

**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**COURSE STRUCTURE - R20**

II YEAR II SEMESTER							
S.No	Subjects	L	T	P	C	I	E
1	Probability & Statistics	3	0	0	3	30	70
2	Fundamentals of Machine Learning	3	0	0	3	30	70
3	Operating Systems	3	0	0	3	30	70
4	Software Engineering	3	0	0	3	30	70
5	Universal Human Values	3	0	0	3	30	70
6	OS Lab	0	0	3	1.5	30	70
7	UML Lab	0	0	3	1.5	30	70
8	Fundamentals of Machine Learning Lab	0	0	3	1.5	30	70
9	Skill Oriented Course – I	0	0	4	2		
	1) Animations – 3D Animation						
	2) Web Application Development Using Full Stack – Frontend Development – Module - II						
10	Critical Reading & Creative Writing	2	0	0	0	--	--
<b>Total Credits</b>					<b>21.5</b>	<b>240</b>	<b>560</b>

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>PROBABILITY AND STATISTICS</b>					

**Course Objectives:**

To enable the students to

- familiarize the students with the foundations of probability and statistical methods
- impart probability concepts and statistical methods in various applications  
Engineering

**Course Learning Outcomes:**

Upon completing this course, the student should be able to:

1. compute descriptive statistics and interpret in data science problems
2. compute various linear and non linear regression models to the data
3. calculate probability distribution and fit problems to data
4. Infer the statistical inferential methods based on small and large sampling tests
5. Design the components of a classical hypothesis test

**UNIT I**

**Descriptive statistics and methods for data science**

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variables: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance), Skewness, Kurtosis.

**UNIT II**

**Correlation & Regression**

Correlation and Regression: Simple Bivariate Correlation: Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.

Linear Regression - Regression lines, Regression coefficients, properties.

Non- Linear Regression - Quadratic, Power and Exponential models using Least squares approximations

### **UNIT III**

#### **Probability Distributions**

Basic concepts on probability, random variables (discrete and continuous), probability distributions- Binomial, Poisson and Normal distributions and their properties, fitting of Binomial distribution, Poisson distribution

### **UNIT IV**

#### **Sampling Theory:**

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to  $t$ ,  $\chi^2$  and  $F$  distributions – Point and Interval estimations – Maximum error of estimate.

### **UNIT V**

#### **Tests of Hypothesis:**

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

#### **Text Books:**

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
2. Miller and Friends, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
3. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12<sup>th</sup> Ed., S. Chand Publishers, 2014

#### **References:**

1. T.S.R. Murthy, Probability and Statistics for engineers, 1<sup>st</sup> edition, BS Publications, 2018. B. V. Ramana, Engineering Mathematics, 4<sup>th</sup> Ed., Tata McGraw Hill, New Delhi, 2009
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.

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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>FUNDAMENTALS OF MACHINE LEARNING</b>					

**Course Objectives:**

To enable the students

- Define ML and understand their relationship with data
- Understand different types of supervised learning and build various regression and classification models
- Understand basic math fundamentals of this domain and intuitively understand basic math fundamental behind each technique
- Understand performance metrics
- Explain the mechanism of unsupervised learning and practice various clustering techniques in Python.
- Comprehend text mining and its applications

**Course Outcomes:**

At the end of the course, the students will be able to

- Understand the importance of Machine Learning
- Apply regression and classification techniques for machine learning examples.
- Comprehend supervised and unsupervised machine learning techniques.
- Apply the neural network and dimensionality reduction techniques for machine learning applications.
- Design and implement machine learning algorithms to solve real-world application problems.

**UNIT I**

**Introduction**

Motivation, Applications of Machine Learning - Well-Posed Learning Problems - Designing a Learning System - Issues in Machine Learning - Types of Machine Learning

**Supervised Learning - Regression Techniques**

Basic concepts and applications of Regression - Simple Linear & Multiple Regression - Gradient Descent - Evaluation Measures for Regression Techniques - overfitting -

underfitting - Regularization - Train-test-split, k-fold cross validation - Hyperparameter tuning.

## **UNIT II**

### **Supervised Learning - Classification Techniques**

Basic concepts and applications of classification - Naïve Bayes Classification, Logistic Regression, K-Nearest Neighbors, Classification Trees, Support Vector Machines, Evaluation Measures for Classification Techniques.

## **UNIT III**

### **Unsupervised Learning**

Definition, K-Means, Hierarchical clustering techniques. Dimensionality reduction using PCA. Feature Engineering –selection, factor analysis. Time series modeling (time series data types, stationarity and ARIMA modeling)

## **UNIT IV**

### **Natural Language Processing / Text mining**

Introduction. Applications. Chatbots, virtual agents (Alexa, Google Assistant, Siri). Importance, Applications, NLP Subproblems. Components of Natural Language. Steps to get text data into workable format. Terms Frequency, Inverse Document Frequency, Bag of Words, ngram, One hot encoding. Notion of corpus. Intro to NLTK

## **UNIT V**

### **Neural Networks**

Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptron, Back-propagation Neural Networks, Convolution Neural Network.

### **Text Books**

1. Tom Mitchell, Machine Learning, TMH
2. C. Bishop, Pattern Recognition and Machine Learning, Springer
3. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach

### **References:**

1. Machine Learning for Absolute Beginners : A Plain English introduction (2nd Edition) - Oliver Theorbald
2. Fundamentals of Machine Learning for Predictive Data Analytics by John D. Kelleher
3. Machine Learning with Python and Scikit-Learn - Develop Machine Learning and Deep Learning models with Python - by Sebastian Raschka - Packt
4. Approaching (Almost) Any Machine Learning Problem by Abhishek Thakur.

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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>OPERATING SYSTEMS</b>					

**Course Objectives :**

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of the OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

**Course Outcomes:**

After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System.
- Understand process management & various CPU scheduling algorithms.
- Apply the principles of concurrency, Design deadlock prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems and system protection.

**UNIT I**

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, Structure of operating System, operating systems services, Introduction to System call, Types of system calls.

**UNIT II**

Process Management – Process concept, The process, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter-process Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

### **UNIT III**

Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

### **UNIT IV**

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

### **UNIT V**

File system Interface- The concept of a file, Access Methods, Directory structure, File system mounting.

File System implementation- File system structure, allocation methods, free-space management, Mass-storage structure overview of Mass-storage structure, Disk scheduling.

System Protection: Goals of protection, Principles and domain of protection, Access Matrix, Access Control, Revocation of access rights.

#### **TEXT BOOK:**

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

#### **REFERENCES:**

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education”, 1996.

3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOFTWARE ENGINEERING</b>					

**Course Objectives:**

- To help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain.
- This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.
- Represent classes, responsibilities and states using UML notation
- Capable of team and organizational leadership in computing project settings, and have a broad understanding of ethical application of computing-based solutions to societal and organizational problems.
- Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

**UNIT-I:**

**Software and Software Engineering:** The Nature of Software, The Unique Nature of WebApps , Software Engineering, Software Process, Software Engineering Practice, Software Myths.

**Process Models:** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models

**UNIT-II:**

**Requirements Analysis and Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

**Software Design:** Overview of the Design Process, How to Characterize of a Design? Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design, Developing the DFD Model of a System

**UNIT – III:**

**Unified Modeling Language (UML):** Introduction to UML, why we model, Standard

Diagrams: Structural Diagrams- Class diagram, Object diagram, Component diagram, Deployment diagram, Behavioural Diagrams-Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram.

#### **UNIT – IV:**

**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing.

#### **UNIT – V:**

**Software Reliability and Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

**Software Maintenance:** Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

#### **TEXT BOOKS:**

1. Software Engineering a Practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education
4. The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

#### **REFERENCE BOOKS:**

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, PankajJalote, Wiley India,2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

#### **e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105182/>

#### **OUTCOMES:**

- Define and develop a software project from requirement gathering to implementation.
- Obtain knowledge about principles and practices of software engineering.
- Represent classes, responsibilities and states using UML notation

- Focus on the fundamentals of modeling a software project.
- Obtain knowledge about estimation and maintenance of software systems

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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIVERSAL HUMAN VALUES</b>					

### **Course Objectives**

This introductory course input is intended:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
- Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

### **Salient Features of the Course**

The salient features of this course are:

1. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality “as it is”) through the process of self-exploration.
2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.
3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.

4. While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

### **Course Methodology**

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 28 lectures (discussions) and 14 practice sessions.
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

### **COURSE TOPICS**

#### **UNIT - I**

##### **Introduction to Value Education:**

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous, Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

**Tutorial 1: Practice Session PS1** *Sharing about Oneself*

**Tutorial 2: Practice Session PS2** *Exploring Human consciousness*

**Tutorial 3: Practice Session PS3** *Exploring Natural Acceptance*

**Expected outcome:**

The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.

The students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of most of the present-day problems; and a sustained solution could emerge only through understanding of value-based living. Any solution brought out through fear, temptation of dogma will not be sustainable.

The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.

The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to overcome this disharmony.

The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facility in most of the cases, while they have given higher priority to earning of physical facility in their life giving less value to or even ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

**UNIT - II****Harmony in the Human Being (6 lectures and 3 tutorials for practice session)**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, , Harmony of the Self with the Body, Programme to ensure self-regulation and Health

**Tutorial 4: Practice Session PS4** *Exploring the difference of Needs of Self and Body*

**Tutorial 5: Practice Session PS5** *Exploring Sources of Imagination in the Self*

**Tutorial 6: Practice Session PS6** *Exploring Harmony of Self with the Body*

**Expected outcome:**

The students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the physical facility is related to the body. They are also able to see that 'I' and Body are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

The students are able to see that all physical facility they are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

The students are able to see that activities like understanding, desire, thought and selection are the activities of 'I' only the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.

The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance

The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

### **UNIT- III – Harmony in the Family and Society**

Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order

**Tutorial 7: Practice Session PS7** *Exploring the Feeling of Trust,*

**Tutorial 8: Practice Session PS8** *Exploring the Feeling of Respect*

**Tutorial 9: Practice Session PS9** *Exploring Systems to fulfil Human Goal*

#### **Expected outcome:**

The students are able to note that the natural acceptance (intention) is always for living in harmony, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a bad person.

The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for them and for others through he may have different body, physical facility or beliefs.

The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible



to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

#### **UNIT - IV – Harmony in the Nature/Existence**

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

**Tutorial 10: Practice Session PS10**  
*of Nature*

*Exploring the Four Orders*

**Tutorial 11: Practice Session PS11**  
*Existence*

*Exploring Co-existence in*

#### **Expected outcome:**

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.

The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

#### **UNIT - V**

##### **Implications of the Holistic Understanding – a Look at Professional Ethics**

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

## **Tutorial 12: Practice Session PS12**

*Exploring Ethical Human Conduct*

## **Tutorial 13: Practice Session PS13**

*Exploring Humanistic Models in Education*

## **Tutorial 14: Practice Session PS14**

*Exploring Steps of Transition towards Universal Human Order*

### **Expected outcome:**

The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g. mutually enriching production system with rest of nature.

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for the happy and prosperous family and society.

### **Guidelines and Content for Practice Sessions (Tutorials)**

In order to connect the content of the proposals with practice (living), 14 practice sessions have been

designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

### **TEXT BOOK:**

#### **Text Book and Manual**

a. The Textbook

*A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2<sup>nd</sup> Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Manual

Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2<sup>nd</sup> Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

**OUTCOME OF THE COURSE:**

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

## **Teaching-Learning Material:**

Handouts <https://drive.google.com/drive/folders/16eOka8AoBpLGICDajRvk4MXgfXQWzFCB?usp=sharing>

Presentations

<http://www.fdp-si.aicte-india.org/download.php#1> Recording of English 5-Day Online UHV FDP <https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZIGC4>

Recording of UHV-II lectures (including some FAQs) [https://www.youtube.com/playlist?list=PLKDFuUlbRCEbe1oj21ih9ECA78R\\_18d3-](https://www.youtube.com/playlist?list=PLKDFuUlbRCEbe1oj21ih9ECA78R_18d3-)

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>OPERATING SYSTEMS LAB</b>					

**Course Objectives:**

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.
- To study the concurrency and dead lock concepts.
- To study the storage management concepts.
- To study the file management and disk management concepts.

**Course Outcomes:**

1. Students should be able to solve the scheduling algorithms.
2. Students can analyse the concurrency and Deadlock problems.
3. Students should be able to solve the page replacement algorithms.
4. Students should be able to implement the memory management techniques.

**List of Lab Experiments**

1. Simulate the following CPU Scheduling Algorithms
  - (a) FCFS (b) SJF (c) Priority (d) Round-Robin
2. Simulate the following
  - (a) Multiprogramming with a Fixed number of Tasks (MFT)
  - (b) Multiprogramming with a Variable number of Tasks (MVT)
3. Simulate Bankers Algorithm for Dead Lock Avoidance.
4. Write a program to implement the producer-consumer problem using semaphores.
5. Write a program to implement IPC using shared memory.
6. Simulate the following Page Replacement Algorithms
  - (a) FIFO (b) LRU (c) LFU
7. Write a program to simulate the following contiguous memory allocation techniques
  - a) Worst-fit b) Best-fit c) First-fit
8. Write a program to implement Paging technique for memory management.
9. Simulate the following File Allocation Strategies
  - (a) Sequenced (b) Indexed (c) Linked

10. Simulate the following Disk Scheduling Algorithms

(a) FCFS (b) SSTF (c) SCAN

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>UNIFIED MODELING LANGUAGE (UML) LAB</b>					

**Course Objectives:**

- To know the practical issues of the different object oriented analysis and design concepts
- Inculcate the art of object oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object oriented way

**Course Outcomes:**

At the end of the course, student will be able to

- Know the syntax of different UML diagrams
- Create use case documents that capture requirements for a software system
- Create class diagrams that model both the domain model and design model of a software system
- Create interaction diagrams that model the dynamic aspects of a software system
- Write code that builds a software system
- Develop simple applications

**Note:** For performing the experiments consider any case study (ATM/ Banking/ Library/ Hospital management systems)

**Experiment 1:**

Familiarization with Rational Rose or Umbrella environment

**Experiment 2:**

- a) Identify and analyze events
- b) Identify Use cases
- c) Develop event table

**Experiment 3:**

- a) Identify & analyze domain classes
- b) Represent use cases and a domain class diagram using Rational Rose
- c) Develop CRUD matrix to represent relationships between use cases and problem domain Classes

**Experiment 4:**

- a) Develop Use case diagrams
- b) Develop elaborate Use case descriptions & scenarios
- c) Develop prototypes (without functionality)

**Experiment 5:**

- a) Develop system sequence diagrams and high-level sequence diagrams for each use case
- b) Identify MVC classes / objects for each use case
- c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

**Experiment 6:**

- a) Develop detailed design class model (use GRASP patterns for responsibility assignment)
- b) Develop three-layer package diagrams for each case study

**Experiment 7:**

- a) Develop Use case Packages
- b) Develop component diagrams
- c) Identify relationships between use cases and represent them
- d) Refine domain class model by showing all the associations among classes

**Experiment 8:**

Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams



<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>FUNDAMENTALS OF MACHINE LEARNING LAB</b>					

**Course objectives:**

This course will enable students to

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice

**Course outcomes:**

The students should be able to:

- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.

Note : For every Machine Learning model students should calculate the performance metrics and calculate the predictions on the test set.

1. Build a simple linear regression model and perform predictions on the test dataset.  
Consider a company's data, where there is the amount spent on different types of advertisements and its subsequent sales
2. Build a Multiple Linear Regression model on a dataset (eg: 50\_startups)
3. Cross validate the above two models
4. Design a naive Bayes classifier for a sample training data set stored as a .CSV file.  
Compute the accuracy of the classifier, considering few test data sets
5. Build a Logistic Regression classifier by considering a suitable dataset.
6. Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
7. Design a classifier using Support vector machine on a suitable dataset
8. Build a Decision Tree Classifier on a suitable dataset (eg. Pima Indians Diabetes dataset)

9. Practice K-Means clustering by generating your own data using the `make_blobs` function from `sklearn.datasets` module.
10. Perform K-Means clustering on the hand-written digits dataset.
11. Time series modeling - Predict number of air passengers per month. (Dataset : AirPassengers)
12. Create an N-gram language model by using Reuters corpus of the NLTK library
13. Write python implementations for the following activation functions
  1. Sigmoid
  2. Tanh
  3. Relu
  4. Softmax
14. Implement perceptron algorithm from scratch and test it on a sample dataset (eg. breast cancer dataset from sklearn)

Weblinks for Datasets:

1. Company Dataset : <https://www.kaggle.com/rahulrky/company-data>[https://github.com/Kaushik-Varma/linear\\_regression\\_model\\_python/blob/main/Company\\_data.csv](https://github.com/Kaushik-Varma/linear_regression_model_python/blob/main/Company_data.csv)
2. 50\_startups Dataset : Link to dataset : <https://www.kaggle.com/farhanmd29/50-startups>
3. Pima Indian Diabetes Dataset : <https://www.kaggle.com/uciml/pima-indians-diabetes-database>
4. Air Passengers : <https://www.kaggle.com/rakannimer/air-passengers>

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>SKILL ORIENTED COURSE - II</b>					
Web Application Development Using Full Stack – Module - II					

**Course Objectives:**

The objective of this lab is

- to build strong foundation of JavaScript which will help developer
- to apply JavaScript concepts for responsive web frontend development

**Course Outcomes:**

By the end of this lab the student is able to

- develop of the major Web application tier- Client side development
- participate in the active development of cross-browser applications through JavaScript
- develop JavaScript applications that transition between states

**Perform experiments related to the following concepts:**

- 1) Introduction to JavaScript
- 2) Applying JavaScript (internal and external)
- 3) Understanding JS Syntax
- 4) Introduction to Document and Window Object
- 5) Variables and Operators
- 6) Data Types and Num Type Conversion
- 7) Math and String Manipulation
- 8) Objects and Arrays
- 9) Date and Time
- 10) Conditional Statements
- 11) Switch Case
- 12) Looping in JS
- 13) Functions

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>CRITICAL READING AND CREATIVE WRITING</b>					

**COURSE OBJECTIVES:**

**The students will have the ability to**

1. Understand how to identify, analyze, interpret and describe critical ideas, themes, and values in literary texts
2. List the elements of a Short Story
3. Apply critical and theoretical approaches to the reading and analysis of literary texts in multiple genres

**COURSE OUTCOMES:**

Upon the completion of the course, the student will be able to:

1. Understand and explain the characteristics of a literary text
2. Critically analyze the quality of a Shorty Story
- 3 Produce essays like personal essay or descriptive essay applying the principles of good writing
4. Identify facts, themes and critical ideas in a passage
5. Articulate an awareness of the basic elements of a speech

**UNIT – I:**

Essentials of Good Writing

1. Focus, Development, Unity, Coherence and Correctness
2. Imagery
  - A. Figurative Language- Simile, Metaphor, Personification, Hyperbole, Oxymoron, Paradox, Alliteration, Assonance
  - B. Sensory details
3. Point of View

**UNIT – II:**

Elements of a Short story

1. Plot, Setting, Character, Theme
2. Analysis of given short stories: 2 stories
  - A. Good Sees the Truth but Waits by Leo Tolstoy

B. The Cop and the Anthem by O. Henry

### **UNIT – III**

Prose Writing:

Reflective Writing – Personal Essay

Descriptive Writing: Person/Place/Thing

### **UNIT – IV**

Reading Comprehension

Reading for facts, contextual vocabulary, tone and inference

### **UNIT – V:**

Speech Analysis

A. Tryst with Destiny-

<https://www.youtube.com/watch?v=lrEkYscgbqE>

B. Stay Hungry, Stay Foolish –

<https://www.youtube.com/watch?v=UF8uR6Z6KLC>

### **References**

1. The Cambridge Companion to Creative Writing (South Asian Edition)
2. Creative Writing: A Beginner's Manual (Paper Back Edition)
3. Teaching and Developing Reading Skills: Cambridge Handbooks for Language Teachers

### **Web References:**

- <https://www.skillsyouneed.com/learn/critical-reading.html>
- <https://englishforeveryone.org>
- <http://sixminutes.dlugan.com/speech-evaluation-1-how-to-study-critique-speech/>
  - <http://www.homeofbob.com/literature/genre/fiction/ficElmnts.html>