COURSE CURRICULUM

for

THIRD YEAR B.TECH. DEGREE

in

INFORMATION TECHNOLOGY

(Applicable from the academic session 2024-2025)

Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India,713206

Course Name: Software Engineering
Course Code: IT-501
(Semester- V)
Course Broad Category: Professional Core Course

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1. **Course Prerequisite:**
   A. Basic Programming Skills
   B. Innovative Thinking.
   C. Enthusiasm to learn Management concepts.

2. **Course Learning Objectives:**
   The objective of this course is:

   A. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

   B. To provide an idea of using various process models in the software industry according to given circumstances.

   C. To provide an understanding of the working knowledge of the techniques for estimation, design, testing, risk management and quality management of large software development projects.

3. **Teaching methodology and evaluation system for the course:**

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Software Engineering
   Course Code: IT-501
   Hours per Week: 3L : 0T : 0P
   Credits: 3

Module	Topics	45L
1.	**Overview of System Analysis & Design:** Business System Concept, System Development Life Cycle,	10L

Module	Topics	45L
	Waterfall Model , Prototyping Model, Spiral Model, Iterative Model, RAD Model, Evolutionary Model, V Model and Agile Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. Function Point Metric [10L]	
2.	**System Design:** Context diagram and DFD ,Problem Partitioning, Top-Down And Bottom-Up design; Decision tree, Decision table and structured English ;Functional vs. Object- Oriented approach, Cohesion and Coupling[8L]	8L
3.	**Testing Strategies:** A strategic approach to software testing, Black-Box and White-Box testing, Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment, Validation &Verification Metrics, Monitoring & Control, CASE tools, Cyclomatic Complexity [8L]	8L
4.	**Coding & Documentation:** Structured Programming, Object Oriented Programming, Information Hiding, Reuse, System Documentation.[4L]	4L
5.	**Software Project Management**: Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring, Gnatt Chart, PERT Chart, CMMI Metrics for Process and Products [5L]	5L
6.	**Static and Dynamic Models:** why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, stat chart diagram, activity diagram, implementation diagram. [10 L]	10L

Text Book:

1. Pressman, Software Engineering : A practitioner's approach– (TMH)
2. Rajib Mall, Software Engineering- (PHI)
3. Pankaj Jalote, Software Engineering- (Wiley-India)

Reference Books:

4. N.S. Gill, Software Engineering – (Khanna Publishing House)
5. Agarwal and Agarwal, Software Engineering – (PHI)
6. Sommerville, Software Engineering – Pearson
7. Martin L. Shooman, Software Engineering – TMH

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Bloom's Taxonomy	Knowledge Level
IT-501.CO1	Understand software lifecycle processes including traditional and modern approaches depending on the user requirements.	Understand	L2
IT-501.CO2	Role of SDLC in Software project development and Ability to translate end-user requirements into system and software requirements	Remember	L1
IT-501.CO3	Design software using requirement model and Identify appropriate software architectures and patterns to carry out high level design.	Evaluate	L5
IT-501.CO4	Apply software testing and quality assurance techniques at the modular, system and organizational level able to develop testing report.	Apply	L3
IT-501.CO5	Develop project schedule and network diagram for different projects.	Create	L6
IT-501.CO6	Analyze the structure and behaviour of a software system using the UML diagrams.	Analyze	L4

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Operating System
Course Code: IT-502
(Semester- V)
Course Broad Category: Professional Core Course

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1. **Course Prerequisite:**
   Pre-requisites: Knowledge in Computer Organization.

2. **Course Learning Objectives:**
   - Learn concepts of operating systems
   - Learn the mechanisms of OS to handle processes
   - Study of various mechanisms involved in memory management techniques
   - Gaining knowledge of deadlocks prevention and detection techniques
   - Analyzing disk management functions and techniques
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3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Quiz.

   Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

3. **Course Content:**
   Course Name: Operating System
   Course Code: IT-502
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	45L
1.	**Introduction to Operating Systems, Evaluation of OS, Types of operating Systems, system protection, Operating system services, Operating System structure, System Calls and System Boots, Operating System design and implementation, Spooling and Buffering**	8L
2.	**Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling. Process concept, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization,**	10L
3.	**Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling. Concepts of memory management, logical and physical address space, swapping, Fixed and Dynamic Partitions, Best-Fit, First-Fit and Worst Fit Allocation, paging, segmentation, and paging combined with segmentation**	10L
4.	**Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation, Role of Operating System in Security, Security Breaches, System Protection, and Password Managment**	8L
5.	**Disk scheduling, file concepts, File manager, File organization, access methods, allocation methods, free space managements, directory systems, file protection, file organization & access mechanism, file sharing implement issue, File Management in Linux, introduction to distributed systems.**	9L
6.	**CASE STUDY(Not considered in the examination): THE LINUX OPERATING SYSTEM: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter process communication**	

5. References:

Text Book:

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Sixth Edition, Wiley India Pvt Ltd, 2003.

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, PearsonEducation, 2004.

2. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.

3. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Identify the role of Operating System. To understand the design of control unit		
CO2	Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problem		
CO3	Describe the role of paging, segmentation and virtual memory in operating systems		
CO4	Description of protection and security and also the Comparison of UNIX and Windows based OS		
CO5	Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms.		
CO6	Be familiar with various types of operating systems including UNIX		

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Machine Learning
Course Code: IT-503
(Semester - V)
Course Broad Category: Professional Core Course

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1. **Course Prerequisite:**
   A. Mathematics: (Linear Algebra, Probability and Statistics, Calculus)
   B. Data Structures and Algorithms
   C. Programming (Python, R, or MATLAB)

2. **Course Learning Objectives:**
   1. Understand fundamental concepts and types of Machine Learning.
   2. Explore supervised, unsupervised, and reinforcement learning algorithms.
   3. Apply ML algorithms to real-world problems using Python/Matlab.
   4. Evaluate model performance and interpret results.
   5. Learn feature engineering, model selection, and optimization techniques.
   6. Develop small ML projects and hands-on implementations.

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
   C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Machine Learning
   Course Code: IT-503
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	Lectures
1	ML concepts, types, workflow, Applications of ML, Supervised vs unsupervised vs reinforcement learning	7
2	Supervised Learning: Linear regression, logistic regression, Decision trees, KNN, Naive Bayes and SVM	6
3	Unsupervised Learning: Clustering: K-Means, Hierarchical, Dimensionality reduction: PCA, Association rules	6
4	Model Evaluation and Validation: Train-test split, cross-validation, Performance metrics: Accuracy, Precision, Recall, F1-score, Overfitting and underfitting	6
5	Advanced Topics: Ensemble methods: Random Forest, AdaBoost, Hyperparameter tuning, Grid Search, Introduction to Neural Networks	6
6	Mini Project / Case Study: Implement ML algorithms on datasets, Comparative analysis of models, Presentation and report submission	5

5. References:

Text & References Books:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill.
2. Aur´elien G´eron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,
   2nd Edition.
3. Christopher M. Bishop, Pattern Recognition and Machine Learning.
4. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective.

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-503.CO1	Understand ML concepts, types, and workflow.	Understand	L2
IT-503.CO2	Explain supervised, unsupervised, and reinforcement learning algorithms.	Understand	L2
IT-503.CO3	Apply ML algorithms to solve practical problems.	Apply	L3
IT-503.CO4	Analyze model performance using metrics and validation techniques.	Analyze	L4
IT-503.CO5	Evaluate ML models and optimize hyperparameters.	Evaluate	L5
IT-503.CO6	Design and implement ML solutions for small projects.	Evaluate	L5

7. Mapping of course outcomes to module / course content

Module	CO2	CO3	CO4	CO1	CO5	CO6
1						
2						
3						
4						

5						
6						

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
AVG				

***** End of Syllabus*****

Course Name: Database Management Systems
Course Code: IT-504
(Semester–V)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Basic knowledge of computers and programming language.

2. Course Learning Objectives:

I. To understand the different issues involved in the design and implementation of a database system
II. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
III. To understand and use data manipulation language to query, update, and manage a database.
IV. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
V. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
VI. To understand the different issues involved in the design and implementation of a database system.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Database Management Systems
Course Code: IT-504
Hours per Week: 3L:0T:0P
Credits: 3

Module	Topics	Lectures
1	**Database system architecture**: Data Abstraction, Data Independence,Data Definition Language(DDL),Data Manipulation Language(DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	9
2	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source	13

	and Commercial DBMS - MYSQL, ORACLE, DB2, SQLserver. **Relational database design**: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Losslessdesign. **Query processing and optimization**: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	
3	**Storage strategies**: Indices, B-trees, hashing.	3
4	**Transaction processing**: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multiversion and optimistic Concurrency Control schemes, Database recovery.	5
5	**Database Security**: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection	3
6	**Advanced topics**: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	3

5. Text book and Reference books:

1. **."Database System Concepts" , 6th Edition** by Abraham

Silberschatz, Henry F. Korth, S. Sudarshan,McGraw-Hill.

2."**Principles of Database and Knowledge – Base Systems",** Vol 1

by J. D. Ullman, Computer SciencePress.

3."**Fundamentals of Database Systems" , 5th Edition by R.**

Elmasri and S. Navathe,

4.PearsonEducation "Foundations of Databases", Reprint by

Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

5. Database Management Systems, R.P. Mahapatra, Khanna

Publishing House

Web references:

https://nptel.ac.in/courses/106106220

6. Course Outcomes (CO):

After going through this course, the Students will be able to:

CourseOutcomes	Details	ActionVerb	Knowledge Level
IT504.CO1	For a given query write relational algebra expressions for that query and optimize the developed expressions	Understand	L-2
IT504.CO2	For a given specification of the requirement design the databases using E R method andnormalization	Apply	L-3
IT504.CO3	For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, andDB2.	Apply	L-3
IT504.CO4	For a given query optimize its execution using Query optimization algorithms	Analyze	L-4
IT504.CO5	For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.	Create	L-6
IT504.CO6	Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling	Create	L-6

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3
7	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	2	-	-	-	2	-	-	1
CO2	2	2	3	1	3	-	-	-	2	-	-	1
CO3	2	2	3	1	3	-	-	-	2	-	-	2
CO4	2	2	3	1	2	-	-	-	2	-	-	2
CO5	2	2	2	1	2	_	-	-	2	-	-	2
CO6	2	2	2	1	2	2	-	-	2	-	-	3

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-
CO2	3	3	2	-
CO3	3	3	3	-

CO4	3	3	3	-
CO5	3	3	3	2
CO6	3	3	3	2

***** End of Syllabus*****

Course Name: Software Engineering Lab
Course Code: IT-591
(Semester –V)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

A. Basic Programming Skills.
A. Knowledge of Software applications and general mathematical operations.
B. Enthusiasm to learn Management concepts.

2. Course Learning Objectives:

The objective of this course is:

A. To understand the software engineering methodologies involved in the phases for project development.
B. To gain knowledge about open source tools used for implementing software engineering methods.
C. To exercise Designing and developing product-startups implementing software engineering methods. Open source Tools: Microsoft Visio/ Microsoft Project/ lucidchart.com etc.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Laboratory practice and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Internal Assessment (PCIA) (60 Marks)- Formative Continuous Assessment
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Software Engineering Lab
Course Code: PCC-IT 591
Hours per Week: 0L:0T: 4P
Credits: 2

Unit	Content
1	Draw the Data Flow Diagrams (DFD), as the visual representation of the flow of data through several example software systems or processes which is used to understand, analyze, and improve software engineering and business process analysis using Microsoft Visio
2	Draw the Entity Relationship Diagram (ERD) as the visual representation of the flow of relationship in several example software systems or processes which are used to understand, analyze, and improve software engineering and business process analysis using Microsoft Visio.

3	Implement the COCOMO model cost calculation using Java /Python programming.
4	Implement the function Point Metric using Java /Python programming.
5	Prepare Gnatt Chart in Microsoft Project and develop the software project startup, prototype model, using software engineering methodology for the sample experiments
6	Software Designing – Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.

5. References:

Text & References Books:

1. Pressman, Software Engineering: A practitioner's approach– (TMH)
2. Rajib Mall, Software Engineering- (PHI)
3. Pankaj Jalote, Software Engineering- (Wiley-India)

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Bloom's Taxonomy	Knowledge Level
PCC-IT591.1	Define the concepts of Software Development Life Cycle.	Evaluate	L 5
PCC-IT591.2	Explain requirements for proposed project.	Understand	L 2
PCC-IT591.3	Apply tools for project schedule preparation.	Apply	L 3
PCC-IT591.4	Justify real-life scenario using UML diagrams.	Analyze	L 4
PCC-IT591.5	Design test plan for project.	Create	L 6
PCC-IT591.6	Develop the software project in prototype mode.	Create	L 6

7. Mapping of course outcomes to module / course content:

Unit	CO1	CO2	CO3	CO4	CO5	CO6

8. Mapping of the Course outcomes to Program Outcomes (PO):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												
AVG.												

9. Mapping to Program Specific Outcomes (PSO):

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Operating System Lab
Course Code: IT-592
(Semester –V)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- ESCS-291 C Programming, Java Programming, PCC-IT 592 Operating System Lab.)

2. Course Learning Objectives:

1. The main objective is students gain knowledge about various Operating System Memory management and Commands using in Operating system.
2. To inculcate the Shell programming skill and its application
3. To understand the concept of processes, threads, Scheduling and Deadlocks via programming

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Internal Assessment (60 Marks)- Formative Continuous Assessment
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Operating System Lab
Course Code: IT-592
Hours per Week: 0L: 0T: 4P
Credits: 2

Unit	Content
1	Working with basic Unix/ Linux commands
2	Shell Programming.
3	Programs using the following system calls of Unix / Linux operating system: fork, exec, getpid,exit, wait, close, stat, opendir, readdir
4	Programs using the I/O system calls of UNIX operating system (open, read, write)
5	Simulations of Unix / Linux commands like ls, grep, etc
6	Simulation of scheduling algorithms (CPU and Disk).
7	Implementation ofsynchronization problems using Semaphore.
8	Simulation of basic memory management schemes
9	Simulation of virtual memory management schemes

10	Simulation of file systems.

5.REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
CO1	Demonstrate Unix / Linux commands.		
CO2	Implement various commands using shell programming		
CO3	Implement various CPU scheduling algorithms		
CO4	Implement various disk scheduling algorithms..		
CO5	Implement memory management techniques		
CO6	Implement Synchronization and Semaphores..		

7. Mapping of course outcomes to module / course content

Unit	CO1	CO2	CO3	CO4	CO5	CO6

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												
AVG.												

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Machine Learning Lab
Course Code: IT-592
(Semester – V)
Course Broad Category: Professional Core Course

1. Course Prerequisite

- Basic knowledge of Python programming.
- Understanding of data structures and algorithms.
- Basic understanding of probability, statistics, and linear algebra.

2. Course Learning Objectives

- To understand and implement fundamental machine learning algorithms.
- To learn data preprocessing, feature engineering, and model evaluation techniques.
- To use open-source tools and frameworks for machine learning development. **Open Source Tools:** Python, NumPy, Pandas, Scikit-learn, Matplotlib, Jupyter Notebook.

3. Teaching Methodology and Evaluation System

Teaching Methodology:
Hands-on laboratory practice, mini-projects, presentations, interactive discussions, and real-world case studies.

Evaluation System:

- Internal Assessment (PCIA) – 60 Marks
- End-Semester Practical Exam – 40 Marks

4. Course Content

Unit	Content
1	Introduction to Python libraries for ML — NumPy, Pandas, Matplotlib; Data loading and preprocessing; Handling missing values, encoding, normalization, visualization.
2	Implement supervised learning algorithms — Linear Regression, Logistic Regression, k-NN — using Python and Scikit-learn.
3	Implement Decision Trees, Random Forest, Naïve Bayes; Evaluate models using cross-validation, confusion matrix, accuracy, precision, recall, F1-score.
4	Implement unsupervised learning techniques — k-Means clustering, Hierarchical clustering, PCA.
5	Implement Artificial Neural Networks using TensorFlow/Keras.
6	Mini Project — Dataset preparation, model building, evaluation, documentation, and presentation.

5. References

1. Aurélien Géron, *Hands-On Machine Learning* – O'Reilly.
2. Tom Mitchell, *Machine Learning* – McGraw Hill.
3. Müller & Sarah Guido, *Introduction to Machine Learning with Python* – O'Reilly.

6. Course Outcomes (CO)

Course Outcome	Details	Bloom's Taxonomy	Level
PCC-IT592.1	Demonstrate data preprocessing and visualization techniques.	Understand	L2
PCC-IT592.2	Implement supervised learning algorithms.	Apply	L3
PCC-IT592.3	Analyze model performance using evaluation metrics.	Analyze	L4
PCC-IT592.4	Implement unsupervised learning algorithms.	Apply	L3
PCC-IT592.5	Build neural network models using ML frameworks.	Create	L6
PCC-IT592.6	Develop a real-world ML mini project.	Create	L6

7. Mapping of Course Outcomes to Course Content

Unit	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												
AVG.												

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus *****

Course Name: Database Management System Lab

Course Code: IT 594
(Semester –V)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Basic knowledge of programming

2. Course Learning Objectives:

I. **Develop problem-solving skills**
II. **Application Of Problem-Solving** – Apply programming concepts to solve real-world problems

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Internal Assessment (60 Marks)- Formative Continuous Assessment
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Database Management System Lab
Course Code: IT 594
Hours per Week: 0L:0T: 4P
Credits: 2

Unit	Content
1	Structured Query Language: Creating a Database, Creating a Table ,Specifying Relational Data Types, Specifying Constraints, Creating Indexes.
2	Table and Record Handling: INSERT statement Using SELECT and INSERT together DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements 3. Retrieving Data from a Database 1. The SELECT statement 2. Using the WHERE clause 3. Using Logical Operators in the WHERE clause 4. Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause 5. Using Aggregate Functions
3	Combining Tables Using joins: inner joins and outer joins: cross joins, natural join, equi join, self join, left outer join, right outer joins
4	Creating complex queries: By using Sub-queries, Creating Views ,Creating Column Aliases , Creating Database Users using GRANT and REVOKE

5	PL/SQL1: Writing Oracle PL / SQL programs, Stored Procedures: cursors, trigger etc.
6	PL/SQL 2: Develop application programs using PL/SQL
7	Design and implement a minor project: using MySQL, MongoDB databases, using programming language like JavaScript (Node.js)

5. References:

1. SQL, PL/SQL the Programming Language of Oracle by Ivan Bayross.
2. Database Management System (DBMS): A Practical Approach by Rajiv Chopra.

Web Reference: https://www.w3schools.com/

6. Course Outcomes (CO):

Course Outcomes	Details	ActionVerb	Knowledge Level
IT-594.CO1	Design and Implement a database schema	Understand	L-2
IT-594.CO2	Devise queries using DDL, DML, DCL and TCL commands	Apply	L-3
IT-594.CO3	Develop application programs using PL/SQL	Apply	L-3
IT-594.CO4	Design and implement a project using embedded SQL and GUI.	Analyze	L-4

7. Mapping of course outcomes to module / course content

Unit	CO1	CO2	CO3	CO4
1	3	-	-	-
2,3,4	-	3	-	-
5,6	-	-	3	-
7	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	2	-	2	2
CO2	3	3	2	-	-	-	-	-	2	-	2	2
CO3	3	3	3	2	-	-	-	-	2	-	2	2
CO4	3	3	3	2	-	2	-	-	2	-	-	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2

CO2	3	3	2	2
CO3	3	3	3	2
CO4	3	3	3	2

***** End of Syllabus*****

Course Name: Soft Skills and Professional Development Lab
Course Code: IT-595
(Semester – V)
Course Broad Category: Professional Core Course

1. Course Prerequisite

- Basic English communication skills.
- Awareness of professional workplace norms.
- Willingness to participate in team activities and presentations.

2. Course Learning Objectives

- To develop advanced verbal and non-verbal communication skills.
- To apply leadership, negotiation, and conflict resolution techniques.
- To prepare and deliver professional presentations, project reports, and proposals.
- To cultivate problem-solving, analytical thinking, and ethical decision-making skills.
- To build readiness for interviews, group discussions, and corporate engagements.

3. Teaching Methodology and Evaluation System

Teaching Methodology:
Role-plays, simulations, scenario-based exercises, teamwork, case studies, peer feedback, ICT-enabled learning (NPTEL, SWAYAM), mini-projects, presentations, and portfolio assessment. Emphasis on ethics, adaptability, and professional behaviour.

Evaluation System:
Continuous Internal Evaluation (CIE) – 60 Marks

- Participation and Attendance – 10 Marks
- Assignments / Quizzes / Exercises – 20 Marks
- Presentation / Mini Project – 20 Marks
- Viva-Voce – 10 Marks

End Semester Evaluation (ESE) – 40 Marks

- Final Presentation / Activity – 20 Marks
- Final Viva-Voce – 20 Marks

4. Course Content

Module	Content
1	Advanced Communication Skills (Weeks 1–3): Presentation skills, body language, articulation; professional listening and questioning techniques; advanced group discussion exercises.
2	Leadership and Negotiation Skills (Weeks 4–5): Leadership styles and roles; conflict resolution and negotiation strategies; team building exercises.
3	Professional Writing and Reporting (Weeks 6–7): Project report writing; proposal writing and documentation; technical email etiquette.
4	Problem Solving and Analytical Thinking (Weeks 8–10): Critical thinking case studies; decision-making under constraints; problem-solving exercises.
5	Time Management and Ethics (Weeks 11–12): Time and priority management; ethical decision-making; professional adaptability exercises.
6	Mini Project / Corporate Simulation (Weeks 13–14): Mock interviews and group discussion sessions; team-based corporate scenario simulation; presentation of mini-project or portfolio.

5. References

Textbooks:

1. K. Alex, *Soft Skills – Know Yourself and Know the World.*
2. Gopalaswamy Ramesh, *Effective Communication and Soft Skills.*

Reference Books:

1. Dale Carnegie, *How to Win Friends and Influence People.*
2. John Adair, *Effective Communication.*

E-Resources:

- NPTEL / SWAYAM Soft Skills Courses
- TED Talks on Communication and Leadership
- Coursera / EdX: Communication Skills

6. Course Outcomes (CO)

Course Outcome	**Details**	**Bloom's Taxonomy**	**Level**
CO1	Demonstrate advanced verbal and non-verbal communication skills.	Apply	L3
CO2	Apply leadership, negotiation, and conflict resolution techniques.	Analyze	L4
CO3	Prepare and deliver professional presentations and project reports.	Analyze	L4
CO4	Analyze complex workplace scenarios and make ethical decisions.	Evaluate	L5
CO5	Exhibit problem-solving, analytical thinking, and adaptability.	Evaluate	L5
CO6	Demonstrate readiness for interviews, group discussions, and corporate engagement.	Create	L6

7. Mapping of Course Outcomes to Course Content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												
AVG.												

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus *****

Course Name: Constitution of India

Course Code: IT-581

(Semester-V)

Course Broad Category: Value Added Course

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1. **Course Prerequisite:**
   NIL
2. **Course Learning Objectives:**
   i. Be able to understand the principles and architectures of data warehousing and data mining.
   ii. Be able to analyze and design various pattern extraction techniques on the association, classification, and clustering of data.
   iii. Be able to understand the mining of text data, time series data and stream data.
   iv. Be able to understand graph mining and web mining.
   v. Be able to apply data mining techniques for solving real-life problems in various domains.
3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]

4. **Course Content:**
   Course Name: Constitution of India
   Course Code: IT-581
   Hours per Week: 2L: 0T: 0P
   Credits: 0

Module	Topics	Lectures
1	Introduction: Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	3
2	Union Government and its Administration : Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	6
3	State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions	6
4	Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different 4.departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	7
5	Election Commission Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women	7

5. References:

Text & References Books:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-581.CO1	Explain the meaning, sources, and historical evolution of the Indian Constitution, highlighting its unique features such as citizenship, preamble, fundamental rights, duties, and directive principles.	Understand	L2

IT-581.CO2	Analyze the structure of the Indian Union, federalism, and Centre–State relations, and evaluate the roles and powers of the President, Prime Minister, Council of Ministers, and Parliament.	Analyze	L4
IT-581.CO3	Describe the organisation and functioning of State Government, including the Governor, Chief Minister, Council of Ministers, and State Secretariat, and assess their administrative significance.	Understand	L2
IT-581.CO4	Examine the organisation and functioning of local administration at district, municipal, block, and village levels, and appraise the importance of Panchayati Raj institutions in strengthening grassroots democracy.	Understand	L2
IT-581.CO5	Evaluate the role and functioning of the Election Commission of India and State Election Commissions, including the responsibilities of the Chief Election Commissioner and measures for free and fair elections.	Evaluate	L5
IT-581.CO6	Critically assess the role of constitutional and statutory bodies in promoting the welfare of SC/ST/OBC and women, and propose measures for inclusive governance.	Evaluate	L5

7. Mapping of course outcomes to module / course content

	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						

8. Mapping of the Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

CO5												
CO6												

9. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****