ASP.NET web application using Visual Studio.NET,	
	including setting up a project, adding pages, and configuring the	
	necessary settings.	
	UO 2. Differentiate between HTML controls and web controls in	
	ASP.NET, and understand the advantages of using web controls	
	for server-side process <mark>ing.</mark>	
III	Syntax Directed Translation and Symbol Table	15
	Redirecting Options: Response.Redirect, Server.Transfer, Cross Page Post	
	back, Passing Values between pages, Introduction to Master Page, Content	
	Place Holder and Content tags, Accessing Controls of Master page in	
	Content page, Master page with Menus.	
	Unit Outcomes:	
	UO 1. Use the Response.Redirect method in ASP.NET to redirect users	
	to a different page within the application.	
	UO 2. Understand the concept of master pages in ASP.NET and how they	
	can be used to create consistent layouts across multiple pages	
IV	User Controls, Validation, State Management and Web Services	15
	Creating User Control, Required Field Validator, Compare Validator,	
	Range Validator, Regular Expression Validator, Custom Validator, Query	
	String, State Management, Hidden Field, Cookies, Session, Creating Web	
	Services, Web Methods, Database Oriented Asp.net, ADO.NET data	
	access, Data Binding, Web Application with Grid View, Data List, Data	
	Grid, Repeater.	
	Unit Outcome:	
	UO 1. Create user controls in ASP.NET and understand how to use them	
	in their web applications.	
	UO 2. Gain an understanding of how to pass values between pages using	
	query strings in ASP.NET.	

Learning Resources:

- 1. ASP.NET the Complete Reference: Matthew Macdonald
- 2. Mastering Asp.net, BPB Publication, Russel.
- 3. Asp.net 4.0 Black Book





Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)

Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course -VII (Based on MMC VI)

Course Code: 601COS2106

Credits: 03

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. ASP.NET helps students to create their own web applications.
- LO 2. To design & develop static and dynamic websites.
- LO 3. To develop web application with validation controls.
- LO 4. To train the students in creating dynamic web pages using ASP.NET
- LO 5. To facilitate the students, develop real time applications using database

Course Outcomes:

- CO 1. Develop web pages using HTML, CSS and JavaScript.
- CO 2. Create a Web form with server controls
- CO 3. Separate page code from content by using code-behind pages, page controls, and components.
- CO 4. Display dynamic data from a data source by using Microsoft ADO.NET and data binding.
- CO 5. Build web applications using ASP.NET and MySQL database / MS-Access.

Practical No.	Unit
1	Introduction and Installation of Visual Studio.
2	Program for variables declaration and operators in Asp.net.
3	Program for Decision Making, Loops and Function in Asp.net.
4	Program to demonstrate Label, TextBox, Button Control.
5	Program to demonstrate ListBox, ComboBox Control.
6	Program to demonstrate Dropdown list and Calendar Control.
7	Program to design a Masterpage.
8	Program for embedding CSS in Asp.net.
9	Program to demonstrate Exception Handling in Asp.Net.
10	Program to demonstrate Compare validator, Required Filed Validator.
11	Program to demonstrate Range Validator and Custom Validator.
12	Program on Cookies.

13	Program on Session.
14	Program to demonstrate View State and Query String.
15.	Database Connectivity.



Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: MEC II (A) Course Title: Internet of Things Course Code: 601COS2201 Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To introduce the concepts of Internet of Things.
- LO 2. To impart the knowledge on IoT application areas.
- LO 3. To introduce the IoT business process models, design technology for Connected Devices.
- LO 4. To enable the students, learn the effective usage of device connectivity and web connectivity models

Course Outcomes:

- CO 1. Demonstrate the need of IoT in the computing world.
- CO 2. Identify the Business Process models of IoT.
- CO 3. Analyze the data storage and acquisition mechanisms for real time applications.
- CO 4. Design IoT based prototypes

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction Internet of Things	15
	Definition and characteristics of IoT. Sensing, Actuation, Networking	
	basics, Sensor Network. Physical Design of IoT, Things in IoT, IoT	
	Protocols Logical Design of IoT- IoT functional blocks, IoT	
	communication models, IoT enabling Technologies-Wireless sensor	
	networks, cloud computing, big data analytics, communication protocols,	
	embedded systems IoT Levels and deployment templates- IoT Level1 to	
	IoT Level6.	
	Unit Outcome: III Olidii U. Mallavio y ala ya,	
	UO 1. Define and describe the concept of IoT, including its	
	characteristics and components.	
	UO 2. Learn about networking basics in the context of IoT, including	
	different types of networks and their use in connecting IoT devices.	
II	Domain Specific IoTs and IOT vs M2M	15

Unit No.	Title of Unit & Contents	Hrs.
	Introduction: Home automation- Smart lighting, smart appliances,	
	intrusion detection, smoke or gas detectors Cities-Smart parking, smart	
	lighting, smart roads, structural help monitoring, surveillance, emergency	
	response	
	Environment-Weather monitoring, Air pollution monitoring, forest fire	
	detection, river flood detection Retail- Inventory management, smart	
	payments, smart vending machines Logistics- Route generation and	
	scheduling, fleet tracking, ship monitoring, remote vehicle diagnostic	
	Agriculture- smart irrigation, green house control Industry- machine	
	diagnostic, prognosis, indoor air quality monitoring Health and Lifestyle.	
	IOT vs M2M: - M2M, Difference between IoT and M2M, Difference	
	between SDN and NFV for IoT - software defined networking and network	
	function virtualization, IoT Code generator. An emerging industrial	
	structure for IoT, Use case exam <mark>ple.</mark>	
	Unit Outcome:	
	UO 1. Identify and describe different applications of IoT in home	
	automation, including smart lighting, smart appliances, intrusion	
	detection, and smoke or gas detectors.	
	UO 2. Learn about the role of IoT in environmental monitoring, including	
	applications in weather monitoring, air pollution monitoring, forest	
	fire detection, and river flood detection.	
III	IoT Design Methodology	15
	Purpose and requirement specification, Process specification, Domain	
	model specification Information model specification, Service	
	specification, IoT level specification, Functional View specification,	
	Operational View specification Device and component integration,	
	Application Development with Python, Case Study on IoT System for	
	weather monitoring.	
	Unit Outcomes:	
	UO 1. Define the purpose and requirements of an IoT system, and use	
	appropriate methods and tools to elicit, analyse, validate, and	
	document them.	
	UO 2. To identify the domain entities and relationships of an IoT system,	
	and use appropriate methods and tools to model, verify, and refine	
	the domain model.	

Unit No.	Title of Unit & Contents	Hrs.				
IV	Developing IoT Solutions.	15				
	What is an IoT Device? Raspberry Pi Interfaces, Programming Raspberry					
	Pi with Python, Other IoT Devices, IoT Physical Servers on Cloud					
	Offering, Amazon Web Services for IoT, Case studies- Home Automation,					
	Cities, Environment, Agriculture.					
	Unit Outcome:					
	UO 1. UO 1. Use Raspberry Pi as an IoT device, and interface it with					
	various sensors, actuators, and peripherals using GPIO pins, I2C,					
	SPI, UART, etc.					
	UO 2. To understand the role and benefits of cloud computing for IoT					
	systems, and use various cloud services and platforms to host IoT					
	physical servers.					

Learning Resources:

- 1. Internet of Things (A hands on approach) Vijay Madisetti and Arshdeep Bagha
- 2. Designing the Internet of Things Adrian McEwen & Hakim Cassimally.
- Rethinking the Internet of Things A scalable approach to connecting everything Francis Dacosta.



ajarshi Shahu Mahavidyalaya Latur (Autonomous)

Rajarshi Shahu Mahavidyalaya, Latur



(Autonomous)

Department of Computer Science

Course Type: MEC II (B) Course Title: Information Security Course Code: 601COS2202

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. Describe the basic principles of confidentiality, integrity, and availability (CIA) and how they relate to information security
- LO 2. Recognize the current trends and challenges in information security, such as cloud computing, cyberattacks, data breaches, etc.
- LO 3. Define vulnerability, threat, and risk in the context of information security. Conduct risk assessment and mitigation using appropriate methods and tools
- LO 4. Analyze and report the results of the assessments using appropriate formats and tools Recommend and implement corrective actions based on the findings of the assessment

Course Outcomes:

- CO 1. Explain the concepts and principles of information security and its importance for the organization and the individual.
- CO 2. Identify and evaluate the current trends and challenges in information security, such as cloud computing, cyberattacks, data breaches, etc., and the standards and frameworks available for information security.
- CO 3. Conduct risk assessment and mitigation using appropriate methods and tools, and implement quick fixes to reduce the impact of information security incidents
- CO 4. Understand and apply the concepts and importance of business continuity planning (BCP), disaster recovery planning (DRP), incident management, segregation and separation of duties, and IT Act 2000 in information security.
- CO 5. Perform different types of assessments for information security, such as vulnerability assessment and penetration testing (VAPT) of networks, web application audits, IT assessments.

Unit No.	Title of Unit & Contents	Hrs.
Ι	UNIT I Introduction	15

Unit No.	Title of Unit & Contents	Hrs.							
	What is Information Security & Why do you need it? -Basics								
	Principles of Confidentiality, Integrity Availability Concepts								
	Policies, procedures, Guidelines, Standards Administrative Measures								
	and Technical Measures, People, Process, Technology								
	Unit Outcome:								
	UO 1. Students will be able to explain the concepts and principles of								
	information security and its importance for the organization and the								
	individual								
	UO 2. Apply administrative and technical measures to protect								
	information assets.								
II	UNIT II Current Trends in information Security	11							
	Current Trends in information Security, Cloud Computing: benefits								
	and Issues related to info Security Standards available for InfoSec:								
	Cobit, Cadbury, ISO27001, <mark>OWASP, OSSTMM</mark> , etcAn Overview,								
	Certifiable Stan <mark>dard</mark> s: How <mark>, What, When, Who</mark>								
	Unit Outcome:								
	UO 1. Identify and evaluate the current trends and challenges in								
	information security, such as cloud computing, cyberattacks, data								
	breaches, etc.								
	UO 2. Understand the standards and frameworks available for								
	information security, such as COBIT, Cadbury, ISO27001, OWASP,								
	OSSTMM, etc.								
III	UNIT III Threat and Risk	13							
	Vulnerability, Threat and Risk, Risk Assessment and Mitigation +								
	Quick fixes, Introduction to BCP/DRP/Incident management,								
	Segregation and Separation of Duties & Roles and responsibilities, IT								
	ACT 2000								
	Unit Outcomes:								
	UO 1. Define vulnerability, threat, and risk in the context of information								
	security, and conduct risk assessment and mitigation using appropriate								
	methods and tools.								
	UO 2. Implement quick fixes to reduce the impact of information security								
	incidents, and understand the concepts and importance of business								
	continuity planning (BCP).								
IV	UNIT IV assessments for Information Security	10							

Unit No.	Title of Unit & Contents	Hrs.							
	Types of assessments for Information Security								
	1. VAPT of Networks								
	2. Web Application Audits								
	3. IT assessments or audits								
	4. Assessment of Network Equipment's								
	5. Assessment of Security Devices (Web Filtering, Firewalls, IDS/IPS,								
	Routers								
	6. Data Center Assessment								
	7. Security of Application Software								
	8. SAP Security								
	9. Desktop Security								
	10. RDBMS Security								
	11. BCP/DRP assessments								
	12. Policy reviews								
	Unit Outcome:								
	UO 1. Perform different types of assessments for information security,								
	such as vulnerability assessment and penetration testing (VAPT) of								
	networks.								
	UO 2. Analyze and report the results of the assessments using appropriate formats and tools, such as graphs, charts, tables, reports, etc.								

Learning Resources:

- 1. Security Engineering: A Guide to Building Dependable Distributed Systems (Hardcover)by Ross J. Anderson
- 2. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws (Paperback) by Dafydd Stuttard

Rajarshi Shahu Mahavidyalaya



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course (A)

Course Title: Lab Course -VIII (Based on MEC II)

Course Code: 601COS2203

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To introduce the concepts of Internet of Things.
- LO 2. To impart the knowledge on IoT application areas.
- LO 3. To introduce the IoT business process models, design technology for Connected Devices.
- LO 4. To enable the students, learn the effective usage of device connectivity and web connectivity models

Course Outcomes:

- CO 1. Demonstrate the need of IoT in the computing world.
- CO 2. Identify the Business Process models of IoT.
- CO 3. Analyze the data storage and acquisition mechanisms for real time applications.
- CO 4. Design IoT based prototypes.

Practical No.	Unit
1	Install Virtual box and Raspberry Pi to perform actions of Raspberry Pi.
2	Starting Raspbian OS, familiarizing with raspberry pi components and Interface,
	connecting to ethernet, monitor, USB.
3	Displaying different LED patterns with Raspberry Pi.
4	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.
5	Control Raspberry Pi via Telegram Messenger.
6	Setting up Wireless Access Point using Raspberry Pi.
7	Fingerprint Sensor interfacing with Raspberry Pi.
8	GPS Module Interfacing with Raspberry Pi.
9	IOT based Web Controlled Home Automation using Raspberry Pi
10	Visitor Monitoring with Raspberry Pi and Pi camera
11	RFID interfacing with Raspberry Pi.
12	Building Google Assistant with Raspberry Pi.

13	Installing windows 10 IoT core on Raspberry Pi.
14	Light on LED through Python Program using Raspberry Pi
15	Get input from switches and switch on corresponding LEDs controlling on LEDs by button.



Latur (Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Computer Science

Course Type: Lab Course (B)

Course Title: Lab Course -VIII (Based on MEC II)

Course Code: 601COS2203

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. Describe the basic principles of confidentiality, integrity, and availability (CIA) and how they relate to information security
- LO 2. Recognize the current trends and challenges in information security, such as cloud computing, cyberattacks, data breaches, etc.
- LO 3. Define vulnerability, threat, and risk in the context of information security. Conduct risk assessment and mitigation using appropriate methods and tools
- LO 4. Analyze and report the results of the assessments using appropriate formats and tools Recommend and implement corrective actions based on the findings of the assessment

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Explain the concepts and principles of information security and its importance for the organization and the individual.
- CO 2. Identify and evaluate the current trends and challenges in information security, such as cloud computing, cyberattacks, data breaches, etc., and the standards and frameworks available for information security.
- CO 3. Conduct risk assessment and mitigation using appropriate methods and tools, and implement quick fixes to reduce the impact of information security incidents
- CO 4. Understand and apply the concepts and importance of business continuity planning (BCP), disaster recovery planning (DRP), incident management, segregation and separation of duties, and IT Act 2000 in information security.
- CO 5. Perform different types of assessments for information security, such as vulnerability assessment and penetration testing (VAPT) of networks, web application audits, IT assessments or audits, assessment of network equipment's, BCP/DRP assessments, policy reviews, etc., and analyze and report the results using appropriate formats and tools

Practical No.

Unit

1	Create and analyze a security policy for a given scenario, such as a home network,
	a small business, or an organization.
2	Implement and test various administrative and technical measures to protect
	information assets, such as encryption, password management, backup and
	recovery, antivirus software, firewall, etc.
3	Evaluate the effectiveness of people, process, and technology in information
	security, and identify the strengths and weaknesses of each component.
4	Explore and compare different cloud computing models and services, such as
	SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc., and their benefits
	and issues related to information security.
5	Choose and apply a suitable standard or framework for information security, such
	as COBIT, Cadbury, IS <mark>O27001, OW</mark> ASP, OSSTMM, etc., for a given scenario or
	case study.
6	Understand and prepare for the process and benefits of certifying information
	security standards, such as eligibility criteria, certification steps, costs, benefits,
	etc.
7	Identify and classify different types of vulnerabilities, threats, and risks in
	information security, such as malware, phishing, denial-of-service attacks, data
	breaches, identity theft, etc.
8	Conduct risk assessment and mitigation using appropriate methods and tools, such
	as risk matrix, risk register, risk treatment plan, etc.
9	Implement quick fixes to reduce the impact of information security incidents, such
	as isolating infected systems, changing passwords, notifying users or authorities,
	etc. शिव छत्रपता
10	Understand and apply the concepts and importance of business continuity planning
	(BCP), disaster recovery planning (DRP), and incident management in information
	security, using various tools and templates.
11	Apply segregation and separation of duties to prevent unauthorized access and
	misuse of information in a given scenario or case study.
12	Comply with the IT Act 2000 and its provisions related to information security in a
N	given scenario or case study.
13	Perform different types of assessments for information security using various tools
	and resources.
	For example:
	✓ VAP1 of Networks: Use tools such as Nmap ¹ , Wireshark ² , Metasploit ³ ,
	etc., to scan and test network vulnerabilities and exploits.

	✓ Web Application Audits: Use tools such as $OWASP ZAP^4$, Burp Suite ⁵ ,								
	SQLMap, etc., to scan and test web application vulnerabilities and								
	exploits.								
	✓ IT assessments or audits: Use tools such as Nessus, OpenVAS, Qualys,								
	etc., to scan and audit IT systems for compliance and security issues.								
	✓ Assessment of Network Equipment's: Use tools such as Cisco Packet								
	Tracer, GNS3, NetSim, etc., to simulate and test network equipment's such								
	as routers, switches, firewalls, etc.								
14	Analyze and report the results of the assessments using appropriate formats and								
	tools, such as graphs, charts, tables, reports, etc.								
15	Recommend and implement corrective actions based on the findings of the								
	assessments, such as patching vulnerabilities, updating configurations, enhancing								
	security policies, etc.								





Rajarshi Shahu Mahavidyalaya, Latur

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PG First Year

Extra Credit Activities

Sr. No.	Course Title	Credits	Hours	
			T/P	
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.	
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.	
3	IIT Spoken Tutorial	Min. of 02 credits	Min. of 30 Hrs.	
	Courses			

Guidelines:

Extra -academic activities

- 1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
- 2. Maximum 04 extra credits in each academic year will be allotted.
- 3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

- 1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
- 2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
- 3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
- 4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

- 1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
- 2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work. ars bit Shahu Mahawid valaya
- 3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
- 4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
- 5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

- 1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
- 2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
- 3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

- 1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
- 2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
- 3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
- 4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
- 5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
- 6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.

।। आराह तमसा ज्यातिः।।

Rajarshi Shahu Mahavidyalaya Latur (Autonomous)



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(Autonomous)

Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				C Pra	AT ctical	Best Scored CAT & Mid Term	SEE	Total
			3 4							
1	2	Att.	CAT	Mid	CAT	Att.	CAT	5	6	5 + 6
			Ι	Term	Π					
Research	100	10	10	20	10	-	-	40	60	100
Methodology										
DSC/DSE	75	05	10	15	10	-	-	30	45	75
Lab Course	50	y-	-	-	-	05	20	-	25	50
		-								
Field Project	100	10	10	20	10	-	-	40	60	100

Note:

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- 1. All Internal Exams are compulsory
- 2. Out of 02 CATs best score will be considered
- 3. Mid Term Exam will be conducted by the Exam Section
- 4. Mid Term Exam is of Objective nature (MCQ)
- 5. Semester End Exam is of descriptive in nature (Long & Short Answer)
- 6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks.