K.K. Wagh Institute of Engineering Education and Research, Nashik

Curriculum
T.Y. B.Tech.
Information Technology
w.e.f.: AY 2024-2025
(2022 Pattern)

Course Code	Course Type	Title of Course	TH	TU	PR	INSEM	ENDSEM	CCE	TUT /TW	PR /OR	TOTAL	TH	TU	PR	TOTAL
T.Y. B. Tech wef AY 2024-25															
SEM-V															
			Teaching Scheme			Evaluation Scheme and Marks						Credits			
INT223001	DCC	Theory of Computation	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223002	DCC	Operating Systems	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223003	DCC	Machine Learning	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223004	DCC	Operating Systems Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223005	DCC	Machine Learning Lab	-	-	2				25	25	**50**	-	-	1	**1**
INT223006A INT223006B	DEC	Internet of Things/ Design and Analysis of Algorithms	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223007A INT223007B	DEC	Internet of Things Lab/ Design and Analysis of Algorithms Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223008	OEC	IPR & Patents	2	-	-	-	-	50	-	-	**50**	2	-	-	**2**
INT223009	ESC	Human Computer Interaction	3	-	-	20	60	20	-	-	**100**	3	-	-	**3**
INT223010	PSI	Project Based Learning	-	1	2	-	-	-	TUT-25 TW-25	-	**50**	-	1	1	**2**
Total			**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

			Teaching Scheme			Evaluation Scheme and Marks					Credits				
T.Y. B. Tech wef AY 2024-25															
SEM-VI															
Course Code	**Course Type**	**Title of Course**	**TH**	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
INT223011	DCC	Software Engineering & Project Management	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223012	DCC	Data Science and Big Data Analytics	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223013	DCC	Data Science and Big Data Analytics Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223014A INT223014B INT223014C	DEC	Artificial Intelligence & Neural Networks/ Cyber Security /Multimedia Technology	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223015A INT223015B	DEC	Cloud Computing / Software Modeling and Design	3	-	-	20	60	20	-	-	**100**	3	-	-	**3**
INT223016A INT223016B	DEC	Cloud Computing Lab / Software Modeling and Design Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223017	ESC	Communication Networks	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223018	OEC	Bioinformatics	2	-	-	-	-	50	-	-	**50**	2	-	-	**2**
INT223019	ASM	Network and Hardware Support	-	1	2				25	25	**50**	-	1	1	**2**
INT223020	PSI	Project Based Seminar	-	-	2	-	-	-	50	-	**50**	-	-	1	**1**
Total			**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

SEM-1

T. Y. B. Tech.
Pattern 2022 Semester: V Information Technology
INT223001: Theory of Computation

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: - Data structures, Discrete Mathematics

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.	3-Apply
CO2	Understand regular expressions for the regular languages and finite automata.	2-Understand
CO3	Identify types of grammar, design and simplify Context Free Grammar.	2-Understand
CO4	Construct Pushdown Automata machine for the Context Free Language.	3-Apply
CO5	Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.	3-Apply

COURSE CONTENTS

Unit I	Finite Automata	(07hrs)	COs Mapped – CO1

Basic Concepts: Symbols, Strings, Language, Formal Language.
Finite Automata: FA as Language Acceptor or Verifier. Construction of DFA, NFA (with and without ε), Conversion (NFA to DFA), Applications of FA.
Finite State Machines with output: Moore and Mealy Machines. Moore and Mealy M/C Conversion. Limitations of FA.

Unit II	REGULAR EXPRESSIONS AND LANGUAGES	(07hrs)	COs Mapped – CO2

Regular Expressions (RE) : Definition and Identities of RE, Operators of RE, Equivalence of two regular expressions, Equivalence of regular expressions and regular languages (RL), Conversion of RE to FA using direct method, Conversion of FA to RE using Arden's theorem, Pumping lemma for RLs, Closure properties of RLs, Applications of Regular Expressions.

Unit III	CONTEXT FREE GRAMMAR	(08hrs)	COs Mapped – CO3

Context Free Languages: Definition of CFG Leftmost and Rightmost derivations, Ambiguity. Simplification and Normalization (CNF & GNF) and Chomsky Hierarchy (Types 0 to 3). Context Free Language (CFL), Pumping lemma for CFL.

Unit IV	PUSHDOWN AUTOMATA	(8hrs)	COs Mapped – CO4

Pushdown Automata (PDA): Introduction and formal definition of PDA, Construction of Transition diagram and Transition table for PDA Deterministic PDA and Nondeterministic PDA, Context Free Language and PDA Conversion of CFG to PDA and PDA to CFG. Power and Limitations of PDA. Post Machine (PM): Definition and construction of Post Machine

Unit V	TURING MACHINE	(07hrs)	COs Mapped – CO5

Turing Machine: Deterministic TM. Variants of TM, Halting problem, Power of TM Multi-tape TM, Universal Turing Machine, Halting problem of TM , Church-Turing thesis, Recursive Languages and Recursively Enumerable Languages,
Decidability: Decidable problems concerning regular languages, Decidable problems concerning context free languages, Un-decidability.

Text Books

1. J. Martin, Introduction to languages and the Theory of Computation, McGraw Hill.
2. K. Mahesh, Theory of Computation: A Problem-Solving Approach, Wiley.
3. A. Aho, R. Shethi, M. Lam and J. Ulman, Compilers Principles, Techniques and Tools, Pearson.

Reference Books

1. J. Hopcroft, R. Motwani and J. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson.
2. D. Cohen, Introduction to Computer Theory, Wiley.
3. V. Kulkarni, Theory of Computation, Oxford University Press.
4. N. Chandrashekhar, K. Mishra, Theory of Computer Science, Automata Languages & Computations, PHI.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.	
Pattern 2022 Semester: V - Information Technology	
INT223002: Operating Systems	

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	**Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks**

Prerequisite Courses, if any: - Computer Organization and Architecture, C Programming.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand role of operating systems along with basic commands for shell programming.	2-Understand
CO2	Implement concepts of processes, scheduling algorithms and threads.	3-Apply
CO3	Apply concepts of process synchronization, mutual exclusion and deadlock handling.	3-Apply
CO4	Understand various memory management techniques.	2-Understand
CO5	Interpret I/O management and File system in operating system.	2-Understand

COURSE CONTENTS

Unit I	OVERVIEW OF OPERATING SYSTEM	(07hrs)	COs Mapped – CO1

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, Introduction to Linux OS, BASH Shell scripting: Basic shell commands.

Unit II	PROCESS MANAGEMENT	(08hrs)	COs Mapped – CO2

Process: Concept of a Process, Process States, Process Description, Process Control
Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads.
Scheduling: Types of Scheduling, Scheduling Algorithms, First Come First Served, Shortest Job First, Priority, Round Robin

Unit III	CONCURRENCY CONTROL	(07hrs)	COs Mapped – CO3

Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Operating System Support (Semaphores and Mutex).
Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem, Inter-process communication (Pipes, Shared Memory).

Deadlock: Principles of Deadlock, Deadlock Modeling, and Strategies to deal with deadlock: Prevention, Avoidance, Detection and Recovery. Example: Dining Philosophers Problem / Banker's Algorithm.			
Unit IV	**MEMORY MANAGEMENT**	**(07hrs)**	**COs Mapped – CO4**

Memory Management: Memory Management Requirements, **Memory Partitioning:** Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Page table structure, Segmentation
Virtual Memory: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal), Allocation of frames, Thrashing

Unit V	**INPUT / OUTPUT AND FILE MANAGEMENT**	**(07hrs)**	**COs Mapped – CO5**

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, I/O Buffering, Disk Scheduling (FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK).
File Management: Overview-Files and File Systems, File structure. File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.

Text Books
1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition,2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition,2012, ISBN 978-1-118-06333-0
Reference Books
1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN-10: 0596009526, ISBN-13: 978-0596009526.
2. Mendel Cooper, Advanced Shell Scripting, Linux Documentation Project.
3. Andrew S. Tanenbaum& Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech. Pattern 2022 Semester: V - Information Technology INT223003: Machine Learning		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses, if any: - Database Management Systems, Discrete Mathematics

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply basic concepts of machine learning and different types of machine learning algorithms.	3-Apply
CO2	Understand classification strategies and evaluate their performance.	3-Apply
CO3	Differentiate various regression techniques and evaluate their performance.	3-Apply
CO4	Illustrate the tree-based and probabilistic machine learning algorithms.	4-Analyze
CO5	Understand fundamental concepts of ANN.	2-Understand

COURSE CONTENTS

Unit I	INTRODUCTION TO MACHINE LEARNING	(07hrs)	COs Mapped – CO1

Introduction: What is Machine Learning, Definition, Real life applications, Learning Tasks-Descriptive and Predictive Tasks, Types of Learning: Supervised Learning Unsupervised Learning, Semi-Supervised Learning, Reinforcement Learning. Features: Types of Data (Qualitative and Quantitative), Scales of Measurement (Nominal, Ordinal, Interval, Ratio), Concept of Feature, Feature construction, Feature Selection and Transformation, Curse of Dimensionality. Dataset Preparation: Training Vs. Testing Dataset, Dataset Validation Techniques – Hold-out, k-fold Cross validation, Leave-One-Out Cross-Validation (LOOCV)

Unit II	CLASSIFICATION	(09hrs)	COs Mapped – CO2

Binary Classification: Linear Classification model, Performance Evaluation- Confusion Matrix, Accuracy, Precision, Recall, ROC Curves, F-Measure
Multi-class Classification: Model, Performance Evaluation Metrics – Per-class Precision and Per-Class Recall, weighted average precision and recall -with example, Handling more than two classes, Multiclass Classification techniques -One vs One, One vs Rest
Linear Models: Introduction, Linear Support Vector Machines (SVM) – Introduction, Soft Margin SVM, Introduction to various SVM Kernel to handle non-linear data – RBF, Gaussian, Polynomial, Sigmoid.
Logistic Regression – Model, Cost Function. Mapping

Unit III	REGRESSION	(07hrs)	COs Mapped – CO3

Regression: Introduction, Univariate Regression – Least-Square Method, Model Representation, Cost Functions: MSE, MAE, R-Square, Performance Evaluation, Optimization of Simple Linear Regression with Gradient Descent - Example. Estimating the values of the regression coefficients
Multivariate Regression: Model Representation
Introduction to Polynomial Regression: Generalization- Overfitting Vs. Underfitting, Bias Vs. Variance

Unit IV	TREE BASED, PROBABILISTIC AND DISTANCE BASED MODELS	(08hrs)	COs Mapped – CO4

Tree Based Model: Decision Tree – Concepts and Terminologies, Impurity Measures -Gini Index, Information gain, Entropy, Tree Pruning -ID3/C4.5, Advantages and Limitations Probabilistic Models: Conditional Probability and Bayes Theorem, Naïve Bayes Classifier, Bayesian network for Learning and Inferencing.
Distance Based Models: Distance Metrics (Euclidean, Manhattan, Hamming, Minkowski Distance Metric), Neighbors and Examples, K-Nearest Neighbour for Classification and Regression, Clustering as Learning task: K-means clustering Algorithm-with example, k-medoid algorithm-with example, Hierarchical Clustering, Divisive Dendrogram for hierarchical clustering, Performance Measures Association Rule Mining: Introduction, Rule learning for subgroup discovery, Apriori Algorithm, Performance Measures – Support, Confidence, Lift.

Unit V	INTRODUCTION TO ARTIFICIAL NEURAL NETWORK	(08hrs)	COs Mapped – CO5

Perceptron Learning– Biological Neuron, Introduction to ANN, McCulloch Pitts Neuron, Perceptron and its Learning Algorithm, Sigmoid Neuron, Activation Functions: Tanh, ReLu Multi-layer Perceptron Model – Introduction, Learning parameters: Weight and Bias, Loss function: Mean Square Error

Text Books
1. EthemAlpaydin, Introduction to Machine Learning, PHI 2nd Edition-2013
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012
4. Tom M. Mitchell, Machine Learning, 1997, McGraw-Hill, First Edition

Reference Books
1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition
3. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.
4. ParagKulkarni: Reinforcement and Systematic Machine Learning for Decision Making, Wiley IEEE Press, Edition July 2012.
5. Shalev-Shwartz S., Ben-David S., Understanding Machine Learning: From Theory to Algorithms, CUP, 2014

6. Jack Zurada: Introduction to Artificial Neural Systems, PWS Publishing Co. Boston, 2002

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	20

T. Y. B. Tech. **Pattern 2022 Semester: V - Information Technology** **INT223004: Operating Systems Lab**	

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical :02 hrs/week	**01**	**Termwork: 25Marks** **Practical: 25Marks**

Prerequisite Courses, if any: -Fundamentals of Data Structures, C Programming.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Apply the basics of Linux commands to build shell scripts application	3-Apply
CO2	Implement basic building blocks like processes, threads under the Linux.	3-Apply
CO3	Develop system program for the functioning of concurrency control.	3-Apply
CO4	Develop system programs for Inter Process Communication in Linux.	3-Apply

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Study of Basic Linux Commands: echo, ls, read, cat, touch, test, loops, arithmetic comparison, conditional loops, grep, sed etc.	CO1
2	Write a program to implement an address book with options given below: a) Create address book. b) View address book. c) Insert a record. d) Delete a record. e) Modify a record. f) Exit	CO1
3	Implement the C program in which main program accepts the integers to be sorted. Main program uses the FORK system call to create a new process called a child process. Parent process sorts the integers using sorting algorithm and waits for child process using WAIT system call to sort the integers using any sorting algorithm. Also demonstrate zombie and orphan states.	CO2
4	Implement the C program in which main program accepts an array. Main program uses the FORK system call to create a new process called a child process. Parent process sorts an array and passes the sorted array to child process through the command line arguments of EXECVE system call. The child process uses EXECVE system call to load new program which display array in reverse order.	CO2
5	Thread synchronization using counting semaphores. Application to demonstrate: producer- consumer problem with counting semaphores and mutex.	CO3
6	Thread synchronization and mutual exclusion using mutex. Application to demonstrate: Reader- Writer problem with reader priority.	CO3
7	Inter process communication in Linux using FIFOS:Full duplex communication between two independent processes. First process accepts	CO4

	sentences and writes on one pipe to be read by second process and second process counts number of characters, number of words and number of lines in accepted sentences, writes this output in a text file and writes the contents of the file on second pipe to be read by first process and displays on standard output.	
8	Inter-process Communication using Shared Memory: Application to demonstrate: Client and Server Programs in which server process creates a shared memory segment and writes the message to the shared memory segment. Client process reads the message from the shared memory segment and displays it to the screen.	**CO4**

Guidelines for Laboratory Conduction

Use of Open Source Operating System is to be encouraged.
All the assignments should be implemented using C programming language on Open Source OS.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Termwork Assessment

1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

	T. Y. B. Tech.

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T. Y. B. Tech.
Pattern 2022 Semester: V - Information Technology
INT223005: Machine Learning Lab

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Teaching Scheme:		Credit Scheme:	Examination Scheme:
Practical: 02 hrs/week		01	Termwork: 25 Marks Practical: 25 Marks

Prerequisite Courses : - Python programming language

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Implement different supervised and unsupervised learning algorithms.	3-Apply
CO2	Evaluate performance of machine learning algorithms for real-world applications.	2-Apply
	Reference Books	

1. EthemAlpaydin, Introduction to Machine Learning, PHI 2nd Edition-2013
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012
4. Tom M. Mitchell , Machine Learning, 1997, McGraw-Hill, First EditionC. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
5. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition
6. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012.
7. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.
8. Shalev-Shwartz S., Ben-David S., Understanding Machine Learning: From Theory to Algorithms, CUP, 2014
9. Jack Zurada: Introduction to Artificial Neural Systems, PWS Publishing Co. Boston, 2002

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Download heart dataset from following link. https://www.kaggle.com/zhaoyingzhu/heartcsv Implement following Data Preprocessing using Python / Scilab: a. Data Cleaning b. Handling Missing Data c. Data Transformation, d. Randomly divide dataset in training (75%) and testing (25%).	**CO1**
2	Consider COVID Dataset. Through the diagnosis test I predicted 100 report as COVID positive, but only 45 of those were actually positive. Total 50	**CO2**

	people in my sample were actually COVID positive. I have total 500 samples. Considering above scenario create dataset and generate confusion matrix and find : I. Accuracy II. Precision III. Recall IV. F-1 score.	
3	Assignment on Regression technique: Download temperature data from below link. https://www.kaggle.com/venky73/temperaturesof-india?select=temperatures.csv This data consists of temperatures of INDIA averaging the temperatures of all places month wise. Temperatures values are recorded in CELSIUS a. Apply Linear Regression using suitable library function and predict the Month-wise temperature. b. Assess the performance of regression models using MSE, MAE and R-Square metrics c. Visualize simple regression model.	**CO1,CO2**
4	**Assignment on Classification** technique Every year many students give the GRE exam to get admission in foreign Universities. The data set contains GRE Scores (out of 340), TOEFL Scores (out of 120), University Rating (out of 5), Statement of Purpose strength (out of 5), Letter of Recommendation strength (out of 5), Undergraduate GPA (out of 10), Research Experience (0=no, 1=yes), Admitted (0=no, 1=yes). Admitted is the target variable. Data Set Available on kaggle (The last column of the dataset needs to be changed to 0 or 1) Data Set :https://www.kaggle.com/mohansacharya/graduate-admissions The counsellor of the firm is supposed check whether the student will get an admission or not based on his/her GRE score and Academic Score. So to help the counsellor to take appropriate decisions build a machine learning model classifier using Decision tree to predict whether a student will get admission or not. Apply Data pre-processing (Label Encoding, Data Transformation….) techniques if necessary. Perform data-preparation (Train-Test Split) Apply Machine Learning Algorithm Evaluate Model.	**CO1,CO2**
5	Assignment on Improving Performance of Classifier Models A SMS unsolicited mail (every now and then known as cell smartphone junk mail) is any junk message brought to a cellular phone as textual content messaging via the Short Message Service (SMS). Use probabilistic approach (Naive Bayes Classifier / Bayesian Network) to implement SMS Spam Filtering system. SMS messages are categorized as SPAM or HAM using features like length of message, word depend, unique keywords etc. Download Data -Set from: http://archive.ics.uci.edu/ml/datasets/sms+spam+collection This dataset is composed by just one text file, where each line has the correct class followed by the raw message. a. Apply Data pre-processing (Label Encoding, Data Transformation….) techniques if necessary	**CO1,CO2**

	b. Perform data-preparation (Train-Test Split) c. Apply at least two Machine Learning Algorithms and Evaluate Models d. Apply Cross-Validation and Evaluate Models and compare performance. e. Apply Hyper parameter tuning and evaluate models and compare performance.	
6	Assignment on Clustering Techniques Download the following customer dataset from below link: Data Set: https://www.kaggle.com/shwetabh123/mall-customers This dataset gives the data of Income and money spent by the customers visiting a Shopping Mall. The data set contains Customer ID, Gender, Age, Annual Income, Spending Score. Therefore, as a mall owner you need to find the group of people who are the profitable customers for the mall owner. Apply at least two clustering algorithms (based on Spending Score) to find the group of customers. a. Apply Data pre-processing (Label Encoding , Data Transformation….) techniques if necessary. b. Perform data-preparation(Train-Test Split)	**CO1,CO2**
7	**Assignment on Association Rule Learning** Download Market Basket Optimization dataset from below link. Data Set: https://www.kaggle.com/hemanthkumar05/market-basket-optimization This dataset comprises the list of transactions of a retail company over the period of one week. It contains a total of 7501 transaction records where each record consists of the list of items sold in one transaction. Using this record of transactions and items in each transaction, find the association rules between items. There is no header in the dataset and the first row contains the first transaction, so mentioned header = None here while loading dataset. Follow following steps: Data Preprocessing Generate the list of transactions from the dataset Train Apriori algorithm on the dataset Visualize the list of rules Generated rules depend on the values of hyper parameters. By increasing the minimum confidence value and find the rules accordingly	**CO1,CO2**
8	**Assignment on Artificial Neural Network Model** Download the dataset of Crystal System Properties for Li-ion batteries Data Set:https://www.kaggle.com/datasets/divyansh22/crystal-system-properties-for-liion-batteries Consider the above dataset contains data about the physical and chemical properties of the Li-ion silicate cathodes. These properties can be useful to predict the class of a Li-ion battery. These batteries can be classified on the basis of their crystal system. Three major classes of crystal system include: monoclinic, orthorhombic and triclinic. Predict the battery classes with Artificial Neural Network (ANN) classification algorithm.	**CO1,CO2**
Guidelines for Laboratory Conduction		
Use of open source software is to be encouraged. All the assignments should be implemented using python programming language		
Guidelines for Student's Lab Journal		
The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement,		

theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Termwork Assessment
1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

T. Y. B. Tech.
Pattern 2022 Semester: V - Information Technology
INT223006A: Internet of Things

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses, if any: - Computer Organization and Architecture

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand fundamental requirements and architecture of IoT	2- Understand
CO2	Understand business models for the Internet of Things	2- Understand
CO3	Explore the various platforms in IoT.	2- Understand
CO4	Design and implement IoT application based on network architecture	3-Apply
CO5	Design and implement smart object interface using wireless technology for IoT application	3-Apply

COURSE CONTENTS

Unit I	INTRODUCTION TO IoT	(08hrs)	COs Mapped - CO1

What is the Internet of Things? : History of IoT, About IoT, Overview and Motivations, Examples of Applications of IoT,
Internet of Things Definitions and Frameworks: IoT Definitions, IoT Architecture, General Observations, ITU-T Views, IoT Framework.
Physical Design of IoT: IoT Protocols, Logical Design of IoT: Functional block.
IoT Enabling Technologies: WSN, Cloud Computing, Big data Analytics, Communication Protocols, Embedded systems
IoT levels and Deployment templates: Level 1 to Level 5.

Unit II	FUNDAMENTALS OF IoT NETWORK ARCHITECTURE AND DESIGN	(08hrs)	COs Mapped – CO4

The one M2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture, A Simplified IoT Architecture, IoT protocol stack, The Core IoT Functional Stack, IoT Data Management and Compute Stack: Fog Computing, Edge Computing, The Hierarchy of Edge, FogCloudIoT and M2M: Introduction to M2M, Difference between IoT and M2M

Unit III	Smart Objects: the "Things" in IoT	(07hrs)	COs Mapped – CO5

Sensors, Actuators, and Smart Objects, Sensor Networks
Connecting Smart Objects: Communications Criteria
Introduction to Non-IP Based Protocol (IEEE 802.11, IEEE 802.15.4), BlueTooth, ZigBee, IP Based Protocol (IPV4, IPV6, 6LoWPAN)

Unit IV	ADDRESSING TECHNIQUES AND BUSINESS MODELS FOR IoT	(06hrs)	COs Mapped – CO2

Address Capabilities, IPv6 Protocol Overview, IPv6 Tunneling, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.
Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things.

Unit V	IOT PLATFORMS AND ITS APPLICATIONS	(09hrs)	COs Mapped – CO3

What is an IoT Device, Exemplary Devices: Raspberry Pi, Raspberry Pi Interfaces Other IoT Devices: CubieBoard, ARDUINO
Internet of Things Application: Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Home Automation

Text Books
1. Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach" , 2014, Universities Press(India) Pvt Ltd., ISBN: 9788173719547   2.David Hanes, Gonzalo Salgueiro, Patrick Grossetete, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", Cisco Press
Reference Books
1. Peter Waher, "Learning Internet of Things", 2015, Packt Publishing, ISBN: 978-1-78355-353-2   2.Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", 2010, Wiley Publication, ISBN: 978-0-470-99765-9   3. Simon Monk, "Raspberry Pi Cookbook, Software and Hardware Problems and solutions", 2019, O'Reilly, ISBN 9781492043225

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	20

T. Y. B. Tech.
Pattern 2022 Semester: V - Information Technology
INT223006B: Design and Analysis of Algorithms

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: Data Structures and Algorithms, Discrete Structures and Basic mathematics.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Calculate computational complexity using asymptotic notations for various algorithms.	3-Apply
CO2	Apply Divide & Conquer as well as Greedy approach to design algorithms.	3-Apply
CO3	Understand and analyze optimization problems using dynamic programming.	2-Understand
CO4	Illustrate different problems using Backtracking.	3-Apply
CO5	Compare different methods of Branch and Bound strategy.	3-Apply

COURSE CONTENTS

Unit I	INTRODUCTION	(08hrs)	COsMapped- CO1

Proof Techniques: Contradiction, Mathematical Induction, Direct proofs, Proof by counter example, Proof by contraposition. Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega. Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations using Masters theorem and Substitution method. Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem.

Unit II	DIVIDE AND CONQUER AND GREEDY METHOD	(08hrs)	COs Mapped - CO1, CO2

Divide & Conquer: General method, Quick Sort – Worst, Best and average case. Binary search, Finding MaxMin, Large integer Multiplication (for all above algorithms analysis to be done with recurrence). Greedy Method: General method and characteristics, Kruskal's method for MST (using n log n complexity), Dijkstra's Algorithm, Fractional Knapsack problem, Job Sequencing, Max flow problem and Ford-Fulkerson algorithm in transport network.

Unit III	DYNAMIC PROGRAMMING	(08hrs)	COs Mapped - CO1, CO3

General strategy, Principle of optimality, 0/1 knapsack Problem, Coin change-making problem, Bellman Ford Algorithm, Multistage Graph problem (using Forward computation), Travelling Salesman Problem

Unit IV	BACKTRACKING	(07hrs)	COs Mapped - CO1, CO4

General method, Recursive backtracking algorithm, Iterative backtracking method. n-Queen problem, Sum of subsets, Graph coloring, 0/1 Knapsack Problem.

Unit V	BRANCH AND BOUND	(07hrs)	COs Mapped - CO1, CO5

The method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem – LC branch and bound and FIFO branch and bound solution, Traveling salesperson problem- LC branch and bound

Text Books
1. Horowitz and Sahani, Fundamentals of computer Algorithms, Galgotia, ISBN 81-7371-612-9. 2.
2. AnanyLevitin, Introduction to the Design &Analysis of Algorithm, Pearson, ISBN 81- 7758-835-4

Reference Books
1. Jon Kleinberg, Algorithm Design, Pearson, ISBN : 0-321-29535-8.
2. S. Sridhar, Design and Analysis of Algorithms, Oxford, ISBN 10 : 0-19-809369-1.
3. Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithm, PHI, ISBN: 9788120340077

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

	T. Y. B. Tech. **Pattern 2022 Semester: V - Information Technology** **INT223007A: Internet of Things Lab**		
Teaching Scheme:		**Credit Scheme:**	**Examination Scheme:**
Practical : 02 hrs/week		**01**	**Termwork: 25Marks** **Practical: 25 Marks**

Prerequisite Courses, if any: - Computer Organization and Architecture

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Understand fundamental requirements and architecture of IoT	2- Understand
CO2	Understand business models for the Internet of Things	2- Understand
CO3	Explore the various platforms in IoT.	2- Understand
CO4	Design and implement IoT application based on network architecture	3-Apply
CO5	Design and implement smart object interface using wireless technology for IoT application	. 3-Apply

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Study of different operating systems for Raspberry Pi. Understanding the process of OS installation on Raspberry – Pi	**CO1,3,5**
2	Study of Connectivity and Configuration of Raspberry-Pi circuit with basic peripherals. Understanding GPIO and its use in program. Write an application to interface LEDs with Raspberry-Pi and blink LED.	**CO1,3,5**
3	Understanding the connectivity of Raspberry-Pi / Adriano with IR sensor. Write an application to detect obstacle and notify user using LEDs.	**CO1,3,5**
4	Understanding the connectivity of Raspberry-Pi / Adriano with ultrasonic sensor. Calculate the distance to an object with the help of an ultrasonic sensor	**CO1,3,5**
5	Design and implement IoT system using Arduino Uno/ Raspberry Pi using 'Ultrasonic sensor and Servo motor' such as 'Door opener in home automation'.	**CO1,3,5**
6	Design and implement parameter monitoring IoT system keeping records on Cloud such as 'environment humidity and temperature monitoring'.	**CO1,3,5**
7	Design and implement real time monitoring system using android phone (Blynk App.)	**CO1,3,5**
8	Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.	**CO1,3,5**
Guidelines for Laboratory Conduction		

1. Teacher will brief the given experiment to students its procedure
2. Apparatus and equipments required for the allotted experiment will be provided by the lab assistants using SOP
3. Students will perform the allotted experiment in a group (three/four students in each group) under the supervision of faculty and lab assistant
4. After performing the experiment students will check their output from the teacher

<div align="center">Guidelines for Student's Lab Journal</div>

Write-up should include title, aim, steps of circuit designing (Block Diagram , Truth Table , K Map , Expression , Realization , Conclusion)

<div align="center">Guidelines for Termwork Assessment</div>

1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

T. Y. B. Tech.	
Pattern 2022 Semester: V - Information Technology	
INT223007B: Design and Analysis of Algorithms Lab	

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical : 02 hrs/week	**01**	**Termwork: 25 Marks** **Practical: 25 Marks**

Prerequisite Courses, if any: Data Structures and Algorithms, Discrete Structures and Basic mathematics.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Calculate computational complexity using asymptotic notations for various algorithms.	3-Apply
CO2	Apply Divide & Conquer as well as Greedy approach to design algorithms.	3-Apply
CO3	Understand and analyze optimization problems using dynamic programming.	2-Understand
CO4	Illustrate different problems using Backtracking.	3-Apply
CO5	Compare different methods of Branch and Bound strategy.	3-Apply

	List of Laboratory Experiments / Assignments	
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Write a program to implement Binary Search using Divide and Conquer approach.	**CO2**
2	Write a program to implement Quick sort using Divide and Conquer approach.	**CO2**
3	Write a program to implement Merge sort using Divide and Conquer approach.	**CO2**
4	Write a program to find Maximum and Minimum element in an array using Divide and Conquer strategy and verify the time complexity.	**CO1, CO2**
5	Write a program to implement Knapsack problem using Greedy approach.	**CO2**
6	Write a program to implement Prim's algorithm using Greedy approach.	**CO2**
7	Write a program to implement Kruskal's algorithm using Greedy approach.	**CO2**
8	Write a program to solve the travelling salesman problem and to print the path and the cost using Dynamic Programming.	**CO1, CO3**
9	Write a recursive program to find the solution of placing n queens on chessboard so that no two queens attack each other using Backtracking.	**CO4**
10	Write a program to solve the travelling salesman problem and to print the path and the cost using Branch and Bound.	**CO1, CO5**

Guidelines for Laboratory Conduction
1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.
2. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications.
3. All the assignments should be conducted on multicore hardware and 64-bit open-source software
Guidelines for Student's Lab Journal
1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.
Guidelines for Termwork Assessment
Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).

<table>
<tr><td colspan="5" align="center">**T. Y. B. Tech.**
Pattern 2022 Semester: VI - Information Technology
INT223008: IPR & Patents</td></tr>
<tr><td colspan="2">**Teaching Scheme:**</td><td colspan="2">**Credit Scheme:**</td><td>**Examination Scheme:**</td></tr>
<tr><td colspan="2">**Theory : 02 hrs/week**</td><td colspan="2" align="center">**02**</td><td>**Continuous Comprehensive Evaluation: 50Marks**</td></tr>
</table>

Prerequisite Courses, if any: - NA

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand the concepts of Intellectual Property Rights.	2-Understand
CO2	Understand the Trademark.	2-Understand
CO3	Understand the Copyrights.	2-Understand
CO4	Understand the knowledge how to protect trade secrets.	2-Understand

<table>
<tr><td colspan="4" align="center">**COURSE CONTENTS**</td></tr>
<tr><td>**Unit I**</td><td>**INTRODUCTION TO INTELLECTUAL PROPERTY LAW**</td><td>**(06hrs)**</td><td>**COs Mapped – CO1**</td></tr>
<tr><td colspan="4">The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law. Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right</td></tr>
<tr><td>**Unit II**</td><td>**TRADEMARK**</td><td>**(06hrs)**</td><td>**COs Mapped – CO2**</td></tr>
<tr><td colspan="4">Trademark Registration Process – Post registration Procedures – Trade mark maintenance - Transfer of Rights - Inter partes Proceeding – Infringement - Dilution Ownership of Trade mark – Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trademark Laws.</td></tr>
<tr><td>**Unit III**</td><td>**COPYRIGHTS**</td><td>**(06hrs)**</td><td>**COs Mapped – CO3**</td></tr>
<tr><td colspan="4">Principles of Copyright Principles -The Subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer, and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitations - Copyright disputes and International Copyright Law – Semiconductor Chip Protection Act</td></tr>
<tr><td>**Unit IV**</td><td>**INTRODUCTION TO TRADE SECRET**</td><td>**(06hrs)**</td><td>**COs Mapped – CO4**</td></tr>
<tr><td colspan="4"></td></tr>
</table>

Maintaining Trade Secret – Physical Security – Employee Limitation - Employee confidentiality agreement - Trade Secret Law - Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law

Text Books
1. Debirag E. Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Pub.
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
5. https://nptel.ac.in/courses/109105112

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	One Assignment on Each Unit (4*5)	20
2	One MCQ Test on Each Unit (4*5)	20
3	One Case Study/Presentation	10
	Total	50

T. Y. B. Tech.
Pattern 2022   Semester: VI Information Technology
INT223009: Human Computer Interaction

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks

Prerequisite Courses, if any: -Basic Computer Skills, Design Principles.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Explain importance of HCI study and principles of user-centered design (UCD) approach and understanding of human factors in HCI design.	2-Understand
CO2	Understanding of models, paradigms, and context of interactions.	2-Understand
CO3	Design effective user-interfaces following a structured and organized UCD process.	2-Understand
CO4	Evaluate usability of a user-interface design.	3-Apply
CO5	Apply cognitive models for predicting human-computer-interactions	3-Apply

COURSE CONTENTS

Unit I	INTRODUCTION	(07hrs)	COs Mapped – CO1

What is HCI? A discipline involved in HCI, Why HCI study is important? The psychology of everyday things, Donald A. Norman, Principles of HCI, User-centered Design. Measurable Human factors. Understanding the human and human interaction: Input-output channels, Human memory, , Individual differences, Ergonomics, Human errors, Models of interaction, Paradigms of Interactions, Interaction styles, Interactivity

Unit II	HCI MODELS AND THEORIES	(07hrs)	COs Mapped – CO2

User Profiles, categorization of users, Goal and task hierarchy model, Linguistic model, Physical and Device models, GOMS, Norman's 7 stage model, Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations.

Unit III	DESIGN PROCESS	(08hrs)	COs Mapped – CO3,

Design Rules : Principles that support usability, Design standards, Design Guidelines, What is interaction design?, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques, Wire-Framing, Understanding the UI Layer and Its Execution Framework, Model-View-Controller (MVC) Framework.

Unit IV	HCI GUIDELINES AND EVALUATION TECHNIQUES	(9hrs)	COs Mapped – CO4

Using toolkits, User interface management system (UIMS), Goals of evaluation, Categorization of Evaluation techniques, Choosing an Evaluation Method. DECIDE, Heuristic Evaluation, cognitive walk through, Usability testing

Unit V	FUTURE TRENDS	(07hrs)	COs Mapped – CO1, CO5

Ubiquitous Computing, Design thinking, Finding things on web, Augmented Reality, Virtual Reality , Challenges in designing interfaces for smart homes, smart devices, handheld devices, smart wristwatch, Future of HCI

Text Books

1. Alan Dix (2008). Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5
2. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013).
3. Designing The User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited. ISBN 978-1-292-03701-1.

Reference Books

1. Gerard Jounghyun Kim (20 March 2015). Human–Computer Interaction: Fundamentals and Practice. CRC Press. ISBN 978-1-4822-3390-2.
2. Donald A. Norman (2013). The Design of Everyday Things Basic Books. ISBN 978-0-465-07299-6.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1 &2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

TY B. Tech.
Pattern 2022 Semester: VI -Information Technology
INT223010: Project Based Learning

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Tutorial: 01 hr/week Practical : 02 hrs/week	01 01	Termwork: 25Marks Tutorial : 25Marks

Prerequisite Courses, if any: - Basic Programming Skills

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Design solution to real life problems and analyze its concerns through shared cognition.	3-Apply
CO2	Apply learning by doing approach in PBL to promote lifelong learning.	3-Apply
CO3	Tackle technical challenges for solving real world problems with team efforts	3-Apply
CO4	Collaborate and engage in multi-disciplinary learning environments.	3-Apply

COURSE CONTENTS

Group Structure

Group structure should enable students to work in mentor–monitored groups. The students plan, manage and complete a task/project / activity which address the stated problem.
1. There should be a team of 3 to 6 students who will work cohesively.
2. A Mentor should be assigned to individual groups who will help them with learning and development process.

Selection of Project/Problem

1. The project scope/topic can be from any field/area, but selection related to IT technical aspect is desirous.
2. The project/problem done in first year engineering could be extended further, based on its potential and significance analysis.
3. Project/problem requiring solutions through conceptual model development and use of software tools should be preferred.
4. Different alternate approaches such as theoretical, practical, working model, demonstration or software analysis should be used in solving/implementing of project/problem.
5. The project/problem requiring multi-disciplinary approach to solve it, should be preferred.
6. Problem may require in depth study of specific practical, scientific or technical domain.
7. Hands-on activities, organizational and field visits, interacting with research institutes and expert consultation should be included in the approach to make students aware of latest technologies.

Assessment

The department should be committed to assess and evaluate both student performance and solution impact. Progress of PBL will be monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation the individual and

team performance is to be measured by mentor. Students must maintain an institutional culture of authentic collaboration, self- motivation, peer learning and personal responsiveness. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and students must actively participate in assessment and evaluation processes. Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

1. Individual assessment for each student (Understanding individual capacity, role and involvement in the project).
2. Group assessment (roles defined, distribution of work, intra-team communication and togetherness.
3. Documentation and presentation

Evaluation and Continuous Assessment

It is recommended that the all activities are to be recorded in PBL workbook, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor. The PBL workbook will reflect accountability, punctuality, technical writing ability and work flow of the task undertaken. Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department. Recommended parameters for assessment, evaluation and weightage:

1. Idea Inception (5%)
2. Outcomes of PBL/Problem Solving Skills/Solution provided/Final product(40%) (Individual assessment and team assessment)
3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents (25 %)
4. Potential for the patent(10%)
5. Demonstration (Presentation, User Interface, Usability etc.) (10%)
6. Contest Participation/ publication (5%)
7. Awareness/Consideration of Environment/ Social /Ethics/ Safety measures/Legal aspects (5%). Design the rubrics based on the above parameters for evaluation of student performance

Faculty/Mentor is expected to perform following activities

Revision of PBL concepts Skill assessment of students Formation of diversified and balanced groups Share information about patent, copyright and publications to make students aware about it Discussion of sample case studies Design of the rubrics for evaluation of student performance Discussion of the rubrics with students Weekly Assessment of the deliverables such as Presentation, Report, Concept map, logbook Scaffolding of the students Summative and Formative assessment

Reference Books

1. Project-Based Learning, Edutopia, March 14,2016.
2. What is PBL? Buck Institute for Education.
3. www.schoology.com
4. www.howstuffworks.com

SEM-2

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TUT /TW	PR /OR	TOTAL	TH	TU	PR	TOTAL
INT223011	DCC	Software Engineering & Project Management	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223012	DCC	Data Science and Big Data Analytics	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223013	DCC	Data Science and Big Data Analytics Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223014A INT223014B INT223014C	DEC	Artificial Intelligence & Neural Networks / Cyber Security / Multimedia Technology	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223015A INT223015B	DEC	Cloud Computing / Software Modeling and Design	3	-	-	20	60	20	-	-	**100**	3	-	-	**3**
INT223016A INT223016B	DEC	Cloud Computing Lab/ Software Modeling and Design Lab	-	-	2	-	-	-	25	25	**50**	-	-	1	**1**
INT223017	ESC	Communication Networks	3	-	-	20	60	20			**100**	3	-	-	**3**
INT223018	OEC	Bioinformatics	2	-	-	-	-	50	-	-	**50**	2	-	-	**2**
INT223019	ASM	Network and Hardware Support	-	1	2				25	25	**50**	-	1	1	**2**
INT223020	PSI	Project Based Seminar	-	-	2	-	-	-	50	-	**50**	-	-	1	**1**
Total			**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

The table is headed:

T.Y. B. Tech wef AY 2024-25

SEM-VI

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223011: Software Engineering and Project Management

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03 hrs/week	03	**Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20 Marks EndSem Exam: 60 Marks**

Prerequisite Courses:- Fundamentals of Data Structures, Programming Paradigms and Java Programming

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Identify unique features of various software application domains and classify software applications.	2-Understand
CO2	Analyze software requirements by applying various modelling techniques	4-Analyze
CO3	Discuss the SCRUM process and distinguish agile process models from other process models.	3-Apply
CO4	Understand IT project management and future trends in IT Project Management.	2-Understand
CO5	List and classify CASE tools and discuss recent trends and research in software engineering.	2-Understand

COURSE CONTENTS

Unit I	**INTRODUCTION TO SOFTWARE ENGINEERING**	**(08hrs)**	**CO1**

Software, Software Process: Software Engineering Practice, Software Myths, Generic Process model.
Analysis and comparison of Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Concurrent, Specialized Process Models, Personal and Team Process Models, Introduction to Clean Room, Software Development Life Cycle (SDLC).

Unit II	**REQUIREMENT ANALYSIS AND PROJECT PLANNING**	**(07hrs)**	**CO2**

Requirements Capturing Analysis: Requirements engineering (elicitation, specification, validation, negotiation, prioritizing requirements (Kano diagram) - real life application case study.
Project Planning: Planning Scope Management, Creating the Work Breakdown Structure,
Effort estimation and scheduling: Importance of Project Schedules, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule using Gantt Charts Program Evaluation and Review Technique (PERT) with examples. CASE STUDY: Software Requirement Specification and project planning of Library Management System.

Unit III	AGILE DEVELOPMENT PROCESS	(07hrs)	CO3

Agile Development: Agile manifesto, agility and cost of change, agility principles, myth of planned development, toolset for the agile process.
Agile Practices: Test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing
Extreme Programming: XP values, process, industrial XP, SCRUM - process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospective.

Unit IV	PROJECT MANAGEMENT	(07hrs)	CO4

Project monitoring and control: Tools for project management, Software tools like Microsoft project management or any other open source tools.
The Importance of Project Quality Management: Planning Quality Management, Performing Quality Assurance, Controlling Quality, IT Risk Management.
Software Engineering. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, CMM Models.

Unit V	RECENT TRENDS IN SOFTWARE ENGINEERING AND PROJECT MANAGEMENT	(07hrs)	CO5

Software configuration management: SCM basics, SCM repository, SCM process, SCM tools such as GitHub, CASE – taxonomy, tool-kits, workbenches, environments, components of CASE, categories (upper, lower and integrated CASE tools).
Emerging software engineering trends: Technology evolution, process trends, collaborative development, test-driven development, global software development challenges.
Project Management trends: CRM, ERP: Basic concepts, Advantages and limitations, SAP, Business process reengineering, International Project Management, Case studies.

Text Books
1. Roger Pressman, "Software Engineering: A Practitioner's Approach"‖, McGraw Hill, ISBN 0- 07-3375
2. Ian Sommerville,"Software Engineering", Addison and Wesely, ISBN 0-13-703515-2.

Reference Books
1. Pankaj Jalote, Software Engineering: A Precise Approach, Wiley India, ISBN: 9788126523115.
2. Marchewka, Information Technology Project Management, Wiley India, ISBN: 9788126543946. 3. Chris Dawson with Ben Straub, Building Tools with GitHub, O'Relly, Shroff publishers, ISBN: 978-93- 5213-333-8.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223012: Data Science and Big Data Analytics

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses, if any: - Engineering and discrete mathematics, Database Management Systems, Programming skill.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand and apply Big data primitives and fundamentals for application development.	2-Understand
CO2	Apply various mathematical models for Big Data.	3-Apply
CO3	Explore and demonstrate programming platforms like Hadoop and NoSQL databases.	2-Understand
CO4	Analyze Big data applications using Hive and RHadoop.	4-Analyze
CO5	Understand the needs, challenges and techniques for big data visualization for data analysis.	2-Understand

COURSE CONTENTS

Unit I	INTRODUCTION: DATA SCIENCE AND BIG DATA	(06hrs)	COs Mapped – CO1

Introduction to Subject & Big Data, Applications, Defining Data science and Big Data, Big Data examples, **Data Explosion:** Data Volume, Data Variety, Data Velocity and Veracity, Big data infrastructure and challenges, **Big Data Processing Architectures:** Data Warehouse, Re-Engineering the Data Warehouse, shared everything and shared nothing architecture, Big data learning approaches, **Data Science** – The Big Picture: Relation between AI, Statistical Learning, Machine Learning, Data Mining and Big Data Analytics.

Unit II	MATHEMATICAL FOUNDATION OF BIG DATA	(07hrs)	COs Mapped – CO2

Probability: Random Variables and Joint Probability, Conditional Probability, Concept of Markov chains, Tail bounds, Markov chains, Random walks, Pair-wise independence and universal hashing Approximate counting, Approximate median, **Data Streaming Models and Statistical Methods:** Flajole Martin algorithm, Distance Sampling and Random Projections, Bloom filters, Mode, Variance, standard deviation, Correlation analysis and Analysis of Variance

Unit III	BIG DATA PROCESSING	(06hrs)	COs Mapped – CO3

Big Data Analytics- Ecosystem and Technologies, Introduction to Google file system, Hadoop Architecture, **Hadoop Storage:** HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, HadoopMapReduce paradigm, Map Reduce tasks, Job, Task trackers, Cluster Setup – SSH &Hadoop Configuration, Introduction to NOSQL, Textual ETL processing

Unit IV	BIG DATA ANALYTICS	(06hrs)	COs Mapped – CO4

Big Data Analytics- Architecture and Life Cycle, Types of analysis, Analytical approaches, Data Analytics with Mathematical manipulations, Data Ingestion from different sources, Data cleaning, Handling missing values, data imputation, Data transformation, Data Standardization, Handling categorical data with 2 and more categories, statistical and graphical analysis methods, Hive Data Analytics

Unit V	BIG DATA VISUALIZATION	(05hrs)	COs Mapped – CO5

Introduction to Data visualization, Challenges to Big data visualization, Conventional data visualization tools, Techniques for visual data representations, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Propriety Data Visualization tools, Open –source data visualization tools, **Case Study:** Analysis of a business problem of Zomato using visualization, Analytical techniques used in Big data visualization, Data Visualization using Tableau Introduction to: Candela, D3.js, Google Chart API

Text Books
1. Krish Krishnan, Data warehousing in the age of Big Data, Elsevier, ISBN: 9780124058910, 1st Edition.
2. DT Editorial Services, Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition.

Reference Books
1. Mitzenmacher and Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University press, ISBN :521835402 hardback.
2. EMC Education Services, Data Science and Big Data Analytics, Wiley India, ISBN:9788126556533

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.

Pattern 2022 Semester: VI - Information Technology
INT223013: Data Science and Big Data Analytics Lab

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical :02 hrs/week	**01**	**Termwork: 25Marks** **Practical: 25Marks**

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply Big data primitives and fundamentals for application development.	3-Apply
CO2	Apply the Analytical concept of Big data using Python.	3-Apply
CO3	Visualize the Big Data using Tableau.	3-Apply
CO4	Design algorithms and techniques for Big data analytics.	3-Apply
CO5	Design and develop Big data analytic application for emerging trends.	3-Apply

List of Laboratory Experiments / Assignments

Group A: Assignments based on the Hadoop

1. Single node/Multiple node Hadoop Installation - **CO1**
2. Design a distributed application using MapReduce (Using Java) which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform. – **CO1**
3. Write an application using HiveQL for flight information system which will include –**CO4**
a. Creating an external Hive table.
b. Load table with data, insert new values and field in the table, Join tables with Hive
c. Create index on Flight Information Table
d. Find the average departure delay per day in 2008.

Group B: Assignments based on Data Analytics using Python

1. Perform the following operations using Python on the Facebook metrics data sets – **CO2**
a. Create data subsets
b. Merge Data
c. Sort Data
d. Transposing Data
e. Shape and reshape Data
2. Perform the following operations using Python on the Air quality and Heart Diseases data sets- **CO2**
a. Data cleaning
b. Data integration
c. Data transformation
d. Error correcting
e. Data model building

3. Visualize the data using Python libraries matplotlib, seaborn by plotting the graphs for assignment no. 2 and 3 (Group B) – **CO4**

4. Perform the following data visualization operations using Tableau on Adult and Iris datasets. – **CO3**
a. 1D (Linear) Data visualization
b. 2D (Planar) Data Visualization
c. 3D (Volumetric) Data Visualization
d. Temporal Data Visualization
e. Multidimensional Data Visualization
f. Tree/ Hierarchical Data visualization
g. Network Data visualization

Group C: Model Implementation

1. Create a review scrapper for any ecommerce website to fetch real time comments, reviews, ratings, comment tags, customer name using Python. – **CO5**
2. Develop a mini project in a group using different predictive models techniques to solve any real life problem. - **CO5**
(Refer link dataset- https://www.kaggle.com/tanmoyie/us-graduate-schools-admission-parameters)

Text Books
1. Big Data, Black Book, DT Editorial services, 2015 edition. 2. Data Analytics with Hadoop, Jenny Kim, Benjamin Bengfort, OReilly Media, Inc. 3. Online References for data set 1) http://archive.ics.uci.edu/ml/ 2)https://www.kaggle.com

T. Y. B. Tech.
Pattern 2022Semester: VI - Information Technology
INT223014A: Artificial Intelligence & Neural Networks

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks

Prerequisite Courses: - Machine learning and Data structure

Course Outcomes: On completion of the course, students will be able to–

		Course Outcomes	Bloom's Level
CO1		Apply the uninformed search strategies to solve the various problems	3-Apply
CO2		Apply the informed search strategies to solve the various problems	3-Apply
CO3		Study and Understand ANNs for image classification	2- Understand
CO4		Study and Understand CNNs for Object Detection and Medical Image analysis	2- Understand
CO5		To Study and Understand RNNs for Natural Language Processing	2- Understand

COURSE CONTENTS

Unit I	UNINFORMED SEARCH STRATEGIES	(08hrs)	COs Mapped - CO1

Formulation of real world problems, Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search, Comparison of Uninformed search Strategies Searching with partial information, Sensor-less problems, Contingency problems

Unit II	INFORMED SEARCH STRATEGIES	(08hrs)	COs Mapped – CO2

Generate&test,HillClimbing,BestFirstSearch,A*andAO*Algorithm,Constraintsatisfaction,Gameplaying:MinimaxSearch,Alpha-BetaCutoffs, WaitingforQuiescence

Unit III	ARTIFICIAL NEURAL NETWORKS (ANN)	(07hrs)	COs Mapped –CO3

Basics of Neural Networks, History and Motivation, Perceptron's, Multi-Layer Perceptron's (MLPs), Back propagation ,Gradient Descent Variants, Regularization Techniques, Hyper parameter Tuning, Learning Rate Scheduling, Applications of Artificial Neural Networks

Unit IV	CONVOLUTION NEURAL NETWORKS (CNN)	(09hrs)	COs Mapped – CO4

Introduction to Neural Networks, Motivation for CNNs, Basic Components of CNNs Architecture of CNNs, Convolution Operation ,Pooling Operation ,Implementation of Convolution and Pooling, Training CNNs, Fine-tuning and Transfer Learning ,Data Augmentation, Modern Architectures, Attention Mechanisms, CNNs for Specific Applications: Object Detection, Image Segmentation, Medical Image Analysis, Natural Language Processing with CNNs.

Unit V	Recurrent Neural Networks (RNN)	(09hrs)	COs Mapped – CO5

Basics of Neural Networks, Motivation for RNNs, Structure of RNNs, Architectures of RNNs,Back Propagation in RNNs, Gradient Vanishing and Exploding, Training RNNs,Sequence-to-Sequence Learning, LSTM and GRU Networks, Hierarchical RNNs and Deep RNNs, Applications of RNNs Natural Language Processing. Time Series Prediction

Text Books
1. Elaine Rich and Kevin Knight, "Artificial Intelligence" Tata McGraw Hill
2. Stuart Russell & Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Edition

Reference Books
1. Ivan Bratko, "Prolog Programming For Artificial Intelligence", 2nd Edition, Addison Wesley, 1440.
2. Eugene, Charniak, Drew Mcdermott, "Introduction to Artificial Intelligence", Addison Wesley.
3. Patterson, "Introduction to AI and Expert Systems", PHI.
4. Nilsson, "Principles of Artificial Intelligence", Morgan Kaufmann.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	20

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223014B: Cyber Security

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs / week	**03**	**Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks**

Prerequisite Courses, if any: -

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	To understand the basic concepts of cyber security.	2-Understand
CO2	Differentiate among different types of cyber threats and cyber-crimes.	3-Apply
CO3	illustrate cyber forensic techniques and forensic analysis tools	3-Apply
CO4	Apply cryptographic algorithms and protocols to maintain computer security.	3-Apply
CO5	Evaluate the effectiveness of cyber-security, cyber-laws and other countermeasures against cybercrime.	3-Apply

COURSE CONTENTS

Unit I	**INTRODUCTION TO CYBER SECURITY**	**(06hrs)**	**COs Mapped – CO1**

Introduction: Introduction to Cyber Security, CIA Triad, Cyber Threats ,Cyber-warfare,Cyberspace, Cyber Crime, Cyber terrorism, Cyber Espionage, BYOD, Challenges of cyber security,Layers Of Security.

Unit II	**CYBER CRIMES AND HACKING**	**(07hrs)**	**COs Mapped – CO2**

Overview of – cyber threats , cybercrime ,cybercriminal
Types of Threats – Malware, spyware, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.
Classification of cybercrimes - cyber stalking ,internet time thefts, Newsgroup Spam, software piracy, cyber terrorism, phishing, computer vandalism, computer hacking, password sniffing , spamming, cross site scripting, online auction fraud, cyber-squatting, logic bombs, web jacking, DoS attack, salami attack, data diddling, email spoofing ,Types of Hacker

Unit III	**CYBER FORENSICS AND DIGITAL FORENSICS**	**(07 hrs)**	**COs Mapped – CO3**

Introduction to Cyber Forensics, The need of computer forensic, challenges in cyber forensics
Web Attack Forensics: Intrusion forensics, database forensics, preventive forensics; Anti- forensics practices, Anti-forensics detection techniques, Network forensics analysis tools.
Malware Forensics: Malware types, Malware Analysis, Tools for analysis;
Introduction to Digital Forensics, Cyber Forensics vs Digital Forensics , Forensic Software and Hardware properties of digital evidence, recovering and preserving digital evidence , Advanced forensic Tools, selecting and analyzing digital evidence, validating the evidence

Unit IV	**CRYPTOGRAPHY**	**(08hrs)**	**COs Mapped – CO4**

Introduction to Cryptography, Hashing, Encryption
Cryptography technique: Symmetric cryptography, Asymmetric cryptography
Hashing: What is Hashing,Types of Hashing in Cybersecurity: MD5, SHA-1, SHA-2, CRC32, Encryption, Hashing Vs Encryption**,** Steganography**,** Digital Signatures, Digital Certificate.

Unit V	**CYBER ETHICS AND LAWS**	**(06 hrs)**	**COs Mapped – CO5**

Introduction to Cyber Laws, Need, Property , Crime against individual, E-Commerce and E-Governance, Offences under IT Act, Computer Offences and its penalty under ISO 27001, IT Act 2000, Positive Aspects and weak areas of ITA 2000, Digital signatures and the Indian ITA act, ITA 2008, and International Standards maintained for Cyber Security.
Compliance Standard: ISO 27001, ISO 20000.

Text Books
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1 2. Practical Cyber Forensics an Incident-Based Approach to Forensic Investigations, Niranjan Reddy, Apress, ISBN-13: 978-1-4842-4459-3 3. Practical Digital forensics – Richard Boddingtion, PACKT Publishing ISBN 978-1-78588-710-9 4. Cryptography and network security - Atulkahate, McGraw hill Publishing ISBN978-1-25902-988-2 5. Cyber Laws and IT Protection - Harish-Chander, PHI Publishing ISBN-978-8-12034-570-6
Reference Books
1. William Stallings, Computer Security: Principles and Practices, Pearson 6th Ed, ISBN: 978-0- 13-335469-0 2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81- 315-1349- 1 3. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN- 978- 81-203-5082-3

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.	

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223014C: Multimedia Technology

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03 hrs/week	03	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses, if any: - Data Structures and Files, Computer Graphics

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand basic building block and applications of Multimedia.	2-Understand
CO2	Solve and analyze different algorithms for text and image compression.	4-Analyze
CO3	Classify different audio and video file formats of Multimedia.	4-Analyze
CO4	Apply open-source authoring tools of animation.	3-Apply
CO5	To express virtual reality and VR devices used in various applications.	2-Understand

COURSE CONTENTS

Unit I	**INTRODUCTION TO MULTIMEDIA**	**(07hrs)**	**COs Mapped – CO1**

Goals, objectives, and characteristics of multimedia, what is Multimedia, Multimedia and Hypermedia, **Multimedia building blocks:** text, image, audio, video, animation, Overview of Multimedia Software Tools, Multimedia Applications, Multimedia architecture, Evolving Technologies for Multimedia Systems, Some useful editing, and Authoring tools

Unit II	**TEXT AND IMAGE PROCESSING**	**(08hrs)**	**COs Mapped – CO2**

Text: Text file formats: TXT, DOC; RTF, PDF
Text compression: Huffman coding, LZ & LZW
Image: Image Data Representation, Image File formats - BMP, TIFF, JPEG, GIF, PNG
Image processing: Acquisition, Storage, Communication, Display, Enhancement
Types of Compression: Lossless: RLE, Shannon - Fano algorithm, Arithmetic coding.
Lossy: Vector quantization, Fractal Compression Technique, Transform coding and Hybrid: JPEG-DCT

Unit III	**AUDIO AND VIDEO PROCESSING**	**(07hrs)**	**COs Mapped – CO3**

Audio: Nature of sound waves, characteristics of sound waves, Use of audio in computer applications, psycho-acoustic, MIDI, Digital audio file formats: AIFF, VOC, AVI, WMA, OGG, PCM,MP3,AAC

Audio compression techniques: DM, ADPCM and MPEG.
Video: video signals formats, Video transmission standards: EDTV, CCIR, CIF, SIF, HDTV, Video file formats: AVI, MOV,RM,WAV,FLV,3GP,Video editing, Video Compression: H-261,H-263, MPEG

Unit IV	ANIMATION	(07hrs)	COs Mapped – CO4

Animation: Historical Background, Uses of Animation, Traditional Animation, Principal of Animation, Techniques of animation, Computer based Animation, Animation on the Web,3D Animation, Rendering Algorithms, Animation File formats, Animation **tools:** Autodesk Maya
Gaming: Facial Recognition, Voice Recognition, Gesture Control, High-Def Displays, Augmented Reality, Mobile Gaming, Cloud Gaming On-Demand Gaming.
VFX: Visual Effect and Special Effect, why use Visual Effect, Blender VFX software.

Unit V	VIRTUAL REALITY	(07hrs)	COs Mapped – CO5

Architecture of VR, Concept and History of VR, Human Physiology and Perception, Forms of VR, VR applications, **VR devices:** Hand Gloves, Head mounted tracking system, VR chair, CCD, VCR, 3D Sound System, Head mounted display, Touchable Holograms

Text Books
1. Ralf Steinmetz and Klara Nahrstedt "Multimedia Computing, Communication and Applications", Pearson Education.
2. Ranjan Parekh, "Principles of Multimedia",2/E, TataMcGraw-Hill,ISBN:1259006506

Reference Books
1. Ze-Nian Li, Marks S. Drew, "Fundamentals of Multimedia", Pearson Education.
2. Gonzalez, Woods, "Digital Image Processing" Addison Wesley.
3. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, Morgan Kaufmann Publishers, San Francisco, CA, 2002.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1& 2 and Unit-5	06
2	One Test on Unit 3 and 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.	
Pattern 2022 Semester: VI - Information Technology	
INT223015A: Cloud Computing	

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20 Marks EndSem Exam: 60 Marks

Prerequisite Courses, if any: Basics of Computer Networks and Operating Systems

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Articulate the main concepts, key technologies and fundamentals of cloud computing.	2-Understand
CO2	Understand cloud enabling technologies and virtualization.	2-Understand
CO3	Analyze various cloud programming models and apply them to solve problems on the cloud.	3-Apply
CO4	Explain data storage and major security issues in the cloud.	2-Understand
CO5	Understand trends in ubiquitous cloud and internet of things.	2-Understand

COURSE CONTENTS

Unit I	FUNDAMENTALS Of CLOUD COMPUTING	(08hrs)	COs Mapped– CO1

Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Federated Cloud/Intercloud, Types of Clouds.

Unit II	CLOUD-ENABLING TECHNOLOGY AND VIRTUALIZATION	(08hrs)	COs Mapped – CO2

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology Virtualization Technology, Web Technology, Multitenant Technology, Service Technology. Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation

Unit III	COMMON STANDARDS AND CLOUD PLATFORMS	(08hrs)	COs Mapped – CO3

Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), and Standards for Security. Amazon web services: Compute services Storage Services Communication Services Additional services Google AppEngine: Architecture

and core concepts, Application life cycle, Cost model Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance.

Unit IV	DATA STORAGE AND SECURITY IN CLOUD	(07hrs)	COs Mapped – CO4

Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Datastore and Simple DB Gautam Shrauf, Cloud Storage-Overview, Cloud Storage Providers. Securing the Cloud-General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.

Unit V	UBIQUITOUS CLOUDS AND THE INTERNET Of THINGS	(07hrs)	COs Mapped – CO5

Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management, Cyber-Physical System), Online Social and Professional Networking. How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More.

Text Books
1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1 st Edition.
2. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.

Reference Books
1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.
2. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476.
3. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	20

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223015B: Software Modeling and Design

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	**Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks**

Prerequisite Courses, if any: -Basic Knowledge of Object-oriented Programming, Software Engineering, Database Management System

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand basics of object oriented methodologies and Unified Modeling Language (UML)	2-Understand
CO2	Apply analysis process, use case modeling, domain/class modeling	3-Apply
CO3	Design and apply interaction and behavior modeling on a given system.	3-Apply
CO4	Comprehend OO design process and business, access and view layer class design.	3-Apply
CO5	Illustrate architectural design principles and guidelines in the various type of application development	4-Analyze

COURSE CONTENTS

Unit I	**INTRODUCTION TO OOM AND UML**	**(07hrs)**	**Cos Mapped-CO1**

Introduction to Object Oriented Methodology- Study of various design methodologies like Object Oriented Design by Booch, Object Modelling Techniques by Rumbaugh, Object-Oriented Analysis by Codd Yourdon and Object-Oriented Software Engineering by Ivar Jacobson Unified Approach – Unification of Booch, Rumbaugh and Jacobson methodologies, Object - Oriented Analysis, Object Oriented Design, Iterative Development & Continuous Testing, Modelling based on UML , Layered Approach Unified Modeling Language – Introduction to Modeling and UML2.0, MDA, UML2.0 Structure, UML Building Blocks, UML common Mechanisms, Introduction to all UML2.0 Diagram notational Techniques, 4+1View

Unit II	**OBJECT ORIENTED ANALYSIS**	**(07hrs)**	**COs Mapped – CO2**

Object Oriented Analysis Process: Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Case Identification, Uses/Include/Extend Association, Writing a formal use case, Forward Engineering (Use case realization)
Class Modeling: Approach for identifying class, Approaches for identifying classes, Class pattern approach, Class Responsibilities, Collaboration Approach, Naming Classes, Class associations Generalization specialization relationship, Aggregation and Composition Relationships

Unit III	INTERACTION AND BEHAVIOR MODELING	(08hrs)	COs Mapped – CO3

Activity Diagram: Activity and Actions, Activity Edge, Decision and Merge Points, Fork-Join, Control Flow, Constraints on Action, Swim Lanes.

Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, delete object, Modelling Interactions.

Collaboration Diagram: Objects and Links, Messages and stimuli, Active Objects, Communication Diagram, Iteration Expression, Parallel Execution, Guard Expression, Timing Diagram.

State Diagram: State Machine, Triggers and Ports, Transitions and conditions, Initial and Final State, nestedstate, Composite States, Submachine States.

Unit IV	OBJECT ORIENTED DESIGN PROCESS	(8hrs)	COs Mapped – CO4

Object Oriented Design Process: Designing Business Layer: Object Oriented Constraints Language (OCL), Designing Business Classes: The Process, Designing Well Defined Class Visibility, Attribute Refinement, Method Design Using UML Activity Diagram, Packaging and Managing Classes. Designing Access Layer: Object Relational Systems, Object Relation Mapping, Table Class Mapping, Table — Inherited Classes Mapping, Designing the Access Layer Classes: create mirror classes, identify access layer class relationships, eliminate redundant classes, create method classes. Designing View Layer: View Layer Classes Design, Identifying View Classes by Analyzing Use Cases, Macro-Level Design Process – identify view layer objects, and build prototype for view layer Interface. Test Usability and Usersatisfaction: Component and Deployment Design using Component and Deployment Diagram

Unit V	SOFTWARE DESIGN PRINCIPLES AND PATTERNS AND ARCHITECTURAL DESIGN	(09hrs)	COs Mapped – CO5

Introduction and need of Design Principles: General Responsibility Assignment Software Patterns (GRASP): Introduction, Creator, Information Expert, Low coupling, Controller, High Cohesion, Polymorphism, Pure fabrication, Indirection, Protected Variations. Introduction to GOF design patterns: Types of design patterns: Creational Pattern: Singleton, Factory Structural Pattern: Adapter, Façade Behavioral Patterns: Strategy, State

Anatomy of Software Architecture, Quality attributes in architecture design, Designing Object-Oriented Software Architecture, Designing Client/Server Software Architecture, Designing Service-Oriented Architectures, Designing Component-Based Software Architectures, Designing Concurrent and Real-Time Software Architectures. Product Line Architecture design

Text Books

1. Ali Bahrami, Object Oriented systems Development using Unified Modelling Language McGraw – Hill, International Editions 1999, ISBN: 0-07-1160090-6
2. Erich Gamma et al, Design Patterns: Elements of Reusable Object, Pearson, First Edition,ISBN:9789332555402, 9332555400

Reference Books

1.Object-Oriented Analysis and Design with Applications, Third Edition by Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli Houston, 2007.
2. An introduction to Software Architecture by Shaw &Garlan,

http://sunnyday.mit.edu/16.355/intro_softarch.pdf
 3. Hassan Gomaa, Software Modeling And Design UML, Use Cases, Pattern, & Software Architectures, Cambridge University Press, ISBN: 978-0-521-76414-8.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223016A: Cloud Computing Lab

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical : 02 hrs/week	**01**	**Termwork: 25 Marks** **Practical: 25 Marks**

Prerequisite Courses, if any: Basics of Computer Networks and Operating Systems

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Articulate the main concepts, key technologies and fundamentals of cloud computing.	2-Understand
CO2	Understand cloud enabling technologies and virtualization.	2-Understand
CO3	Analyze various cloud programming models and apply them to solve problems on the cloud.	3-Apply
CO4	Explain data storage and major security issues in the cloud.	2-Understand
CO5	Understand trends in ubiquitous cloud and internet of things.	2-Understand

List of Laboratory Experiments / Assignments

Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Install Google App Engine. Create hello world app and other simple web applications using python/java.	**CO1**
2	Use GAE launcher to launch the web applications.	**CO1**
3	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim	**CO2**
4	Find a procedure to transfer the filesfrom one virtual machine to another virtual machine.	**CO2**
5	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)	**CO3**
6	Design and deploy a web application in a PaaS environment.	**CO3**
7	Design and develop custom Application (Mini Project) using Salesforce Cloud.	**CO4**
8	Design an Assignment to retrieve, verify, and store user credentials using Firebase Authentication, the Google App Engine standard environment, and Google Cloud Data store.	**CO4**

Guidelines for Laboratory Conduction

1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.
2. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications.
3. All the assignments should be conducted on multicore hardware and 64-bit open-source software.

Guidelines for Student's Lab Journal
1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.
Guidelines for Termwork Assessment
1. Continuous assessment of laboratory work shall be based on overall performance of a student.
2. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223016B: Software Modeling and Design Lab

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical : 02 hrs/week	01	Termwork: 25Marks Practical: 25Marks

Prerequisite Courses, if any: -Basic Knowledge of Object-oriented Programming, Software Engineering, Database Management System

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Understand basics of object oriented methodologies and Unified Modeling Language (UML)	2-Understand
CO2	Apply analysis process, use case modeling, domain/class modeling	3-Apply
CO3	Design and apply interaction and behavior modeling on a given system.	3-Apply
CO4	Comprehend OO design process and business, access and view layer class design.	3-Apply
CO5	Illustrate architectural design principles and guidelines in the various type of application development	4-Analyze

	List of Laboratory Experiments / Assignments	
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Write Problem Statement and draw Use Case diagrams for Mini Project Identify Project of enough complexity, which has at least 4-5 major functionalities. Identify stakeholders, actors and write detail problem statement for your system. Identify Major Use Cases, Identify actors. Write formal Use Case specification for all major Use Cases.	CO2
2	Prepare Dynamic Model for the system. Identify Activity states and Action states. Draw Activity diagram with Swim lanes and fork-joins using UML 2.0 Notations for major Use Cases Draw Sequence Diagram Using UML 2.0 notations for major Use Cases.	CO2, CO3
3	Prepare Static Model for the System. Draw class diagram using UML 2.0 notations. Prepare Data Dictionary for the databases. Draw Deployment diagram UML 2.0 notations	CO3
4	Consider your neighboring travel agent from whom you can purchase flight tickets. To book a ticket you need to provide details about your journey i.e., on which date and at what time you would like to travel. You also need to provide your address. The agency has recently been	CO2, CO3

	modernized. So, you can pay either by cash or by card. You can also cancel a booked ticket later if you decide to change your plan. In that case you need to book a new ticket again. Your agent also allows you to book a hotel along with flight ticket. While cancelling a flight ticket you can also cancel hotel booking. Appropriate refund as per policy is made in case of cancellation. Perform the following tasks and draw the use case diagram using UML tool. a. Identify the use cases from a given non-trivial problem statement. b. Identify the primary and secondary actors for a system. c. Use to generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase	
5	Consider a library, where a member can perform two operations: issue book and return it. A book is issued to a member only after verifying his credentials. Develop a use case diagram for the given library system by identifying the actors and use cases and associate the use cases with the actors by drawing a use case diagram. Use UML tool	**CO1, CO2, CO3**
6	Consider the online shopping system. Draw the sequence diagram using UML tool to show message exchanges	**CO2, CO3**
7	Outputs and Code demonstration (10 Hrs) Write the code for the Mini Project. Execute the code and record the output screens	**CO1, CO2, CO3**

Guidelines for Laboratory Conduction
1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.
2. The instructor may set multiple sets of assignments and distribute among batches of students. Students should work in group of 3-4 students. Common problem statement (minimum 3-4 major functionalities it should cover) should be considered to execute all assignment.
3. It is appreciated if the assignments are based on real world problems/applications.
4. Any open-source UML designing tool like StarUML, Visual Paradigm, Umbrello, AgroUML, can be used todraw UML diagram. Languages and databases : JAVA, MySQL, MongoDB, C#.

Guidelines for Student's Lab Journal
1. Student should submit term work in the form of handwritten journal based on specified list of assignments.
2. Practical Examination will be based on the term work.
3. Candidate is expected to know the theory involved in the experiment.
4. The practical / Oral examination should be conducted if and only if the journal of the candidate is complete in all respects.

Guidelines for Termwork Assessment
1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with diagrams specified in the assignment, implementation (wherever applicable) attendance etc.
2. Examiners will judge the understanding of the practical/ oral performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware should be checked by the concerned faculty member(s).

T. Y. B. Tech.
Pattern 2022 Semester: VI - Information Technology
INT223017: Communication Networks

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :03 hrs/week	03	Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20 Marks EndSem Exam: 60 Marks

Prerequisite Courses, if any: - Data communication

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Summarize fundamental concepts of Computer Networks, protocols and technologies	1-Remember
CO2	Illustrate the working and functions of data link layer	2-Understand
CO3	Analyze the working of different routing protocols and mechanisms	4-Analyse
CO4	Implement client-server applications using sockets	3-Apply
CO5	Explain Responsibilities, services offered and protocol used at application layer of network	2-Understand

COURSE CONTENTS

Unit I	INTRODUCTION TO COMPUTER NETWORK	(07hrs)	COs Mapped – CO1

Basics of Computer Networks, Network Devices, Network Software, Protocol Layering.
Reference Models: OSI, TCP/IP, Comparison of OSI & TCP/IP.
Physical Layer: Guided Media, Unguided Media, And Wireless Transmission: Electromagnetic Spectrum, Switching: Circuit-Switched Networks, Packet Switching, and Structure of a Switch.

Unit II	DATA LINK LAYER	(07hrs)	COs Mapped – CO2

DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction (Hamming Code, Parity, CRC, Checksum), Elementary Data Link protocols: Stop and Wait, Sliding Window (Go Back N, Selective Repeat), Piggybacking, HDLC.
Medium Access Protocols: Random Access, Controlled Access, Channelization, Ethernet Protocol: Standard Ethernet, Fast Ethernet (100 Mbps), Gigabit Ethernet, 10- Gigabit Ethernet.

Unit III	NETWORK LAYER	(08hrs)	COs Mapped – CO3

Network Layer Services, Packet Switching, Network Layer Performance, IPv4 Addressing (Classfuland Classless), Subnetting, Supernetting, IPv4 Protocol, DHCP, Network Address Translation (NAT).
Routing Algorithms: Distance Vector Routing, Link State Routing, Path Vector Routing.
Protocols – RIP, OSPF, BGP.
Next Generation IP: IPv6 Addressing, IPv6 Protocol, Transition from IPV4 to IPV6.

Unit IV	**TRANSPORT LAYER**	**(9hrs)**	**COs Mapped – CO4**

Transport Layer: Transport Layer Services, Connectionless & Connection-Oriented Protocols.
Transport Layer Protocols: User Datagram Protocol: UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers.

Unit V	**APPLICATION LAYER**	**(07hrs)**	**COs Mapped – CO5**

Client Server Paradigm: Communication using TCP and UDP, Peer to Peer Paradigm, Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME, and Network Management: SNMP.

Text Books
1. A. Tanenbaum, Computer Networks, Pearson.
2. B. Forouzan, Data Communications and Networking, McGraw Hill.

Reference Books
1. B. Forouzan, TCP/IP Protocol Suite, McGraw Hill.
2. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13- 212695-
3. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Two Assignments on Unit-1 & 2, Unit 5	06
2	One Test on Unit-3 & 4	04
3	LMS Test on Each Unit	10
	Total	**20**

T. Y. B. Tech.
Pattern 2022   Semester: V Information Technology
INT223018: Bioinformatics

Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory :02 hrs/week		02	Continuous Comprehensive Evaluation: 50 Marks

Prerequisite Courses, if any: -Basics of biology, Design and Analysis of Algorithms Basic concepts of Data Mining and Machine Learning

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Integrate biological concepts with information technologies to study the biological system.	2-Understand
CO2	Study Gene structure, various biological database, and methods to manage the different types of biological data.	2-Understand
CO3	Describe principles and algorithms of pairwise and multiple alignments	2-Understand
CO4	Study various bioinformatics tools and Algorithm.	2-Understand

COURSE CONTENTS

Unit I	BASICS OF BIOINFORMATICS	(06hrs)	COs Mapped – CO1

What is Bioinformatics and its relationship with molecular biology, Information Theory and Central Dogma of Molecular Biology, Bioinformatics Scope, Challenges and Bioinformatics Applications, Features and Major Databases in Bioinformatics, Interdisciplinary nature of Bioinformatics, Major Bioinformatics databases and tools.

Unit II	BIOLOGICAL DATABASE AND GENE STRUCTURE	(06hrs)	COs Mapped – CO2

Types of biological Database, Primary, Secondary and Structural data bases, tools for web search, data retrieval tools Protein primary databases - PIR, SWISS-PROT; Composite protein sequence database - NRDB, OWL, Protein secondary databases - PROSITE, Profiles; Database on protein structures – PDB, Genome databases - human (HGP) What is a Gene? Structural Genes, Genome Sequencing and Applications of Genetics Maps

Unit III	SEQUENCE ALIGNMENT AND DATA VISUALIZATION	(06hrs)	COs Mapped – CO3

Introduction to Sequence alignments and dynamic programming; Local alignment and Global Alignment. Methods of Sequence Alignments, Scoring Matrix: PAM and BLOSUM Sequence Visualization, Sequence maps, Structure Visualization and rendering tools, Statistical Concepts Microarray.

Unit IV	BIOINFORMATICS ALGORITHM AND TOOLS	(06hrs)	COs Mapped – CO4

Biological algorithm vs. computer algorithms, Clustering, and classification algorithms FASTA Algorithm, BLAST Algorithm and its comparison, Hidden Markov Models, Graph and Genetics Algorithm.

Text Books

1. S.C.Rastogi, N. Mendiratta, P. Rastogi 'Bioinformatics-Methods & Application Genomics, Proteomics and Drug Discovery', Third Edition, Prentice Hall of India.
2. Bryan Bergeron, 'Bioinformatics Computing', Pearson Education
3. Orpita Bosum Simminder Kaur Thukral 'Bioinformatics: Databases, Tools and Algorithms', Oxford press

Reference Books

1. Supratim Choudhuri , "BIOINFORMATICS FOR BEGINNERS Genes, Genomes, Molecular Evolution, Databases and Analytical Tools", Academic Press is an imprint of Elsevier
2. Baxevanis, A. D. and Ouellette. B. F. F. 2004. Bioinformatics: A practical guide to the analysis of genes and proteins. Wiley Inter-science. New York. 560 p.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	One Assignment on Each Unit (4*5)	20
2	One MCQ Test on Each Unit (4*5)	20
3	One Case Study/Presentation	10
	Total	**50**

<table>
<tr><td colspan="3" align="center">**T. Y. B. Tech.**
Pattern 2022 Semester: VI - Information Technology
INT223019: Network and Hardware Support</td></tr>
<tr><td>**Teaching Scheme:**</td><td>**Credit Scheme:**</td><td>**Examination Scheme:**</td></tr>
<tr><td>**Tutorial: 01 hr/week**
Practical : 02 hrs/week</td><td>**01**
01</td><td>**Termwork: 25 Marks**
Practical: 25 Marks</td></tr>
</table>

Prerequisite Courses, if any: - Data communication

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Summarize fundamental concepts of Computer Networks, protocols and technologies	1-Remember
CO2	Understand and apply of networking and simulation tool i.e packet tracer.	2-Understand
CO3	Understand the working of different routing protocols and mechanisms	2-Understand
CO4	Implement client-server applications using sockets	3-Apply
CO5	Explain Responsibilities, services offered and protocol used at application layer of network	2-Understand

<table>
<tr><td colspan="4" align="center">**COURSE CONTENTS**</td></tr>
<tr><td>**Unit I**</td><td>**Network and Hardware fundamentals**</td><td>**(04hrs)**</td><td>**COs Mapped – CO1**</td></tr>
<tr><td colspan="4">Networking Devices, Network components: Routers , Controllers, Servers, L2 and L3 switches, Endpoints, Firewalls and IPS, Accent points, Protocols. Physical interface and cabling types comparison: Single-mode fiber, Copper, Multimode fiber, Connections, PoE</td></tr>
<tr><td>**Unit II**</td><td>**Network Interfacing**</td><td>**(03hrs)**</td><td>**COs Mapped – CO2**</td></tr>
<tr><td colspan="4">Types of Network Topology, communication media, Crimping procedure, color band, LAN cabling types, different networking command and their purpose.</td></tr>
<tr><td>**Unit III**</td><td>**IP Connectivity**</td><td>**(04hrs)**</td><td>**COs Mapped – CO3**</td></tr>
<tr><td colspan="4">Interpret the components of routing Table, IPv4 and IPv6 Static Routing, Default route, Floating static Route, TCP and UDP Socket Programming, Network Address Translation (NAT).</td></tr>
<tr><td>**Unit IV**</td><td>**Security Fundamentals**</td><td>**(02hrs)**</td><td>**COs Mapped – CO4**</td></tr>
<tr><td colspan="4">Configuration of password, Remote access and site-site VPN, ACL Switch port security, Application Layer Protocols functions</td></tr>
<tr><td colspan="4" align="center">**Text Books**</td></tr>
<tr><td colspan="4">1. B. Forouzan, Data Communications and Networking, McGraw Hill.</td></tr>
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1. B. Forouzan, TCP/IP Protocol Suite, McGraw Hill.
2. Andrew S. Tanenbaum, David J. Wethrall, Computer Network, Pearson Education, ISBN: 978-0-13-212695-
3. Kurose Ross, Computer Networking: A Top Down Approach Featuring the Internet, Pearson Education, ISBN: 978-81-7758-878

Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Execute and analyze basic networking commands: ifconfig, ip, traceroute, tracepath, ping, netstat, ss, dig, nslookup, route, host, arp, hostname, curl or wget, mtr, whois, tcpdump.	CO1
2	Demonstrate the different types of topologies and types of transmission media by using a packet tracer tool.	CO1, CO2
3	Setup a WAN which contains wired as well as wireless LAN by using a packet tracer tool. Demonstrate transfer of a packet from LAN 1 (wired LAN) to LAN2 (Wireless LAN).	CO1. CO2
4	Implement Link State Routing Protocols.	CO3
5	Implement Distance Vector Routing Protocols	CO3
6	Implement Socket Programming using TCP with C/Java/python: TCP Client, TCP Server.	CO4, CO5
7	Implement Socket Programming using UDP with C/Java/python: UDP Client, UDP Server.	CO4, CO5
8	Study and Analyze the performance of HTTP, HTTPS and FTP protocol using Packet tracer tool.	CO5
Guidelines for Laboratory Conduction		

1. Use of open source software is to be encouraged.
2. Operating System recommended:- Windows , Linux
3. Programming tools recommended: -Cisco Packet Tracer, C Editor

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Termwork Assessment

1. Continuous assessment of laboratory work shall be based on overall performance of a student.
2. Assessment of each laboratory assignment shall be based on rubrics that include

R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).

T. Y. B. Tech.
Pattern 2022Semester: VI -Information Technology
INT223020: Project Based Seminar

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 02 hrs/week	01	Termwork: 50Marks

Prerequisite Courses, if any: - Basic Communication, reading and writing skills

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.	2-Understand
CO2	To write a technical report summarizing state-of-the-art on an identified topic.	2-Understand
CO3	Present the study using graphics and multimedia presentations.	2-Understand
CO4	Define intended future work based on the technical review.	2-Understand
CO5	To explore and enhance the use of various presentation tools and techniques.	2-Understand
CO6	To understand scientific approach for literature survey and paper writing.	2-Understand

COURSE CONTENTS

Guidelines for Project Based Seminars

1. A project group consisting of 3 to 4 students shall identify problem(s) in Computer Engineering / Information Technology referring to recent trends and developments in consultation with institute guide.
2. The group must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc.) in relevant area on their project topic as decided by the guide.
3. Internal guide shall define a project statement based on the study by student group.
4. Students should identify individual seminar topic based on the project undertaken in consultation with guide.
5. Seminar topics should be based on project undertaken. Guide should thoughtfully allocate seminar topics on different techniques to solve the given problem (project statement), comparative analysis of the earlier algorithms used or specific tools used by various researchers.
6. Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI or from freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, JRD Tata Memorial Library, citeseerx.ist.psu.edu, getcited.org, arizona.openrepository.com, Open J-Gate, Research Gate, worldwidescience.org etc.
7. The group shall present the study as individual seminars in 20 – 25 minutes.

Guidelines for Seminar Report

1. Each student shall submit two copies of the seminar report in a prescribed format duly signed by the guide and Head of the department/Principal.
2. First chapter of a project group may talk about the project topic. At the end of the first chapter

individual students should begin with introduction of seminar topic and its objectives.

3. Broad contents of review report (20-25 pages) shall be

i. Introduction of Project Topic

ii. Motivation, purpose and scope of project and seminar

iii. Related work (of the seminar title) with citations

iv. Discussion (your own reflections and analysis)

v. Conclusions

vi. Project definition.

(Short version of RUP's vision document if possible). vii. References in IEEE Format 4. Students are expected to use open source tools for writing seminar report, citing the references and plagiarism detection. (Latex, Lex for report writing ; Mendeley, Zatero for collecting, organizing and citing the resources; DupliChecker , PaperRater, PlagiarismChecker and Viper for plagiarism detection)

Guidelines for Seminar Evaluation

1. A panel of examiners appointed by University will assess the seminar externally during the presentation.

2. Attendance for all seminars for all students is compulsory.

3. Criteria for evaluation

i. Relevance of topic - 05 Marks

ii. Relevance + depth of literature reviewed- 10 Marks

 iii. Seminar report (Technical Content) - 10 Marks

iv. Seminar report (Language) - 05 Marks

v. Presentation Slides - 05 Marks

vi. Communication Skills - 05 Marks

vii. Question and Answers - 10 Marks

Guidelines for Seminar Presentation

1) A panel of examiner will evaluate the viability of project scope and seminar delivery.

2) Oral examination in the form of presentation will be based on the project and seminar work completed by the candidates.

3) Seminar report must be presented during the oral examination.

Text Books
1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN :130981745, 4th Edition. 2. Andrea J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia, 2nd Edition. 3. Lesikar, Lesikar's Basic Business Communication, Tata McGraw, ISBN :256083274, 1st Edition.