IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.)

Computer Science & Engineering (IOT and Cyber Security Including Block Chain Technology) (CSITCS)

V Semester

Sr. No.	Course Type	Course Code	Course Title	Scheme			Credits
				L	T	P	
1	PCC	CB08	Microprocessor & Microcontroller	2	1	–	3
2	PCC	CB09	Operating System	2	1	–	3
3	PCC	CB10	Theory of Computation	2	1	–	3
4	PCC	CB11	Software Engineering & Project Management	3	–	–	3
5	HSMC	HS05	Humanities and Social Sciences Open Courses - I	2	–	–	2
6	IFC	DS01	Interdisciplinary Foundation Course-II	2	–	–	2
7	LC	CB08(P)	Microprocessor & Microcontroller Lab	–	–	2	1
8	LC	CB09(P)	Operating System Lab	–	–	2	1
9	SBC	CB02(P)	Programming in Python Lab	–	–	4	2
10	PROJ	CB01	Mini Project	–	–	4	2
11	LLC03	LLC	Liberal Learning Course –III	–	–	2	–
12	MLC	MLC03	Environmental Studies	1	–	–	**Audit***
13	PROJ	–	Internship-I	Credit to be added in Sixth Semester			
Total Academic Engagement and Credits				**14**	**3**	**14**	**22**
				31			

* Zero credit course

- **Humanities and Social Sciences Open Courses – I**
  (A) English Language Proficiency
  (B) German Language
  (C) French Language
  (D) Japanese Language
  (E) Soft skill and Interpersonal Communication

- **Interdisciplinary Foundation Course-II (IFC-DS01)**
  (Offered by CSE (Data Science) Branch)
  - Foundation of Data Science

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PCC-CB08	Microprocessor and Microcontroller	2L:1T:0P (3hrs.)	3 Credits

Prerequisite: Fundamentals of Digital Electronics and programming.

Course Objective: The objective of this course is that students can learn fundamental concepts of embedded system design and robotics and advanced microcontrollers like PIC, AVR and ARM.

Course Contents: (40 hrs.)

Module 1: **(08hrs.)**
Microprocessor 8086 Architecture - BIU and EU, Registers, Pin Diagram, Memory Addressing, Clock Generator 8284, Buffers and Latches, Maximum and Minimum Modes.

Module 2: **(08hrs.)**
Addressing Modes, Instruction set of 8086, Assembly Language Programming, Assemblers, Procedures, Macros, Interrupts, 8086 Based Multiprocessor Systems - Coprocessors (8087 NDP), Closely and Loosely Coupled Multiprocessor Systems (8089 IOP).

Module 3: **(08hrs.)**
Interfacing Chips-8251A (USART), 8255A (Programmable Peripheral Interface), 8253/8254 (Programmable Interval Timer/Counter), 8257 (DMA Controller), 8259A (Programmable Interrupt Controller).

Module 4: **(08hrs.)**
Microcontrollers - Microcontroller 8051- Architecture, Pin Diagram, I/O Ports, Internal RAM and Registers, Interrupts, Addressing Modes, Memory Organization and External Addressing, Instruction Set, Assembly Language Programming, Real Time Applications of Microcontroller-Interfacing with LCD, ADC, DAC, Stepper Motor, Key Board and Sensors.

Module 5: **(08hrs.)**
Embedded Systems- Introduction, Classification, Processors architecture, Hardware Units, Software embedded into System, Applications and products of embedded systems, Structural units in processor, Memory devices, I/O devices, Buses, Interfacing of processor memory and I/O devices, Case study of an embedded system for a smart card.

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Course Outcome:

1. Understand the fundamentals and history of embedded system design.
2. Define different types of Actuators used in Robotics and illustrate concepts about their working.
3. Classify types of Robots in different applications and define various concepts related to their movements.
4. Understand PIC & AVR microcontroller architectures and programming in Robotics and embedded systems.
5. Design automated embedded systems by interfacing different Modules with advance controllers. Illustrate overview of ARM microcontroller architectures.

List of Text/Reference Books:

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming and Design PHI.
3. D. V. Hall: Microprocessors and Interfacing, TMH.
4. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
5. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning.
6. V. Deshmukh: Microcontroller (Theory and Application), TMH.
7. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
8. V. Udayashankara and M. S. Mallikarjuna swamy: 8051 Microcontroller, TMH, New Delhi.

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V Semester

PCC-CB09	Operating System	2L:1T:0P (3hrs.)	3 Credits

Prerequisite: Computer Organization & Architecture.

Course Objective: This Course provides a comprehensive introduction of Operating System, Process Management, Memory Management, File Management and I/O management.

Course Contents: (40 hrs.)

Module 1: **(06hrs.)**
Introduction to Operating Systems: Function, Evolution, Different Types, Desirable Characteristics and features of an O/S, Operating Systems Services: Types of Services, Different ways of providing these Services – Utility Programs, System Calls, Operating System Structure, and Spooling & Buffering.

Module 2: **(11hrs.)**
CPU Scheduling: Process Concept, Scheduling Concepts, Types of Schedulers, Scheduling Criteria, Process State Diagram, Scheduling Algorithms, Operation on Process, Algorithms Evaluation, System calls for Process Management; Multiple Processor Scheduling; Concept of Threads.

Module 3: **(06 Hrs.)**
Concurrent Processes: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, InterProcess Communication, Critical Section Problem, Solution to Critical Section Problem: Semaphores – Binary and Counting Semaphores, WAIT & SIGNAL Operations, and their implementation. Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery.

Module 4: **(11hrs.)**
Memory Management: Different Memory Management Techniques – Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Techniques for supporting the execution of large programs: Overlay, Dynamic Linking and Loading, Virtual Memory – Concept, Implementation by Demand Paging etc., Page replacement algorithms.

Module 5: **(06hrs.)**
File Systems: File Concept, User's and System Programmer's view of File System, Disk

Organization, Tape Organization, Different Modules of a File System, Disk Space Allocation Methods – Contiguous, Linked and Indexed. Directory Structures, File Protection, System Calls for File Management, Disk Scheduling Algorithms. Introduction to Network, Distributed and Multiprocessor Operating Systems. Case Studies: Unix/Linux, WINDOWS, and other Contemporary Operating Systems.

Course Outcome:

1. State the core concepts of operating system, evolution and types of operating system.
2. Illustrate various input output concepts, inter process communication and deadlock
3. Illustrate process scheduling and memory management techniques.
4. Describe the concept of file and disk management.
5. State the core concepts of network, distributed and multiprocessor operating system.

List of Text / Reference Books:

1. Avi Silber Schatz, Peter Galvin, Greg Gagne, “Operating System Concepts Essentials”, Wiley Asia Student Edition, 10th Edition, 2018.
2. William Stallings, “Operating Systems: Internals and Design Principles”, Prentice Hall of India, 5th Edition, 2005.
3. Charles Crowley, “Operating System: A Design-oriented Approach”, Irwin Publishing, 1st Edition.
4. Gary J. Nutt, “Operating Systems: A Modern Perspective”, Addison-Wesley, 2nd Edition.
5. Maurice Bach, “Design of the Unix Operating Systems”, Prentice-Hall of India, 8th Edition.
6. Daniel P. Bovet, Marco Cesati, “Understanding the Linux Kernel”, O' Reilly and Associates, 3rd Edition.
7. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall, 3rd Edition, 2007.
8. Bovet & Cesati, “Understanding the Linux Kernel”, O’ Reily, 3rd Edition.

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V Semester

PCC-CB10	Theory of Computation	2L:1T:0P (3hrs.)	3 Credits

Prerequisite: Discrete structure

Course Objective: The main objective of this course is to understand fundamental of Theory of Computation.

Course Contents :(40 Hrs.)

Module1: (08hrs)

Introduction of Automata theory: Introduction to set theory, operations on languages and sets—union, intersection, concatenation, and Kleene closure. Basic concepts of automata, formal languages, and applications of automata. Non-Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, NFA with ε transition, minimization of automata machines.

Module2: (08hrs)

Finite Automata and Regular Languages: Finite Automata as a language acceptor and translator, Moore machines and Mealy machines, composite machine, Conversion from Mealy to Moore and vice versa. Regular languages, regular expressions, regular language classification, and applications. Closure properties of regular languages, pumping lemma for regular languages. Arden's theorem, 2- way DFA.

Module 3: (08hrs)

Grammars: Types of grammar, Regular Grammar (RG), Context-Free Grammar (CFG), and Context-Sensitive Grammar (CSG). Derivation trees, ambiguity in grammar, simplification o f context free grammar, Chomsky hierarchy of grammar. Chomsky normal form and Greibach normal form. Conversion of grammar to automata machine and vice versa.

Module 4: (08 hrs)

Push down Automata: Introduction, formal definition and examples of PDA. Deterministic Pushdown Automata (DPDA) and Non-deterministic Pushdown Automata (NPDA) comparison and applications, Conversion of PDA into context free grammar and vice versa, equivalence between PDA and CFG. Petri Net model.

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Module 5: **(08 hrs)**

Turing Machine: Formal model, techniques for Turing Machine construction, Universal Turing Machine (UTM), Multi-tape, Multi-head, and Multidimensional Turing Machines.NP and NP-Complete problems. Decidable (recursive) languages, recursively enumerable (RE) languages, undecidable languages, and the relationship between decidable and RE languages. Halting problem of Turing machine & the post correspondence problem.

Course Outcomes

1. Explain the basic concepts of switching and finite automata theory & languages.
2. Relate practical problems to languages, automata, computability and complexity.
3. Construct abstract models of computing, check their power to recognize the languages and analyze the grammar, its types, simplification and normal form.
4. Interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.
5. Develop an overview of how automata theory, languages and computation are applicable in engineering application.

List of Text/ Reference Books:

1. DanielI. A. Cohen, "Introduction to Computer Theory", Wiley India, 2nd Edition, 2003.
2. John E Hopcroft, Jeffrey D. Ullman and Rajeev Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2nd Edition, 2001.
3. K. L. P Mishra & N. Chandra sekaran, "Theory of Computer Science", PHI Learning, 3rd Edition, 2006.
4. Peter Linz, "Introduction to Automata Theory and Formal Languages", Narosa Publishing. 3rd Edition, 2007.
5. John C Martin, "Introduction to languages and the theory of computation", TATA McGraw Hill, 3rd Edition 2013.
6. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", Pearson Education Asia, 2nd edition, 1998.
7. Dexter C. Kozen, "Automata and Computability", Undergraduate Texts in Computer Science, Springer, 1st edition, 2012.
8. Michael Sipser, "Introduction to the Theory of Computation", PWS Publishing., 3rd edition, 2012.

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V Semester

PCC-CB11	Software Engineering & Project Management	3L:0T:0P (3hrs.)	3 Credits

Pre-requisite: Programming fundamentals and object-oriented programming.

Course Objective: To equip students with the fundamental concepts and modern practices of software engineering and project management for developing, testing and managing quality software systems.

Course Contents: (40 hrs.)

Module 1: **(08hrs.)**

The Software Product and Software Process: Introduction to software engineering, Characteristics of quality software, product vs process, Software Process Models: Linear Sequential Models, Evolutionary Process Models and Agile development processes. Overview of DevOps lifecycle, selection of an appropriate software process model. Software process customization and improvement: Capability Maturity Model (CMM), product and process metrics.

Module 2: **(08hrs.)**

Engineering and Software Analysis: Feasibility Analysis, Cost Estimation Models, Purpose and Scope of software, Software Requirements: Sources, Elicitation Techniques, Validation and Traceability, Functional and Non-functional requirements, System Architecture and Design: Views, Styles and Patterns.

Module 3: **(08hrs.)**

Software Design

Software Design: The Software Design Process, Design Concepts and Principles, Functional oriented vs Object Oriented, Software modeling using UML diagrams: Structural and Behavioral, SA/SD Component Based Design and Design Metrics.

Module 4: **(08hrs.)**

Software Testing: Software Static and Dynamic analysis, Software Testing, Fundamentals, Process, Criteria, Case Design, Test Techniques: Black-Box Testing, White-Box, Frameworks: Unit Testing, Integration Testing, System Testing, Test Plan, Test Metrics, Testing Tools and automation, introduction to Test-Driven Development (TDD), and the test pyramid.

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Module 5: **(08hrs.)**

Project Monitoring and Software Metrics: Project tracking techniques, sprint monitoring, burndown and Software Project Maintenance and Emerging Practices: Software maintenance and its types, Software Configuration Management, Git-based version control, branching, code review, and CI/CD practices. Fundamentals of Agile project management using Scrum and Kanban, including estimation, sprint planning, and release planning. Introduction to Generative AI in software engineering for coding, testing, debugging, documentation, and review, with emphasis on validation, limitations, ethics, privacy, intellectual property, teamwork, and professional responsibility.

Course Outcomes:

1. Decompose the given project in various phases of a lifecycle.
2. Choose appropriate process model depending on the user requirements.
3. Perform various life cycle activities like Analysis, Design, Implementation, Testing & Maintenance.
4. Know various processes used in all the phases of the product.
5. Apply the knowledge, techniques, and skills in the development of a software product

List of Text / Reference Books:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Pub, 2005.
2. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning, Fourth Edition, 2014.
3. P, S. Pressman "Software Engineering. A Practitioner's Approach" New edition, McGraw Hills, 7th edition, 2010.
4. Sommer ville, "Software Engineering" , Pearson Education, 9th Edition,2011.
5. Richard H. Thayer, "Software Engineering & Project Managements", Wiley India
6. Waman S. Jawadekar, Software Engineering, TMH, 2004.
7. Bob Hughes, M. Cotterell, Rajib Mall "Software Project Management", McGraw Hill, Sixth Edition, 2017
8. Schwalbe, Kathy "Information Technology Project Management" 8th Edition, 2016.
9. Kieron Conway "Software project Management from concept to development Black Book" Dream tech Press.
10. Deepak Jain, "Software Engineering principle and practices" Oxford University Press, 2008.
11. Bell Douglas "Software Engineering for students", Pearson Education., 4th Edition, 2005.
12. Kelkar "Software Project Management," PHI Learning, 3rd edition 2012.

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V Semester

IFC-DS01	Foundation of Data Science	2L:0T:0P(2hrs.)	2credits

Pre-requisite: NA.

Course Objective: This course provides a concise introduction to the fundamental concepts of Data Science.

Module 1: **(05hrs.)**

Introduction: What is Data Science? Big Data and Data Science – Datafication – Current landscape of perspectives - Skill sets needed; Matrices - Matrices to represent relations between data, and necessary linear algebraic operations on matrices Statistics: Descriptive Statistics: distributions and probability.

Module 2: **(05hrs.)**

Data preprocessing: Data cleaning - data integration - Data Reduction Data Transformation and Data Discretization. Evaluation of classification methods –Exploratory Data Analysis – Basic tools (plots, graphs and summary statistics) of EDA.

Module 3: **(05hrs.)**

Introduction to Machine Learning Concepts: Association Rule mining - Linear Regression Logistic Regression- Classifiers - k-Nearest Neighbors (k-NN), k-means -Decision tree.

Module 4: **(05hrs.)**

Clustering: Choosing distance metrics - Different clustering approaches – hierarchical agglomerative clustering, k-means (Lloyd's algorithm), - DBSCAN - Relative merits of each method - clustering tendency and quality.

Module 5: **(05hrs.)**

Case Studies/Projects related to data science.

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V Semester

Course Outcome:

1. State the overview of Data Science.
2. Explain the process of Data preprocessing.
3. Discuss the various Machine Learning Algorithms.
4. Explain the clustering techniques.
5. Discuss the usage of Data Science technologies.

List of Text/Reference Books:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques", Third Edition ISBN 0123814790, 2011.
3. Mohammed J. Zaki and Wagner Miera Jr, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2014.
4. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016.
5. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015.
6. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.
7. NPTEL Course Link: https://nptel.ac.in/courses/106/106/106106212/
8. NPTEL Course Link: https://nptel.ac.in/courses/106/106/106106179/

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V Semester

LC-CB08(P)	Microprocessor and Microcontroller Lab	0L:0T:2P (2hrs.)	1 Credits

Prerequisite: Fundamentals of Digital Electronics and programming.

Course Objective: The objective of this course is that students can learn fundamental concepts of embedded system design and robotics and advanced microcontrollers like PIC, AVR and ARM.

Module 1: **(04hrs.)**
Microprocessor 8086 Architecture - BIU and EU, Registers, Maximum and Minimum Modes.

Module 2: **(04hrs.)**
Addressing Modes, Instruction set of 8086, Assembly Language Programming, Assemblers, Procedures,

Module 3: **(04hrs.)**
Interfacing Chips-8255A (Programmable Peripheral Interface), 8253/8254 (Programmable Interval Timer/Counter), 8257 (DMA Controller).

Module 4: **(04hrs.)**
Microcontrollers - Microcontroller 8051- Architecture, Pin Diagram, Interfacing with LCD, ADC, DAC, Stepper Motor, Keyboard and Sensors.

Module 5: **(06hrs.)**
Embedded Systems-Introduction, Classification, Processor's architecture, Interfacing of Processor Memory and I/O Devices.

Course Outcome:

1. Understand the fundamentals and history of embedded system design.
2. Define different types of Actuators used in Robotics and illustrate concepts about their working.
3. Classify types of Robots in different applications and define various concepts related to their

movements.

4. Understand PIC & AVR microcontroller architectures and programming in Robotics and embedded systems.
5. Design automated embedded systems by interfacing different Modules with advance controllers. Illustrate overview of ARM microcontroller architectures.

List of Text/Reference Books:

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming and Design PHI
3. D. V. Hall: Microprocessors and Interfacing, TMH.
4. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
5. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning.
6. V. Deshmukh: Microcontroller (Theory and Application), TMH.
7. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
8. V. Udayashankara and M. S. Mallikarjuna swamy: 8051 Microcontroller, TMH, New Delhi.

List of Experiments:

1. Assembly Language Programs of Microprocessor 8086.
2. Assembly Language Programs of Microcontroller 8051.
3. Assembly Language Programs for Interfacing Chips.
4. Write a program in embedded C to read temperature from LM35 and display on LCD.
5. Write a program in embedded C to read data from keypad & display on LCD.
6. Write a program in embedded C to control speed of motor.
7. Write a program in embedded C to control servomotor.
8. Write a program in embedded C to control IR sensor.
9. Code a sequence in Robotic software to pick and place an object by Robotic hand.
10. Code a sequence in Robotic software to control hands of a humanoid Robot.
11. Code a sequence in Robotic software to control legs of a humanoid Robot.
12. Code a sequence in Robotic software to make a Robot walk.
13. Code a sequence in Robotic software to make a Robot dance.

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LC-CB09(P)	Operating Systems Lab	0L:0T:2P (2 hrs.)	1 Credit

Prerequisite: NA.

Course objective: To equip students with a comprehensive understanding of the fundamental concepts and mechanisms in operating systems, focusing on process management, memory management, and file systems.

Module 1: **(06hrs.)**
Process Management: CPU Scheduling, FCFS, Convoy Effect, FCFS with Overhead, SJF, SRTF, Round Robin Algorithm, Longest Job First, Priority Scheduling.

Module 2: **(04hrs.)**
Synchronization: Producer Consumer, Reader Writers, Dining Philosophers Problem, Banker's algorithms.

Module 3: **(04 Hrs.)**
Memory Management: Page replacement algorithm, Belady's Anomaly, Stack algorithms.

Module 4: **(06hrs.)**
File system IO: Disk scheduling (FCFS, SSTF, Scan, C-scan, Look, C-look).

Module 5: **(04hrs.)**
Threads and system calls: Communications related system calls

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V Semester

Course Outcome:

1. State the core concepts of operating system, evolution and types of operating system.
2. Illustrate various input output concepts, inter process communication and deadlock
3. Illustrate process scheduling and memory management techniques.
4. Describe the concept of file and disk management.
5. State the core concepts of network, distributed and multiprocessor operating system.

List of Experiments:

1. To implement FCFS CPU scheduling algorithm.
2. To implement SJF CPU scheduling algorithm.
3. To implement Priority CPU Scheduling algorithm.
4. To implement Round Robin CPU scheduling algorithm.
5. To compare various CPU Scheduling Algorithms over different Scheduling Criteria.
6. To implement classical inter process communication problem (producer consumer).
7. To implement classical inter process communication problem (Reader Writers).
8. To implement classical inter process communication problem (Dining Philosophers).
9. To implement Banker's algorithms.
10. To implement & compare various page replacement algorithms.
11. To implement & compare various Disk & Drum scheduling Algorithms
12. To implement Remote Procedure Call (RPC).

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V Semester

SBC-CB02(P)	Programming in Python	0L:0T:4P (4hrs.)	2 Credits

Prerequisite: C and C++ language.

Course Objective: The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.
Learning Outcomes: Problem solving and programming capability.

Module 1: **(04hrs.)**
Introduction, History, Features, Python –Environment Setup Local Environment Setup, Getting Python, Installation of Python, Use of IDE.

Module 2: **(04hrs.)**
Python –Basic Syntax Python Identifiers, Reserved Words, Lines & Indentation, Multiline Statements, Quotation in Python, Comments & other useful constructs, Python –Variables Assigning Values to Variables, Multiple Assignment, Standard Data Types.

Module 3: **(04hrs.)**
Python –Variables, Assigning Values to Variables, Multiple Assignment, Standard Data Types; Python Numbers, Python Strings, Python Lists, Python Tuples, Dictionary, Data Type Conversion.

Module 4: **(04hrs.)**
Python –Basic Operators, Types of Operators, Arithmetic Operators, Comparison Operators, Assignment Operators, Bitwise Operators, Logical Operators, Operator Precedence, Python – Decision Making & Loops, Flowchart, If statement Syntax.

Module 5: **(06hrs.)**
Python-Functions, Syntax for defining a function, Calling a Function, Function Arguments, Anonymous Functions Python-Applications & Further Extensions, Data analysis packages.

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V Semester

Course Outcome:

1. Install Python and have knowledge of syntax of Python.
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
3. Express different decision-Making statements and Functions.
4. Develop code in Python using functions, loops etc.
5. Design GUI Applications in Python and evaluate different database operations.

List of Experiments:

Write a Python program:

1. To find GCD of two numbers.
2. To find the square root of a number by Newton's Method.
3. To find the exponentiation of a number.
4. To find the maximum from a list of numbers.
5. To perform Linear Search.
6. To perform binary search.
7. To perform selection sort.
8. To perform insertion sort.
9. To perform Merge sort.
10. To find first n prime numbers.
11. To multiply matrices.
12. For command line arguments.
13. To find the most frequent words in a text read from a file.
14. To simulate elliptical orbits in Pygame.
15. To bouncing ball in Pygame.
16. To demonstrate data analysis packages using python like Pandas, Filtering, etc.

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PROJ-CB01	Mini Project	0L:0T:4P (4hrs.)	2 Credits

Prerequisite: A sound knowledge in subjects in respective stream.

Course Objective: The main objective of Mini Project is to offer a platform for students to apply theoretical concepts and programming knowledge in a practical setting, solving real time problems or situations fostering creativity, problem solving abilities and technical proficiencies.

Course Outcome: At the end of the course the student should be able to

1. Understand, plan, and execute a Mini Project with team.
2. Acquire knowledge within the chosen area of technology for project development.
3. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
4. Communicate and report effectively project related activities and findings.
5. Formulate and propose a plan for creating a solution for the problems identified.
6. Report and present the finding of the study conducted in the preferred domain.

Guidelines:

The mini project should preferably be carried out in a group consisting of a minimum of **01** student and a maximum of **03** students. Each group must select a project title related to any engineering discipline, and the project should address or emulate a real-world problem.