UPES

Year: 2021
Semester: VI

1. **Name of the Faculty: Shiv Naresh Shivhare** — **Course Code: CSAI2102**
2. **Course: Introduction to Machine Learning Lab** — **L: 0**
3. **Program : B. Tech CS+AI&ML** — **T: 0**
4. **Target : Level 2** — **P: 1**
   C: 1

COURSE PLAN

Target	50% (marks)
Level-1	40% (population)
Level-2	50% (population)
Level-3	60% (population)

1. Method of Evaluation

UG
Viva voce and Quiz (50%)
Continuous Assessment and Record (50%)

2. Passing Criteria

Scale	UG
Out of 10point scale	SGPA – "5.0" in each semester CGPA – "5.0" Min. Individual Course Grade – "C" Course Grade Point – "4.0"

*for UG, passing marks are 35/100 in a paper

3. Pedagogy

- Synchronous Mode using BB Collaborate aided with power point presentations and demonstration.
- Regular Communication for Tests/Quizzes/Vivas will be ensured by the faculty through email or Blackboard announcements/ email ids.
- In continuation to problem description, the solution to the given problem statement should be designed suitably using algorithm/flow-chart/pseudocode. After obtaining a successful design, the design is implemented using java language and tested with appropriate test cases (with an insight on Input/Output Data Constraints). Students are evaluated under two main categories (1) Performance (via efficient design and implementation) and record, and (2) Preparation of the student evaluated via viva-voce /quiz. The same is detailed in Section-E.

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GUIDELINES TO STUDY THE SUBJECT

Instructions to Students:

1. Go through the 'Syllabus' in the Black Board section of the web-site(https://learn.upes.ac.in) in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line lecture notes (Content, videos) at Lecture Notes section. These are our lecture notes. Make sure you use them during this course.
4. check your blackboard regularly
5. go through study material
6. check mails and announcements on blackboard
7. keep updated with the posts, assignments and examinations which shall be conducted on the blackboard
8. Be regular, so that you do not suffer in any way
9. C**ell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments/tests/quizzes and asynchronous lectures (Recorded Lectures or Voice over ppt) will be uploaded on online learning tool BlackBoard. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail sshivhare@ddn.upes.ac.in. Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

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RELATED OUTCOMES

1. **The expected outcomes of the Program are:**

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2. The expected outcomes of the Specific Program are: (upto3)

PSO1	Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques
PSO2	Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.
PSO3	Ability to create & develop most efficient solutions by applying machine learning with analytical emphasis on industrial and research problems.

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3. **The expected outcomes of the Course are: (minimum 3 and maximum 6)**

CO 1	To discuss the basic concepts of model building and validation of overall models.
CO 2	To experiment classification algorithm like Regression, Decision Trees, K-NN, Neural Network etc.
CO 3	To implement clustering algorithm like Hierarchical Clustering, Partition based Clustering, Density based Clustering.

4. **Co-Relationship Matrix**
   Indicate the relationships by1- Slight (low) 2- Moderate (Medium) 3-Substantial (high)

Program Outcomes / Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	1														3
CO 2				1	1			1	1						3
CO 3		1	1			1				2		1			3

1=weakly mapped 2= moderately mapped 3=strongly mapped

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OVERVIEW OF COURSE DELIVERY/BROAD PLAN OF COURSE COVERAGE

Course Activities:

Table: Mapping of COs with POs and PSOs

Course Outcomes (COs)		Mapped PO & PSO
CO1	To discuss the basic concepts of model building and validation of overall models	PO1, PSO3
CO2	To experiment classification algorithm like Regression, Decision Trees, K-NN, Neural Network etc.	PO4, PO5, PO8, PO9, PSO3
CO3	To implement clustering algorithm like Hierarchical Clustering, Partition based Clustering, Density based Clustering.	PO2, PO3, PO10, PO12, PSO3

COURSE OUTLINE

Expt. No.	Big Ideas/ Topics	CO	Modality
Experiment No 1	Introduction to Weka Tool	CO1	F2F/e-lab
Experiment No 2	Perform basic algorithm with inbuilt data on Weka Tool	CO1	F2F/e-lab
Experiment No 3	Introduction to Python with supporting libraries	CO1	F2F/e-lab

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Experiment No 4	Implementation of Linear and Multiple Linear Regression	CO2	F2F/e-lab
Experiment No 5	Implementation of Logistics Regression Analysis	CO2	F2F/e-lab
Experiment No 6	Implementation of Decision Tree	CO2	F2F/e-lab
Experiment No 7	Implementation of Naïve Bayes	CO2	F2F/e-lab
Experiment No 8	Implementation of KNN (k-Nearest Neighbor) Algorithm	CO2	F2F/e-lab
Experiment No 9	Implementation of SVM (Support Vector Machine)	CO2	F2F/e-lab
Experiment No 10	Implementation of k-Means Clustering	CO3	F2F/e-lab
Experiment No 11	Implementation of DBSCAN (Density Based Spatial Clustering of Applications with Noise)	CO3	F2F/e-lab
Experiment No 12	Outliers and Anomalous Data Analysis	CO3	F2F/e-lab

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DETAILED DELIVERY PLAN

EXPERIMENT – 1

TITLE: - Introduction to Weka Tool

Explore the tools with different options like

- Preprocess
- Classify
- Cluster
- Associate
- Select Attributes
- Visualize

EXPERIMENT – 2

TITLE: Implement the different Machine Learning on Weka Tool

- Analyzing data in different views of relation contact-lenses, iris data
- Implement Classification, Association Rule, Clustering, Visualize

EXPERIMENT – 3

TITLE: Introduction to Python with supporting libraries

- Data formats read by python
- Reading free-field text data files

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- Reading statistics data files
- Reading Excel files
- Viewing the data

EXPERIMENT – 4

TITLE: Logistics Regression Analysis

- Perform a classification rule method on given data set using logistic regression.
- Draw the residual plots for the logistic regression

EXPERIMENT – 5

TITLE: Multiple Linear Regression

- Demonstrate the implementation of Multiple Linear Regression on Boston house pricing dataset using Scikit-learn.

EXPERIMENT – 6

TITLE: Decision Trees Algorithm

- Write a program to demonstrate ID3 Algorithm to classify dataset.

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EXPERIMENT – 7

TITLE: Naïve Bayes

- Write a program to demonstrate Naïve Bayes Algorithm to classify dataset.

EXPERIMENT – 8

TITLE: kNN (k-Nearest Neighbor) Algorithm

- Perform a classification rule method on given data set using neural network.
- Perform a classification rule method using support vector machine

EXPERIMENT – 9

TITLE: SVM (Support Vector Machine)

- Write a program to demonstrate SVM Classification algorithm on Iris dataset.

EXPERIMENT – 10

TITLE: **k-Means Clustering**

- Write a program to demonstrate k-means clustering algorithm on numerical as well as image dataset.

EXPERIMENT – 11

TITLE: **DBSCAN (Density Based Spatial Clustering of Applications with Noise)**

- Write a program to demonstrate DBSCAN clustering algorithm on given dataset.

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EXPERIMENT – 12(a)

TITLE: **Outliers and Anomalous Data Analysis**

- For the given dataset produce the summary of the variables including the details on skewness and kurtosis.
- Explore the minimum and maximum value of the variables.

EXPERIMENT – 12(b)

TITLE: **Looking for relationships in data**

- Find the correlation between the numerical variable for the given dataset.

SUGGESTED READINGS:

TEXT BOOK:

T1. Book provided by IBM- Data Mining & Prediction Modeling (Course code BAO2SG01 V1.0), Introduction to Machine Learning (Course Code AIML03G01 V1.0).