Name of Institute: IITE Indus University Ahmedabad
Name of Faculty: Prof Aakansha Saxena

Course code:CE0716
Course name: Data Warehouse & Mining
Pre-requisites:

1] Knowledge about Software and basic Programming skills

2] Study of Database Management Systems

3] Knowledge of Statistics and Mathematics

Credit points: 4
Offered Semester: 7th

Course Coordinator (weeks 17)
Full Name: Prof Aakansha Saxena
Department with sitting location: 3rd floor Bhanvar Building
Telephone: 7016668183
Email: aakanshasaxena.ce@indusuni.ac.in
Consultation times: 3.00 P.M. to 5.00 P.M. (Monday to Friday)

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives

1. To learn how to gather and analyze large sets of data to gain useful business understanding and how to produce a quantitative analysis report/memo with the necessary information to make decisions.
2. To develop and apply critical thinking, problem-solving, and decision-making skills. Define knowledge discovery and data mining for skill development.
3. To recognize the key areas and issues in data mining.
4. To apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data for employability.
5. To determine whether a real-world problem has a data mining solution.
6. To apply evaluation metrics to select data mining techniques

Course Outcomes (CO)

After successful completion of the course, student will able:

1. Understand various Data Mining Applications in Real World Scenario

2. Identify the Analytical Characteristics of Mining Techniques like Clustering, Classification, Outlier Analysis etc.
3. Employ algorithm to model Engineering Problems
4. Apply Mining concepts into Business Intelligence for giving solutions, organizational changes, products, technologies and methods to organize key data to improve performance and profit.
5. To learn about various clustering techniques.
6. To learn about pattern search and association rules.

Course Outline

This course provides students with an in-depth understanding of the design and implementation of data warehousing and data mining based systems. It will address the opportunities and challenges of applying data mining techniques in academics, industry, businesses, sciences and the Web. Several aspects of the data mining process are covered in this course such as: data gathering and storage, data selection and preparation, model building and testing, results interpretation and validation and models application

Method of delivery

(Online lectures, self-study material, Active Learning Techniques)

Study time

(3 Hours Per Week)

CO-PO Mapping (PO: Program Outcomes)

1 Program Outcomes (PO's)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.

4. **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.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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. Programme Specific Outcome

Computer Engineering

1. To understand the principles and working of computer systems.
2. To Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

3. Should able to understand the structure and development methodologies of software systems with the use of a various programming languages and open source platforms

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO110	PO111	PO112	PSO1	PSO2	PSO3
1	3	3	-	2	-	-	-	-	-	-	-	1	1	3	-
2	3	-	3	-	1	-	-	-	-	-	-	-	-	-	2
3	-	3	-	3	-	2	2	-	-	2	-	-	-	-	-
4	3	-	3	-	2	-	-	-	-	-	1	-	2	-	1
5	-	3	-	3	-	2	-	-	-	-	-	2	-	2	-
6	2	-	-	2	1	-	-	-	-	3	-	-	-	1	-

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

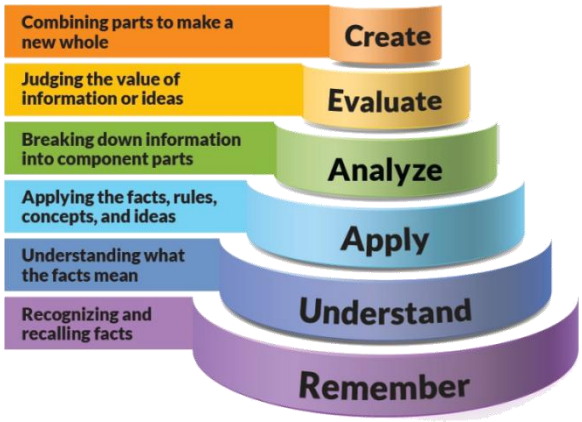


Figure 1: Blooms Taxonomy

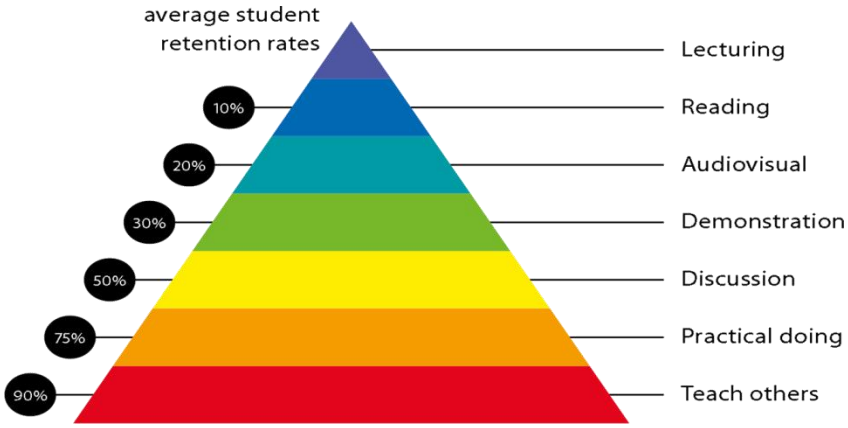


Figure 2: Knowledge retention

Lecture/tutorial times

(Give lecture times in the format below)

Monday: 12.20 PM -1.20 PM
Tuesday: 11.10 AM-12.10 PM
Wednesday: 12.20 PM -1.20 PM

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books:

1. Data Mining concepts and Techniques by Jiawei Han, Micheline Kamber –Elsevier.

Reference Books:

1. Data Mining by Arun K. Pujari – University Press.
2. Mordern Data Warehousing, Data Mining and Visualization by George M. Marakas –Pearson.
3. Data Mining by Vikram Puri and P.Radha Krishana –Oxfrod Press.
4. Data Warehousing by Reema Theraja –Oxford Press

Additional Materials

Web Resources

1. NPTEL Lecture: https://nptel.ac.in/courses/110106064/
2. NPTEL Lecture: https://nptel.ac.in/courses/106101007/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Theory Criteria 60 Marks(Internal) + 40 Marks(External)	Practical Criteria:60 Marks(Internal) + 40 Marks(External)
Attendance: 05 Marks	Practical File Submission & Attendance: 20 Marks
Assignment (Theory based Assignment): 15 Marks	Project Definition-Presentation+ Report: 20 marks (10 marks-Presentation+QA and 10 Marks for Report)
Mid- Semester Exam :40 Marks	Quiz: 20 Marks
End Semester Exam: 40 Marks	End Semester Practical Exam and Viva : 40 Marks

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each student.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

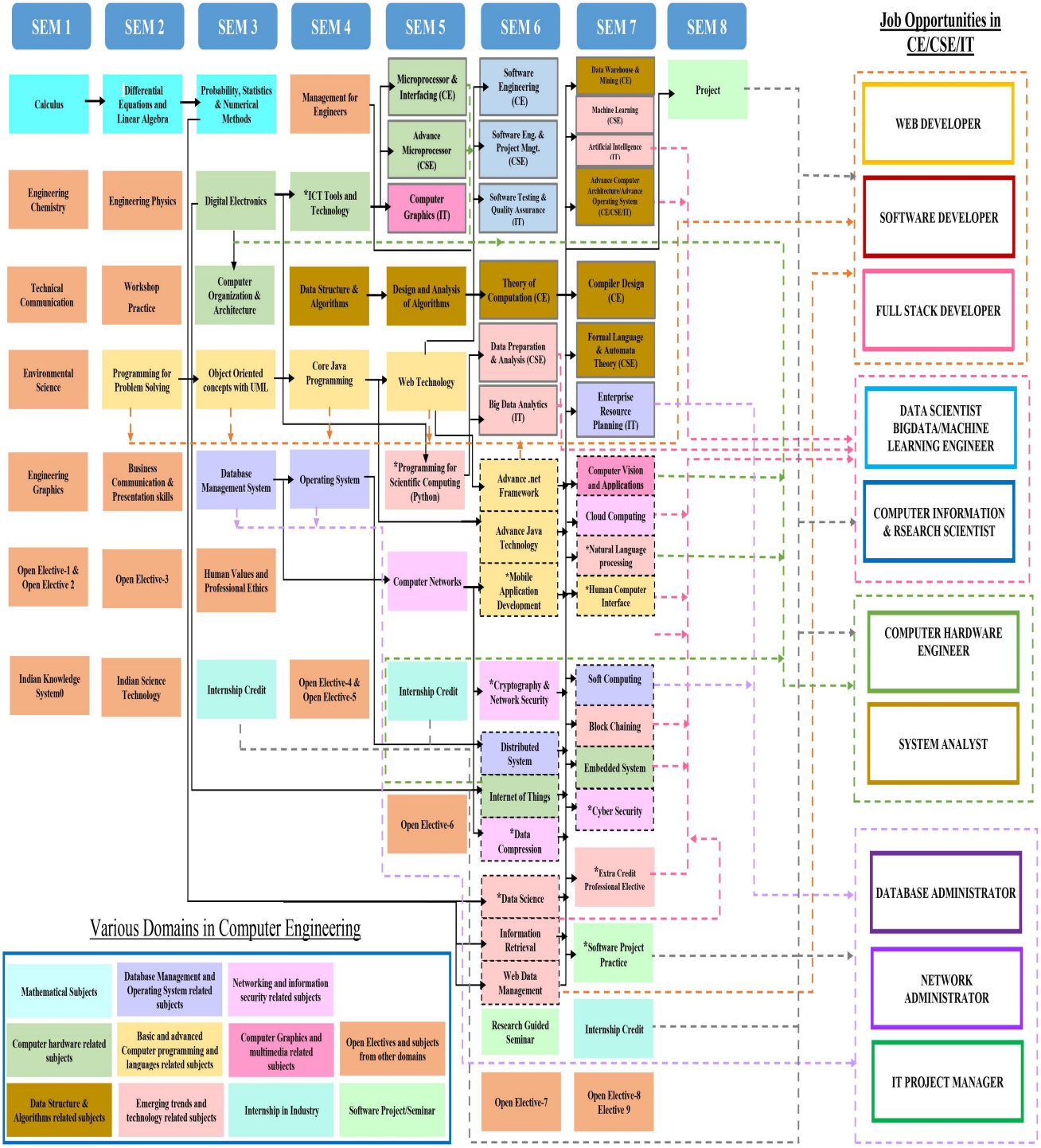
Course schedule

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Week 1	**Introduction to Data Mining:** Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems	1,4	Online Session with PPT/ Notepad
	Week 2	Data mining architecture, Major Issues in Data Mining, Applications of Data Mining, Social Impacts of data mining.	4,5	Online Session with PPT/ Notepad
	Week 3	**Introduction to Data Warehouse and OLAP Technology for Data Mining** Data Warehouse, From Data Warehousing to Data Mining, OLAP versus OLTP, Data Warehouse Architecture	*1, 2,4*	Online Session with PPT/ Notepad
	Week 4	Data Warehouse Development Approach, Multidimensional data Model, Data Warehouse Design Schema	1,4	Online Session with PPT/ Notepad
	Week 5	**Data Pre-processing :**Data cleaning: Filling Out Missing Values, Noisy Data Removal, Outlier Analysis, Data Cleaning as a Process;	1,2	Online Session with PPT/ Notepad
	Week 6	Data Integration: Correlation Techniques, Entity Identification Problem, Tuple Duplication Problem; Data Reduction:	2,4	Online Session with PPT/ Notepad
	Week 7	Principal Component Analysis, Sampling, Attribute Subset Selection, Histograms	3,4	Online Session with PPT/ Notepad
	Week 8	DataTransformation: Normalization,Concept HierarchyGeneration, Aggregation and Discretization	2,3	Online Session with PPT/ Notepad

	Week 9	**Mining Frequent Patterns, Associations, Correlations:**Market Basket Analysis, Association Rule Mining, Association Rue Mining Algorithms: Apriori Algorithm, FP Growth Algorithm;	*2,3*	Online Session with PPT/ Notepad
	Week 10	Mining of: Single dimensional Association Rules, Multilevel Association Rules, Multidimensional Association Rules and Constraint based Association Rules	1,3	Online Session with PPT/ Notepad
	Week 11	**Classification and Prediction:**Classification as a Process, Bayesian Classification, Classification by Decision Tree Induction, Associative Classification, Classification by Backpropagation, Prediction	2,3	Online Session with PPT/ Notepad
	Week 12	Fundamentals of Prediction, Linear Regression and Non-Linear Regression; Issues in Classification and Prediction	4,5	Online Session with PPT/ Notepad
	Week 13	**Cluster Analysis:** Clustering as a Process, Clustering using Partitioning Methods, Hierarchical methods,	4,5	Online Session with PPT/ Notepad
	Week 14	Density based Methods, Grid based Methods and Model based Methods	5	Online Session with PPT/ Notepad
	Week 15	**Mining complex Types of Data:**Introduction to Spatial Data Mining, Multimedia Data Mining, Temporal Data Mining, Text and Web Mining	1,4,5	Online Session with PPT/ Notepad
	Week 16	Revision	4,5	Online Session with PPT/ Notepad

PROGRAM MAP for Bachelor of Engineering
(CE / CSE / IT)

COMPUTER ENGINEERING DEPARTMENT COURSE DEPENDANCY CHART



Name of Institute: Indus Institute of Technology & Engineering
Name of Faculty: Ms. Madhvi Bera

Course code: CE0717
Course name: Compiler Design
Pre-requisites: System Software and basic concept of translator
Credit points: 3
Offered Semester: 7th

Course Coordinator (weeks 01 - 15)
Full Name: Ms. Madhvi A. Bera
Department with siting location: Department of Computer Engineering (4th Floor Faculty Room, Bhanvar Building)
Email: madhvibera.ce@indusuni.ac.in
Consultation times: 03:00 pm to 04:30 pm

Course Lecturer (weeks 01 - 15)
Full name: Ms. Madhvi A. Bera
Department with siting location: Department of Computer Engineering (4th Floor Faculty Room, Bhanvar Building)
Email: madhvibera.ce@indusuni.ac.in
Consultation times: 03:00 pm to 04:30 pm

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives
By participating in and understanding all facets of this Course a student will:

1) To provide a thorough understanding of the internals of Compiler Design.
2) To provide the knowledge of the concepts and different phases of compilation with compile time error handling.
3) To provide the knowledge about design of lexical analyzer, top down and bottom-up parsers.
4) To provide the knowledge about optimization techniques to intermediate code and generate machine code for high level language program.

Course Outcomes (CO)
After successful completion of the course:
1) Explain the concepts and different phases of compilation with compile time error handling.
2) Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language.

3) Compare top down with bottom-up parsers, and develop appropriate parser to produce parse tree representation of the input.
4) Generate intermediate code for statements in high level language.
5) Design syntax directed translation schemes for a given context free grammar.
6) Apply optimization techniques to intermediate code and generate machine code for high level language program.

Course Outline

Lexical Analyzer, Parsing, Error-recovery, Intermediate code generation, Code optimization and generation

Method of delivery

1. Chalk & Talk
2. PPT presentation

Study time

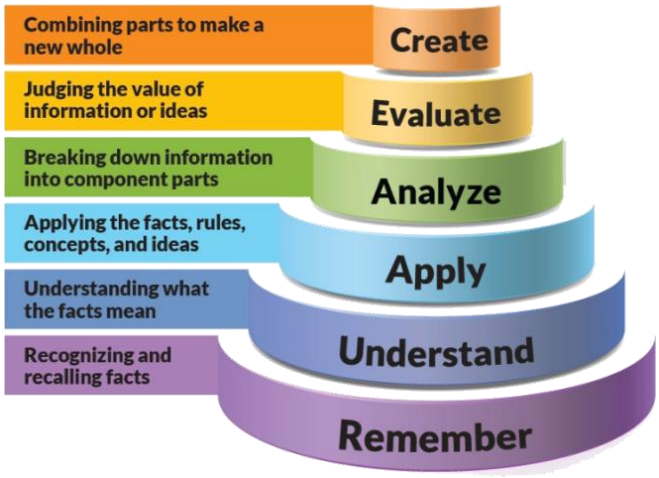
Lecture: 3 hours per week
Reading Time :5 Hours

CO-PO Mapping (PO: Program Outcomes)

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

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)



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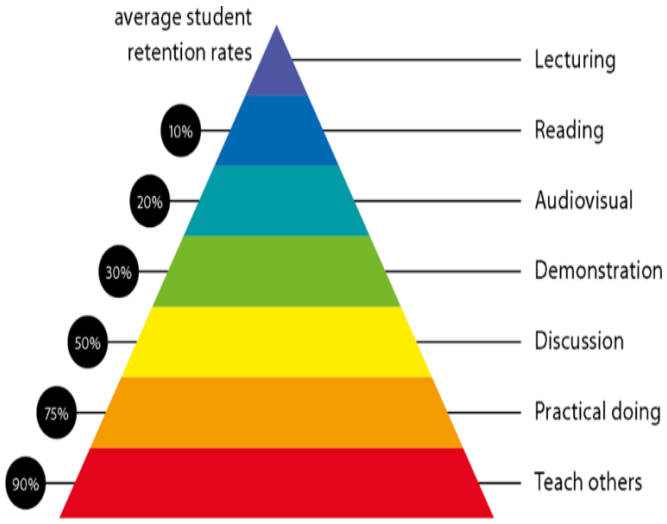

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Lecture/tutorial times

Lecture	Thursday	10.00 am – 11.00 am	Online/Room
Lecture	Thursday	11.10 am – 12.20 pm	Online/Room
Lecture	Friday	09.00 am – 10.00 am	Online/Room

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books

1. "System Programming and Operating System" By D M Dhamdhere, Tata McGraw Hill.
2. Compiler Design by Alfred V. Aho, Ravi Sethi, Jeffery D. Ullman, Pearson Publication

Reference Books:

1. "System Programming" by Donovan, Tata McGraw Hill
2. "Compilers -Principles and Practice" by Parag H. Dave and Himanshu B. Dave, Pearson Education

Additional Materials

1. www.cse.iitd.ernet.in/~sak/courses/cdp/slides.pdf
   http://iitmweb.iitm.ac.in/phase2/downloads/106108113/
2. http://nptel.ac.in/courses/106108052/
3. www.coursera.org/course/compilers
4. www.wikipedia.org/wiki/Compiler
5. https://en.wikipedia.org/wiki/Principles_of_Compiler_Design
6. https://en.wikipedia.org/wiki/Compiler_construction

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Assessment (CIE)	Marks
Mid Semester Exam	40
Assignment - 1	5
Assignment – 2	5
Attendance >80%	5
Quiz	5
End Semester Exam	40

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

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Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

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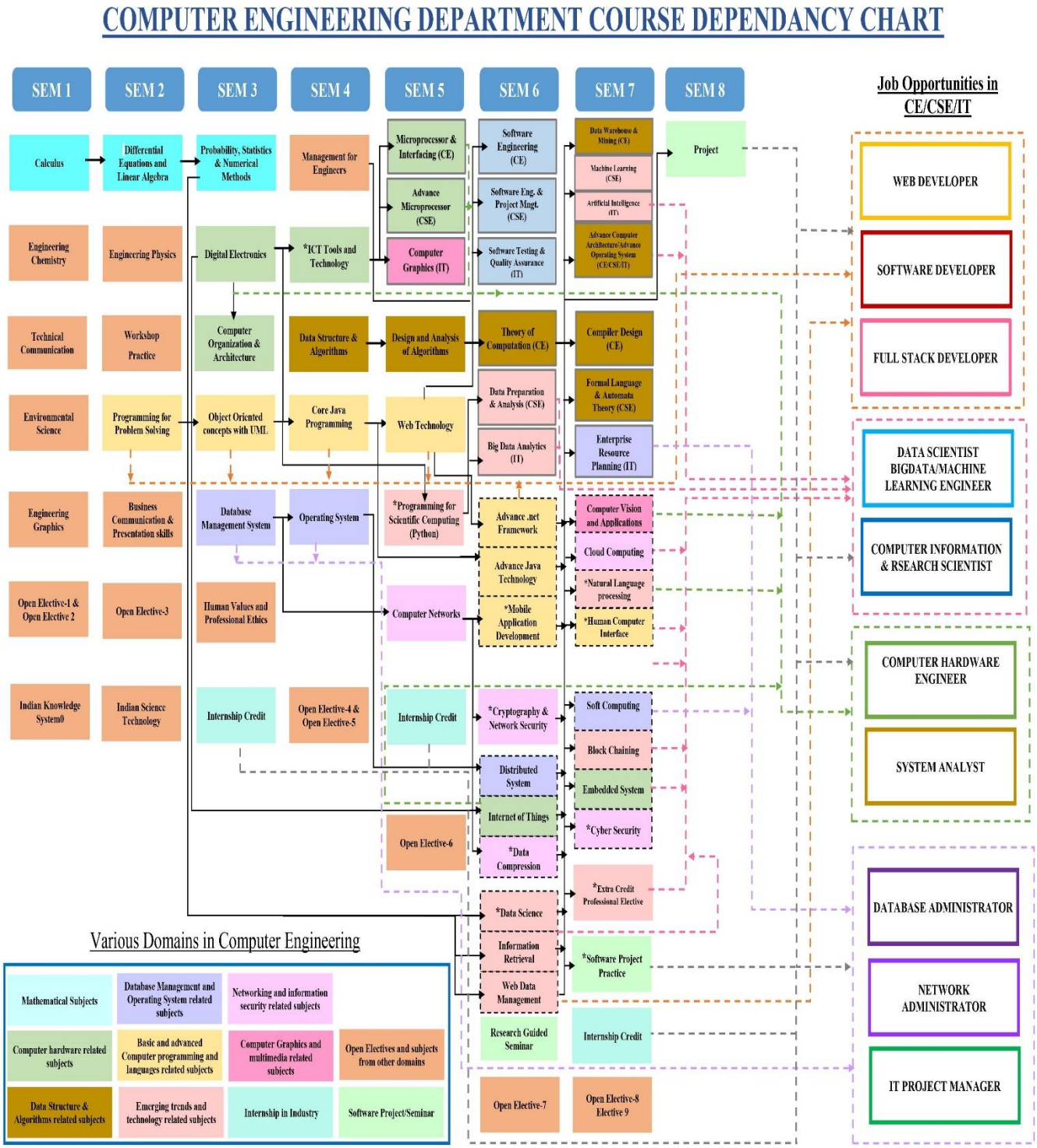
Course schedule (subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Overview and use of linker and loader, types of Compiler, Analysis of the Source Program, The Phases of a Compiler	CO1, CO2	Chalk & Board/ PPT
	Weeks 2	Cousins of the Compiler, The Grouping of Phases, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers, Front-end and Back-end of compiler, pass structure	CO2, CO3	Chalk & Board/ PPT
	Week 3	Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens	*CO2, CO3*	Chalk & Board/ PPT
	Week 4	A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA	CO3	Chalk & Board/ PPT
	Week 5	Top Down and Bottom up Parsing Algorithms, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing	CO3	Chalk & Board/ PPT
	Week 6	LR Parsers, Using Ambiguous Grammars, Parser Generators, Automatic Generation of Parsers.	*CO2, CO3*	Assignment - 1
	Week 7	Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, syntax directed definitions and translation schemes	CO4	Chalk & Board/PPT
	Week 8	Error Detection & Recovery, Ad-Hoc and Systematic Methods	CO4, CO6	Chalk & Board/ PPT
	Week 9	Different Intermediate Forms, Syntax Directed Translation Mechanisms And Attributed Mechanisms And Attributed Definition.	*CO4*	Chalk & Board/ PPT

	Week 10	Source Language Issues, Storage Organization, Storage-Allocation Strategies, and Access to Non local Names, Parameter Passing,	CO4, CO5	Chalk & Board/ PPT
	Week 11	Symbol Tables, and Language Facilities for Dynamic Storage Allocation, Dynamic Storage Allocation Techniques.	CO5, CO6	Chalk & Board/ PPT
	Week 12	Global Data Flow Analysis, A Few Selected Optimizations like Command Sub Expression Removal, Loop Invariant Code Motion, Strength Reduction etc	CO5	Assignment - 2
	Week 13	Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs	CO5	Chalk & Board/ PPT
	Week 14	Next-Use Information, A Simple Code Generator, Register Allocation and Assignment, The DAG Representation of Basic Blocks, Peephole Optimization	CO5, CO6	Chalk & Board/ PPT
	Week 15	Generating Code from DAGs, Dynamic Programming Code-Generation Algorithm, Code Generator Generators	CO5, CO6	Quiz

Program Map for Bachelor of Engineering (CE/CS/IT)



Name of Institute:IITE Indus University Ahmedabad

Name of Faculty:Prof Khushbu Maurya

Course code: CE0719

Course name: Soft Computing

Pre-requisites: NA

Credit points: 3

Offered Semester: 7th

Course Coordinator (weeks 12)

Full Name:Prof Khushbu Maurya

Department with siting location:4th floor Bhanvar Building

Telephone:NA

Email:khushbumaurya.ce@indusuni.ac.in

Consultation times:9.00 AM to 4.30 PM

Course Lecturer (weeks 12)

Full Name:Prof Khushbu Maurya

Department with siting location:4th floor Bhanvar Building

Telephone:NA

Email:khushbumaurya.ce@indusuni.ac.in

Consultation times:9.00 AM to 4.30 PM

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives

By participating in and understanding all facets of this Course a student will:

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Recognize the feasibility of applying a soft computing methodology for a particular problem.
3. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
4. Apply genetic algorithms to combinatorial optimization problems.
5. Apply neural networks to pattern classification and regression problems.
6. Effectively use existing software tools to solve real problems using a soft computing approach.
7. Evaluate and compare solutions by various soft computing approaches for a given problem.

After successful completion of the course, student will able:

CO1-PO1	L	As they could just apply the knowledge of softcomputing for solutions to engineering problems.
CO1-PO2	L	Students could arrive at conclusions using principles of soft computing
CO1-PO3	H	They can design softcomputing systems for societal needs
CO1-PSO1	L	They can design solutions for complex engineering problems by understanding the core principles of working of human brain.
CO1-PSO2	H	Students acquire competency in designing and developing soft computing algorithms which meets the demands of the industry.
CO2-P01	M	Students will be able to describe neural network architectures
CO2-PO2	M	Students will be able to analyse problems and arrive at conclusions using neural networks.
CO2-PO3	H	Students will be able to design systems using neural networks
CO2-	L	Understanding of the working of different neural architectures

PSO1		
CO2-PSO2	H	Students acquire competency in developing a neural network
CO3-PO1	M	Students will be able to describe various fuzzy systems
CO3-PO2	M	Students will be able to describe various fuzzy operations
CO3-PO3	H	Students gain competency in designing fuzzy inference system
CO3-PSO1	L	Understanding the working of various methods fuzzy systems
CO3-PSO2	H	Students acquire competency in developing good fuzzy inference system
CO4-PO1	L	Students will be able to identify different genetic algorithm operations
CO4-PO2	L	Students will gain knowledge in applying genetic algorithm methods
CO4-PO3	M	Students gain competency in designing a genetic method for a problem
CO4-PSO1	L	Understanding of the design and working of genetic algorithm based method
CO5-PO1	M	Students will be able to identify different soft computing methods for real time problems
CO5-PO2	M	Students will be able to design algorithms using standard practices in soft computing
CO5-PO3	H	Students gain competency in designing and developing their own soft computing system
CO5-PSO2	H	Students acquire competency in design and development of soft computing system in the field of character recognition , weather forecasting etc.

Course Outline

An in-depth introduction to a systems programming, Soft Computing language(s) and application of those language(s) to systems level problems. The focus will be on programming constructs that are closely aligned with the architecture of a digital computer including those providing portability between platforms, dynamic allocation and management of virtual memory, complex in-memory data structures, reading/writing binary data using sequential and random access, pointer arithmetic manipulation, and interaction between threads/processes.

Method of delivery

Face to face lectures, self study material, Active Learning Techniques, ppt presentations.

Study time

Lecture hours: 3 hours and Lab hours: 2 hours.

CO-PO Mapping (PO: Program Outcomes)

1 Program Outcomes (PO's)

Engineering Graduates will be able to:

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 modelling 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.

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. Programme Specific Outcome

1. **To** understand the principles and working of computer systems.
2. **To** Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

Mapping CO's with PO's

CO-PO MAPPING	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	1	3	-	-	_	_	_	_	_	_	_
CO2	2	2	3	-	_	_	_	_	_	_	_	_
CO3	2	2	3	-	-	_	_	_	_	_	_	_
CO4	1	1	2	_	-	_	_	_	_	_	_	_
CO5	2	2	3	-	-	_	_	_	_	_	_	_
CO6	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO7	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1-Lightly Mapped 2- Moderately Mapped 3- Highly Mapped

Mapping of CO's with PSO's

	PSO 1	PSO 2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	-
CO5	-	3
CO6	**1**	**3**
CO7		

1-Lightly Mapped 2- Moderately Mapped 3- Highly Mapped

Computer Engineering

1. **To** understand the principles and working of computer systems.
2. **To** Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.
3. Should able to understand the structure and development methodologies of software systems with the use of a various programming languages and open source platforms

Blooms Taxonomyand Knowledge retention(For reference)

(Blooms taxonomy has been given for reference)

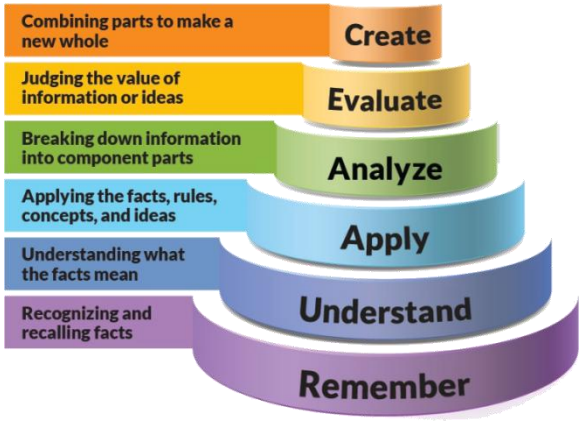


Figure 1: Blooms Taxonomy

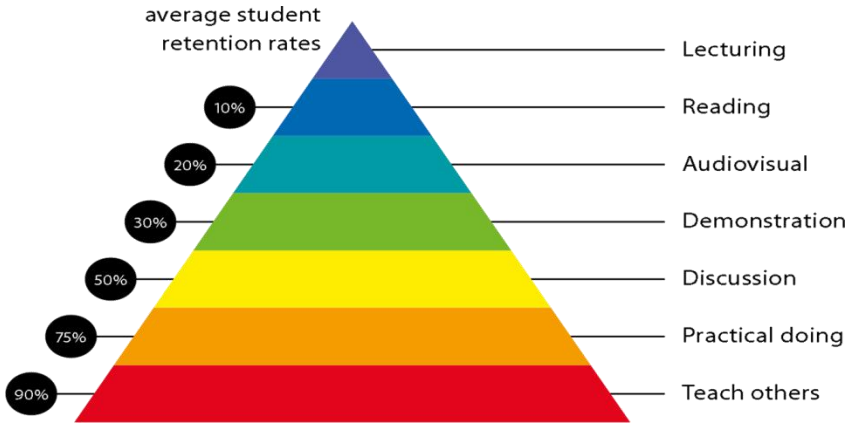


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

Practical work:

Week No	Class Activity	Subject content to be delivered
01	Lab 1	Implement OR, AND Using Perceptron in C
02	Lab 2	Implement OR, AND Using Perceptron in MATLAB Command-line Argument
03	Lab 3	Implement OR, AND Using Perceptron in MATLAB GUI
04	Lab 4	Implement OR, AND, X-OR gate, Using back propagation algorithm in MATLAB using Command-line Argument as well as GUI.
05	Lab 5	Solve a given problem-1 (Operatons) using Fuzzy Logic in MATLAB.
06	Lab 6	Solve a given problem-1 (Max-Min Composition) using Fuzzy Logic in MATLAB
07	Lab 7	To find the solution of the function Maximize, given the constraints using GA approach in C
08	Lab 8	
09	Lab 9	Solve a given problem-1using using Fuzzy Logic in MATLB GUI
10	Lab 10	Study GA tool in MATLAB.

Lecture/tutorial times

(Give lecture times in the format below)

Example:

7th CE			
Lecture	Monday	11:25 – 12:20 am	ONLINE
Lecture	Tuesday	10:30 – 11:25 am	ONLINE
Lecture	Thursday	11:25 – 12:20 am	ONLINE
7th CSE/IT			
Lecture	Tuesday	01:00 – 01:55 am	ONLINE
Lecture	Thursday	02:50 – 03:45 am	ONLINE
Lecture	Friday	09:25 – 10:20 am	ONLINE

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text Books

1. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007.ISBN: 10: 81-265-1075-7.

Reference Books

1. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.
2. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 2004, Pearson Education.

Additional Materials

Online Outcomes:

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Example:	
Test 1	5% (unit 1)
Test II	5% (unit 2)
Mid semester	30% (due week 10)
Final exam (*closed book*)	60%

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

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Course schedule(subject to change)

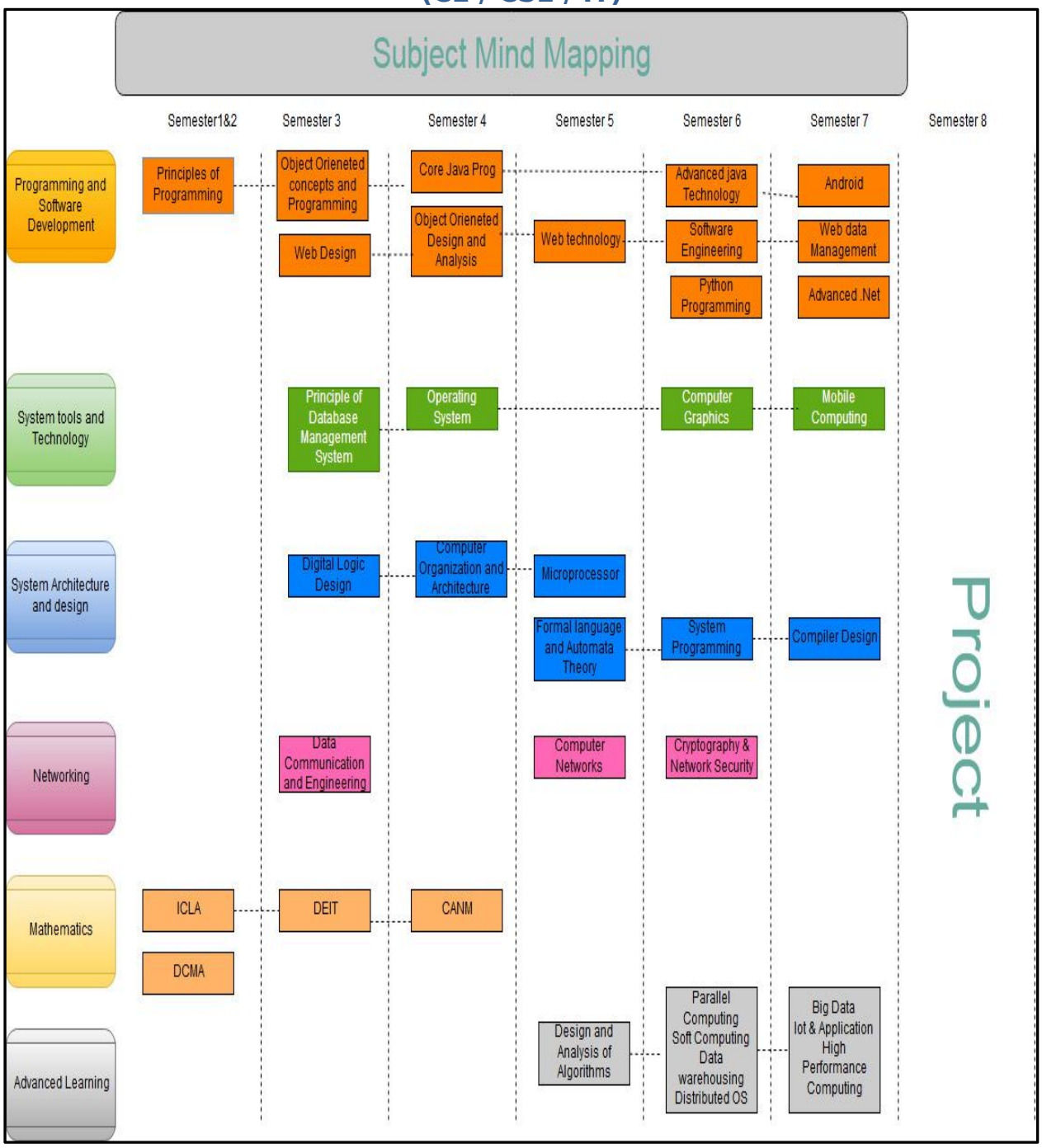
(Mention quiz, assignment submission, breaksetcas well in the table under the Teaching Learning Activity Column)

Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
Weeks 1	Introduction Fundamental concept Basic Models of Artificial Neural Networks Important Terminologies of ANNs McCulloch-Pitts Neuron Linear Separability	1,2	
Weeks 2	Hebb Network. Supervised Learning Network: Perceptron Networks Adaline Multiple Adaptive Linear Neurons Back-Propagation Network Radial Basis Function Network. **Associative Memory Networks** Training Algorithms for Pattern Association	1,2	

	Week 3	Auto associative Memory Network Hetero associative Memory Network Bidirectional Associative Memory Hopfield Networks Iterative Auto associative Memory Networks Temporal Associative Memory Network. Unsuperv Learning Networks: Fixed weight Competitive Nets Kohonen Self-Organizing Feature Maps	1,2	
	Week 4	Learning Vector Quantization Counter propagation Networks Adaptive Resonance Theory Networks Special Networks. **Fuzzy Set Theory** Introduction to Classical Sets and Fuzzy sets	1,2	*Test1(closed book)*
	Week 5	Classical Relations and Fuzzy Relations Tolerance and Equivalence Relations Noninteractive Fuzzy sets Membership Functions: Fuzzification Methods of Membership Value Assignments Defuzzification Lambda-Cuts for Fuzzy sets and Fuzzy Relations Defuzzification Methods. Fuzzy Arithmetic and Measures: Fuzzy Rule Base and Approximate Rea Truth values and Tables in Fuzzy logic	1,2	

	Week 6	Fuzzy Propositions Formation of Rules Decomposition and Aggregation of rules Fuzzy Reasoning Fuzzy Inference Systems (FIS) Fuzzy Decision Making Fuzzy Logic Control Systems. **Genetic Algorithm** Introduction GA	*1,2*	
	Week 7	Basic Operators and Terminologies in GAs Traditional Algorithm vs. Genetic Algorithm Simple GA General Genetic Algorithm	1,2,3	Test2(closed book)
	Week 8	The Scheme Theorem Classification of Genetic Algorithm Holland Classifier Systems Genetic Programming.	1,2,3	Assignment Submission
	Week 9	Applications of Soft Computing: A Fusion Approach of Multispectral Images with SAR Image for Flood Area Analysis	1,2,3	
	Week 10	Travelling Salesman Problem using Genetic Algorithm Approach	2,3,4	
	Week 11	Genetic Algorithm based Internet Search Technique .	2,3,4	
	Week 12	Soft Computing based Hybrid Fuzzy Controlle Soft Computing based Rocket Engine – Contr	4,5,6	

PROGRAM MAP for Bachelor of Engineering (CE / CSE / IT)



Name of Institute: Indus Institute of Technology & Engineering
Name of Faculty: Prof. Bhumi M Shah

Course code: IT0701
Course name: Artificial Intelligence

Pre-requisites : Data Structures, Mathematics

Credit points: 4
Offered Semester: VII

Course Coordinator
Full name: Prof. Bhumi M Shah
Department with sitting location: CE Dept, 3rd floor Bhanwar Building.
Telephone: 3335
Email: bhumishah.ce@indusuni.ac.in
Consultation times:
Monday: 01:20pmm to 2:00pm
Friday: 01:20pmm to 2:00pm

Course lecturer
Full Name:Prof. Bhumi M Shah
Department with sitting location: CE Dept, 3rd floor Bhanwar Building.
Telephone: 3335
Email: bhumishah.ce@indusuni.ac.in
Consultation times:
Monday: 01:20pmm to 2:00pm
Friday: 01:20pmm to 2:00pm

Students will be contacted throughout the session via mail with important information relating to this course.

Course Objectives:

1. Understand AI Problems and Apply Various Techniques for Engineering Problem Solving and skill development.
2. Solve Game Playing Problems
3. Understand how Expert System is designed and how Knowledge Engineering works to provide employability.
4. Apply Fuzzy Logic for Problem Solving.
5. Apply Semantic Rules for reasoning and inference.
6. Apply Various Algorithms like Breadth First Search, Depth First Search, A* and Heuristic Search for various Applications

Course Outcomes (CO)

After learning the course the students should be able to:

1. Understand AI Problems and Apply Various Techniques for Engineering Problem Solving.
2. Solve Game Playing Problems.
3. Understand how Expert System is designed and how Knowledge Engineering works.
4. Apply Fuzzy Logic for Problem Solving.
5. Apply Semantic Rules for reasoning and inference.
6. Apply Various Algorithms like Breadth First Search, Depth First Search, A*, Heuristic Search for various Applications

Course Outline

UNIT-I **[12 hours]**

Artificial Intelligence: Its Roots and Scope

Introduction, history/early work in AI, Overview of AI Application Areas , Turing Test.AI Problems, The Underlying Assumption, What Is An AI Techniques, The Level Of The Model, Criteria For Success

Problem Solving by Searching

Defining the problems as a state space search, production systems, production characteristics, production system characteristics, Issues in designing search programs.

Uninformed and Informed Search Strategies, Searching with Partial Information, Heuristic Functions

UNIT-II **[12 hours]**

Search Techniques:

Generate and test, Hill climbing, Breadth first search, Depth first search, Hill climbing, Best first search, A* algorithm, AO* Algorithm, Iterative Deepening Search, IDA*, Recursive Best First Search, Constraint Satisfaction and Heuristic Repair, Applications, Problem Solving Agents, Searching for Solutions, Real World Problems, Constraint Satisfaction Search, Local Search Algorithms and Optimization Problems, Online Search Agents and Unknown Environments

UNIT-III **[12 hours]**

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation

Using Predicate Logic: Representation Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates and Resolution.

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

Symbolic Reasoning Under Uncertainty: Introduction to Non monotonic Reasoning, Logics for Non-monotonic Reasoning.

Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory, Fuzzy Logic. Semantic Nets, Frames.

UNIT-IV **[12 hours]**

Game Playing : Games, Optimal Decisions in Games, Min max method , Perfect and imperfect decisions, Overview, Min Max, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.
Learning: Overview of different forms of learning, Learning Decision Trees, Neural Networks.

Method of delivery

Chalk and Board, PowerPoint Presentation

Study time

3 hrs theory, 2 Hrs practical

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO 1	3	3	-	2	2	-	-	2	-	-	-	3
CO 2	2	3	2	2	2	2	-	2	2	-	-	3
CO 3	2	2	2	2	2	2	2	2	-	-	-	3
CO 4	3	3	-	-	-	-	-	2	-	-	-	3
CO 5	3	3	-	-	-	-	-	1	-	-	-	3
CO 6	1	1	-	2	-	-	1	1	-	-	-	3

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

Figure 1: Blooms Taxonomy

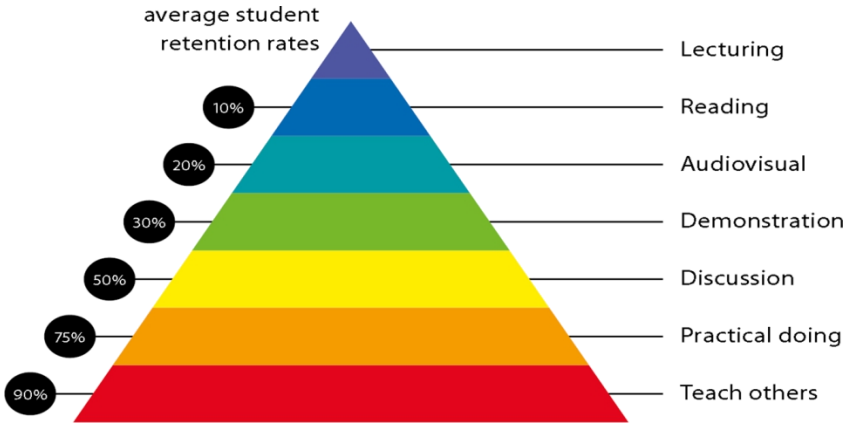


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement	**4 Problem solving skills**

decisions. Be flexible, thorough, innovative and aim for high standards.	
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Practical work:

1	A)Write a PROLOG program that list four addresses in a label form, each address should list a name, one-line address, city, state &ZIP code. B)WAP to Create Database for Hobbies of Different Person	Basic knowledge of PROLOG
2	A)Write a PROLOG program for diagnosis the childhood diseases. B)Write a PROLOG program for Family Relationship.	Basic knowledge of PROLOG
3	Write a PROLOG program Checking for Password. A)Give an opportunity to user to re-enter the password 'n' no. Of Times, on entering wrong password. B)Give an opportunity to user to re-enter the password three (03) Times, on entering wrong password.	Basic knowledge of BFS & DFS
4	Write a PROLOG program to implement Tower Of Hanoi Problem.	Basic knowledge of PROLOG
5	Write a PROLOG program to calculate the roots of quadratic equation Consider all possibilities real, equal, imaginary.	Basic knowledge of Tower Of Hanoi Problem.
6	Write a PROLOG program to solve Water-Jug Problem.	Basic knowledge of PROLOG operators.
7	Write a PROLOG program for Monkey Banana Problem.	Basic knowledge of PROLOG operators
8	Write a PROLOG program to find the factorial of given number	Basic knowledge of Water-Jug Problem
9	Write a PROLOG program based on list:-	Basic knowledge of cut & fail in

	A) To find the length of a list. B) To find whether given element is a member of a list. C) To Append the list. D) To Reverse the list. E) To find the last element of a list. F) To find the first element of the list	prolog.
10	Write a PROLOG program to check if a given year is a Leap Year or not.	Basic knowledge of Traveling Salesman Problem.
11	Write a PROLOG program to To find the Greatest Common Divisor of two number.	Basic knowledge of Monkey Banana Problem
12	Write a PROLOG program to To find the Least Common Divisor of two numbers.	Basic knowledge of N-QUEEN problem.

Lecture/Tutorial times

(Give lecture times in the format below)

Lecture	**Tuesday**	**10:00 am to 11:00 am**
Lecture	**Thursday**	**11:10 am to 12:10 pm**
Lecture	**Friday**	**11:10 am to 12:10 pm**
Practical (A1)	**Thursday**	**2:00 pm to 4:00 pm**
Practical (A2)	**Tuesday**	**3:10 pm to 4:10 pm**
Practical (A2)	**Friday**	**9:00 am to 10:00 am**

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for semester examinations.

Reference Books:

1. “Artificial Intelligence” -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. N. J.Nilsson, “Artificial Intelligence: A New Synthesis”, Harcourt Publishers.
3. “Artificial Intelligence: A Modern Approach”, Stuart Russel, Peter Norvig, PHI
4. “Introduction to Prolog Programming “ by Carl Townsend.
5. “PROLOG Programming For Artificial Intelligence” -by Ivan Bratko(Addison-Wesley)
6. “Programming with PROLOG” –by Klocksin and Mellish.

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

CIE-Theory (60 Marks) **Class Regularity:10 Marks** **Quiz/Assignment:10** **Mid Sem Exam:40 Marks**	**CIE-Practical (60 Marks)** **Lab Regularity:10 Marks** **Lab Performance/Submission:20 Marks** **Presentation:10 Marks** **Quiz:20 Marks**
ESE-Theory- 40 Marks	**ESE-Practical-40 Marks**
Total: 200 Marks	**Total: 200 Marks**

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in internal component or less than 40% in the end semester will be considered for supplementary assessment in the respective components (i.e internal component or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (internal component or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

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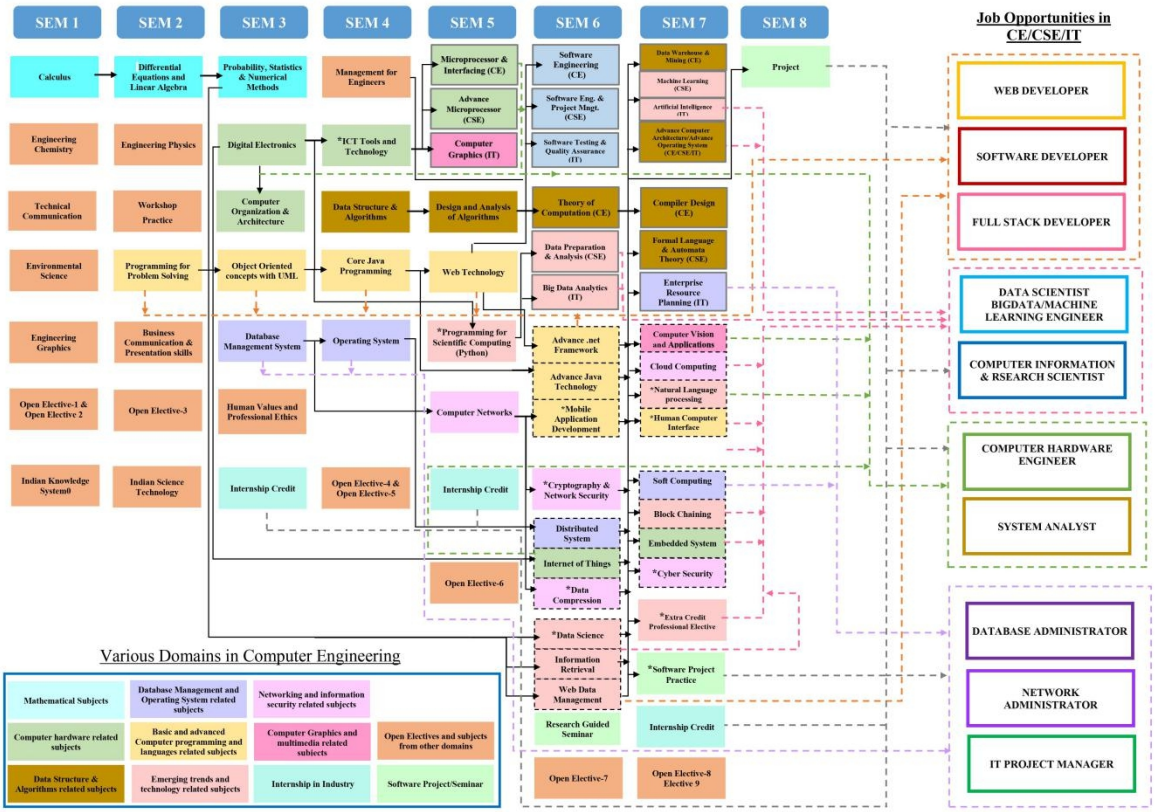
Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment.

Course schedule

Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
Week 1	AI Problems, The Underlying Assumption, What Is An AI Techniques, The Level Of The Model, Criteria For Success	I	Chalk & Board, Discussion
Week 2	Defining the problems as a state space search, production systems, production characteristics, production system characteristics, Issues in designing search programs.	II	Presentation, Chalk & Board
Week 3	Uninformed and Informed Search Strategies, Searching with Partial Information, Heuristic Functions,	II	Presentation, Chalk & Board
Week 4	Generate and test, Hill climbing, Breadth first search, Depth first search, Hill climbing, Best first search,	II	Presentation, Chalk & Board
Week 5	A* algorithm, AO* Algorithm, Iterative Deepening Search, IDA*, Recursive Best First Search, Constraint Satisfaction and Heuristic Repair	VI	Presentation, Chalk & Board
Week 6	Problem Solving Agents, Searching for Solutions, Real World Problems, Constraint Satisfaction Search, Local Search Algorithms and Optimization Problems, Online Search Agents and Unknown Environments	VI	Model presentation
Week 7	Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation	III	Presentation, Chalk & Board, Demonstration

	Week 8	Using Predicate Logic: Representation Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates and Resolution.	III	Presentation, Chalk & Board, Demonstration
	Week 9	Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.	II	Presentation, Chalk & Board
	Week 10	Symbolic Reasoning Under Uncertainty: Introduction to Non monotonic Reasoning, Logics for Non-monotonic Reasoning.	IV	Presentation, Chalk & Board
	Week 11	Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory, Fuzzy Logic. Semantic Nets, Frames.	IV	Presentation, Chalk & Board
	Week 12	Games, Optimal Decisions in Games, Min max method , Perfect and imperfect decisions, Overview, Min Max, Alpha-Beta Cut-off, Refinements	V	Presentation, Chalk & Board
	Week 13	Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting	V	Presentation, Chalk & Board
	Week 14	Hierarchical Planning, Reactive Systems, Other Planning Techniques	VI	Presentation, Chalk & Board
	Week 15	Learning: Overview of different forms of learning, Learning Decision Trees, Neural Networks.	VI	Presentation, Chalk & Board

COMPUTER ENGINEERING DEPARTMENT COURSE DEPENDANCY CHART



Name of Institute: **INSTITUTE OF TECHNOLOGY & ENGINEERING**
Name of Faculty: **Prof. DIVYANI TIRTHYANI.**

Course code: IT0702
Course name: **Enterprise Resource Planning**
Pre-requisites: NIL
Credit points: 3
Offered Semester: VII

Course Coordinator
Full Name: DIVYANI TIRTHYANI
Department with siting location: Computer Engineering (3rd floor,Faculty room, Bhanwar building)
Telephone: 9460154836
Email: divyanijigyasu.ce@indusuni.ac.in
Consultation times: 4:00 PM to 5:00 PM

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives

The objectives of this Course are
1. To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
2. To focus on a strong emphasis upon practice of theory in Applications and Practical- Oriented approach.
3. To Train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
4. To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes (CO)

After successful completion of the course, student will able:

1. Understand the significance and advantages of using ERP.
2. Differentiate and comparison between systems with ERP and without ERP.
3. Trade off between ERP packages.
4. Analyze the management aspect of ERP implementation.
5. Analyze the Impact of ERP and observe Trends in ERP.
6. Classify between a good and bad characteristics of any ERP software.

Course Outline

ERP Market and Vendors,Extended ERP Services,Planning for ERP, Implementation of ERP, The ERP Packages, Managing ERP projects, ERP Case Studies, Internet and WWW, Future directions and Trends in ERP.

UNIT-I

[12 hours]

Introduction to ERP:
Definition of ERP, Significance of ERP, Evolution of ERP, Advantages of ERP, Characteristics of ERP, Process integration with ERP system, Implementation costs, Roadmap for successful ERP implementation.
ERP Market and Vendors:ERP market, ERP vendors, Service oriented architecture, ERP package features.
Extended ERP Services: Defining Extended ERP, Supply chain Management (SCM) and ERP, ERP and Business Intelligence (BI), ERP and E-commerce.

UNIT-II

[12 hours]

Business Process Re-engineering (BPR) and ERP:
Defining BPR, Pros and Cons of BPR, BPR Vs TQM, BPR and change management, approaches in BPR implementation, Methodologies for BPR implementation

Planning for ERP: Planning for ERP implementation, understanding organizational requirement, Economic and strategic justification, Project scope, determining resources, organizational commitment to change, budget for ERP, select right ERP package.

UNIT-III

[12 hours]

Implementation of ERP: ERP life Cycle, Methodologies for Implementation, Cost of ERP Implementation, Selection of consulting partner.
The ERP Packages: ERP package Selection ERP Marketplace, SAP Modules, Oracle Modules, PeopleSoft Modules
Managing ERP projects: ERP Project Team and Project Organization Structure, Project scope, Managing the Requirements Risk Management, Case Studies of ERP Failures.
ERP: Going Live and post implementation: Preparing to go live, Strategies for migration to new ERP system, Managing ERP after Go Live, Maintenance of ERP system.

UNIT-IV

[12 hours]

ERP Case Studies, Internet and WWW – ERP II: The internet explosion, ERP, Internet 4 9 and WWW, ERP to ERP II, Best practices of ERP II.
Future directions and Trends in ERP: New markets, New channels, Easier communication tools, Business models, need based applications, Expenditures, Reduction in implementation time, Market snap shots, Shifting revenue models.

Method of delivery

1. Chalk & Talk
2. PPT presentation

Study time

3 lectures per week

1. CO-PO Mapping (PO: Program Outcomes)

Engineering Graduates will be able to:

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.

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. Programme Specific Outcome

Information Technology

1. To understand the principles and working of computer systems.
2. To Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1					√	√					√	√	√		
CO2		√		√					√		√	√	√		
CO3					√						√	√			
CO4								√			√		√		
CO5					√	√	√				√	√		√	
CO6		√					√								

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

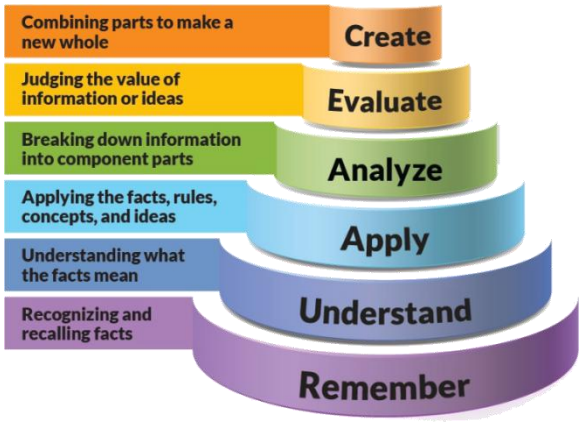


Figure 1: Blooms Taxonomy

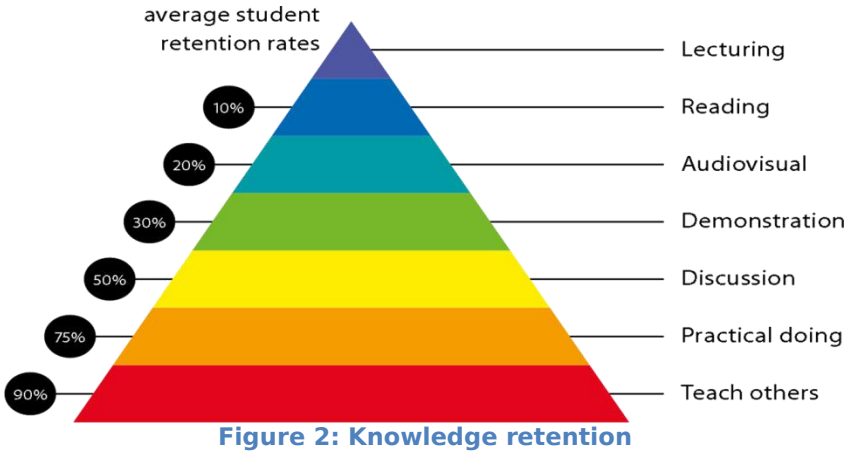


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Lecture/tutorial times

(Give lecture times in the format below)

7 IT
Tuesday: 09:00 AM to 10: 00 AM Lecture
Wednesday: 09:00 AM to 10: 00 AM & 10:00 AM to 11: 00 AM Lecture

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Text books

Text Book :
Alexis Leon, "Enterprise Resource Planning", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2008. Additional Materials

Additional Materials

Reference Books:
1. Ashim Raj Singla, "Enterprise Resource Planning", Cengage Learning India Pvt. Ltd., New Delhi, 2008.
2. V.K. Garg ,"Enterprise Resource Planning: Concepts and Practice".

Web Resources

1. https://nptel.ac.in/courses/110105083/10https://
2. https://nptel.ac.in/courses/112107238/60

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

CIE-Theory (60 Marks)
Class Regularity– 05 Marks
Class Test- 40 Marks
Quiz/Assignment:15 Marks
ESE-Theory- 40 Marks
Total: 100 Marks

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

.

Course schedule (subject to change)

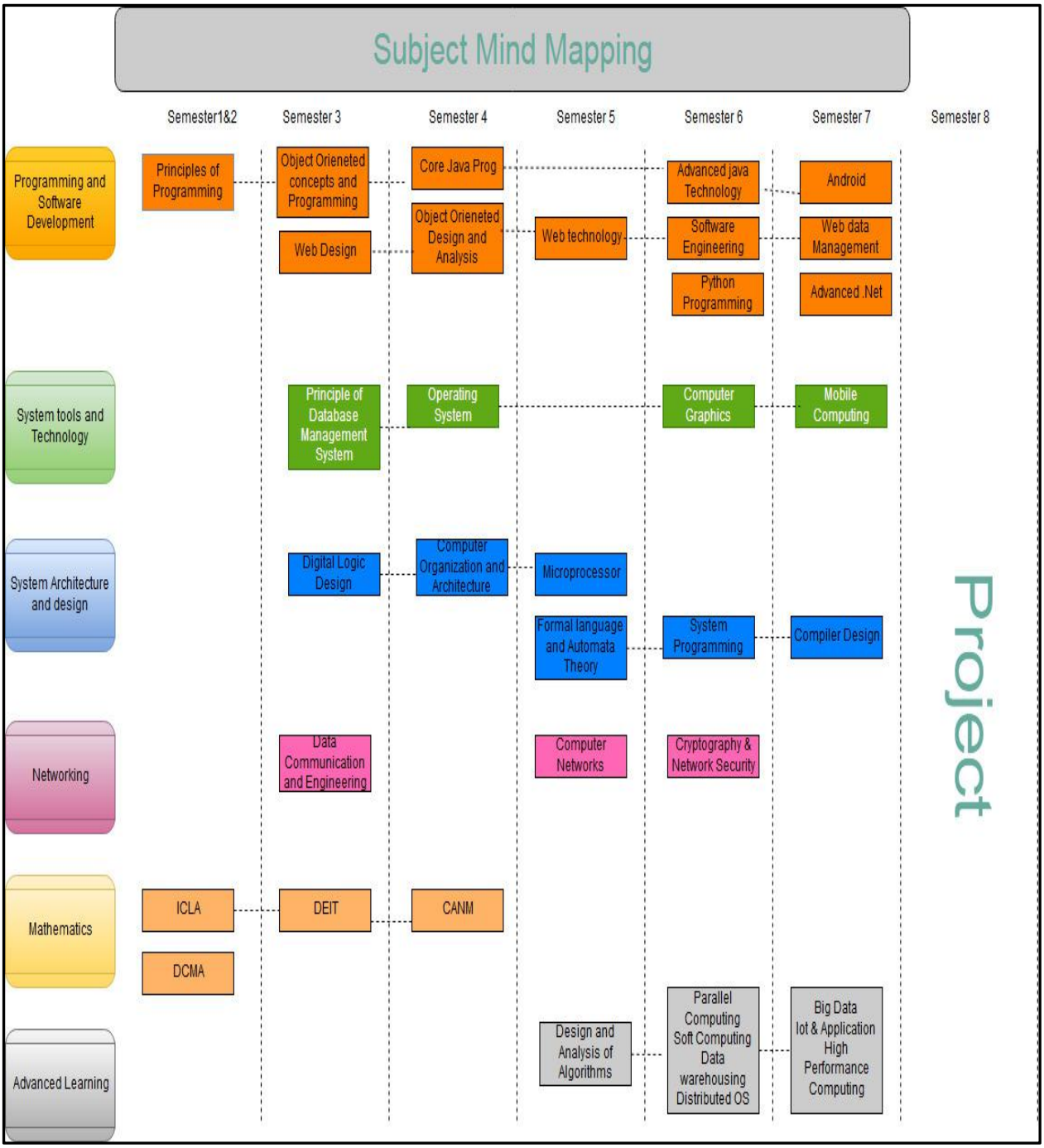
(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	**Introduction to ERP:** Definition of ERP, Significance of ERP, Evolution of ERP, Advantages of ERP, Characteristics of ERP, Process integration with ERP system, Implementation costs, Roadmap for successful ERP implementation.	CO1	
	Weeks 2	**ERP Market and Vendors:**ERP market, ERP vendors, Service oriented architecture, ERP package features.	CO4	
	Week 3	**Extended ERP Services:**Defining Extended ERP, Supply chain Management (SCM) and ERP, ERP and Business Intelligence (BI), ERP and E-commerce.	CO3	
	Week 4	**Business Process Re-engineering (BPR) and ERP:** Defining BPR, Pros and Cons of BPR, BPR Vs TQM, BPR and change management, approaches in BPR implementation, Methodologies for BPR implementation	CO5	
	Week 5	**Planning for ERP:**Planning for ERP implementation, understanding organizational requirement, Economic and	CO5	

		strategic justification		
	Week 6	Project scope, determining resources, organizational commitment to change, budget for ERP, select right ERP package.	CO6	
	Week 7	**Implementation of ERP:** ERP life Cycle, Methodologies for Implementation, Cost of ERP Implementation, Selection of consulting partner.	CO5	
	Week 8	**The ERP Packages:** ERP package Selection ERP Marketplace, SAP Modules, Oracle Modules, PeopleSoft Modules	CO6	
	Week 9	**Managing ERP projects:** ERP Project Team and Project Organization Structure, Project scope, Managing the Requirements Risk Management, Case Studies of ERP Failures.	CO5	
	Week 10	**ERP: Going Live and post implementation:** Preparing to go live, Strategies for migration to new ERP system, Managing ERP after Go Live, Maintenance of ERP system.	CO6	
	Week 11	**ERP Case Studies, Internet and WWW – ERP II:** The internet explosion, ERP, Internet 4 9 and WWW, ERP to ERP II, Best practices of ERP II.	CO2	
	Week 12	**Future directions and Trends in ERP:**New markets, New channels, Easier communication tools, Business models, need based	CO6	

		applications, Expenditures, Reduction in implementation time, Market snap shots, Shifting revenue models.		

PROGRAM MAP for Bachelor of Engineering (CE / CSE / IT)



Name of Institute: **INSTITUTE OF TECHNOLOGY & ENGINEERING**
Name of Faculty: **Prof. Sejal Thakkar.**

Course code: CS0701
Course name: **Machine Learning**
Pre-requisites: NIL
Credit points: 4
Offered Semester: III

Course Coordinator
Full Name: Sejal Thakkar
Department with siting location: Computer Engineering (4rd floor,Faculty room, Bhanwar building)
Telephone: 9033380982,7990552332
Email: sejalthakkar.ce@indusuni.ac.in
Consultation times: Wednesday (4:00 PM to 5:00 PM)

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives
By participating in and understanding all facets of this Course a student will:

1. Understand the key algorithms and theory that form the foundation of Machine Learning.
2. Understand a wide variety of learning algorithms.
3. Recognize the characteristics of machine learning that make it useful to real-world problems.
4. Understand how to perform evaluation of learning algorithms and model selection.
5. Develop skills of using recent machine learning software in order to solve practical problems.
6. Understand and learn state of the art machine learning techniques to provide employability in industry.

Course Outcomes (CO)
After successful completion of the course, student will able:

1. Get exposure of machine learning concepts and range of problems that can be handled by machine learning

2. Compare and parameterize different learning algorithms
3. Apply the machine learning concepts in real life problems
4. Understand learning in machines with different techniques
5. Understand and apply various recognition techniques.
6. Learn about parameter selection and feature extraction. Compare and parameterize different learning algorithms
7. Learn comparison of various algorithms

Course Outline

CNN, ANN, Regression, Classification

Method of delivery

1. Chalk & Talk
2. PPT presentation

Study time

3 lectures per week
2 hour labs per week

CO-PO Mapping (PO: Program Outcomes)

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	√	√	√								√	√	√	√	√
CO2		√	√	√	√	√			√	√			√	√	√
CO3	√	√	√	√	√	√	√				√	√	√	√	√
CO4	√	√	√	√	√						√		√	√	√
CO5	√	√	√									√	√	√	√
CO6			√	√	√								√	√	√
CO7	√	√	√	√	√			√	√				√	√	√

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

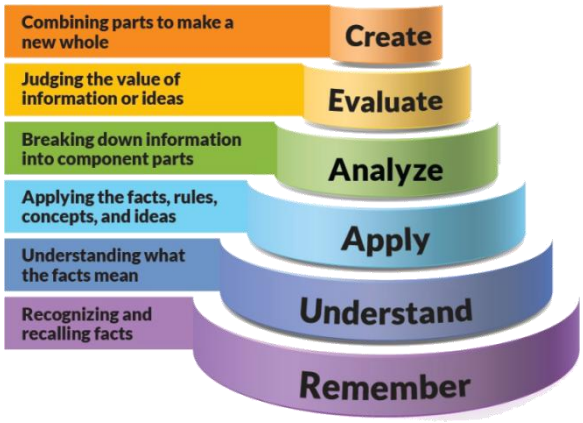


Figure 1: Blooms Taxonomy

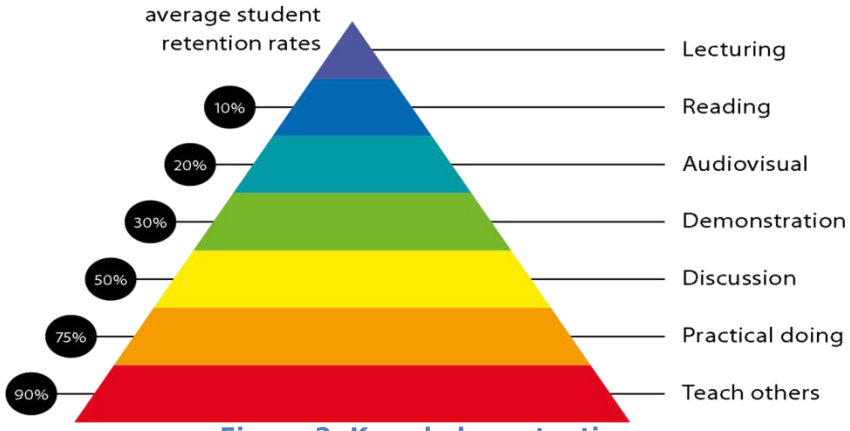


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of	**2 Information literacy, gathering & processing**

sources and technologies. Acknowledge the work and ideas of others.	
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Practical work:

(Mention what practical work this Course involves)
As a part of practical, student have to perform various Python in machine learning project relevant activities.

Lecture/tutorial times

(Give lecture times in the format below)

For 3 Sem IT A and B

Monday: 11 AM to 12 PM: Lecture
Monday: 2 PM to 4: 10 PM: Laboratory
Tuesday: 11:10 AM to 12:10 PM: Lecture
Wednesday: 11:10 AM to 12:10 PM: Lecture
Friday: 2 PM to 4:10 PM: Laboratory

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books

Text Book :

1. Compare and parameterize different learning algorithms
2. Compare and parameterize different learning algorithms

Additional Materials

Reference Book:

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Example:

Theory:

Internal evaluation	**20%** Objective (1-3-4)	
10 marks as attendance 5 bonus for all students having attendance > 80%		
10 marks for assignment or case studies, limited to minimum 02 assignments per course		
Mid semester	40% (due week 10)	Objectives (2-5)
Final exam (*closed book*)	40%	Objectives (1-5)

Practical:
20% for Internal Project
20% Lab file
20% Research related activities/Presentations
40% end semester project exam +Viva

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

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Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

.

Course schedule (subject to change)

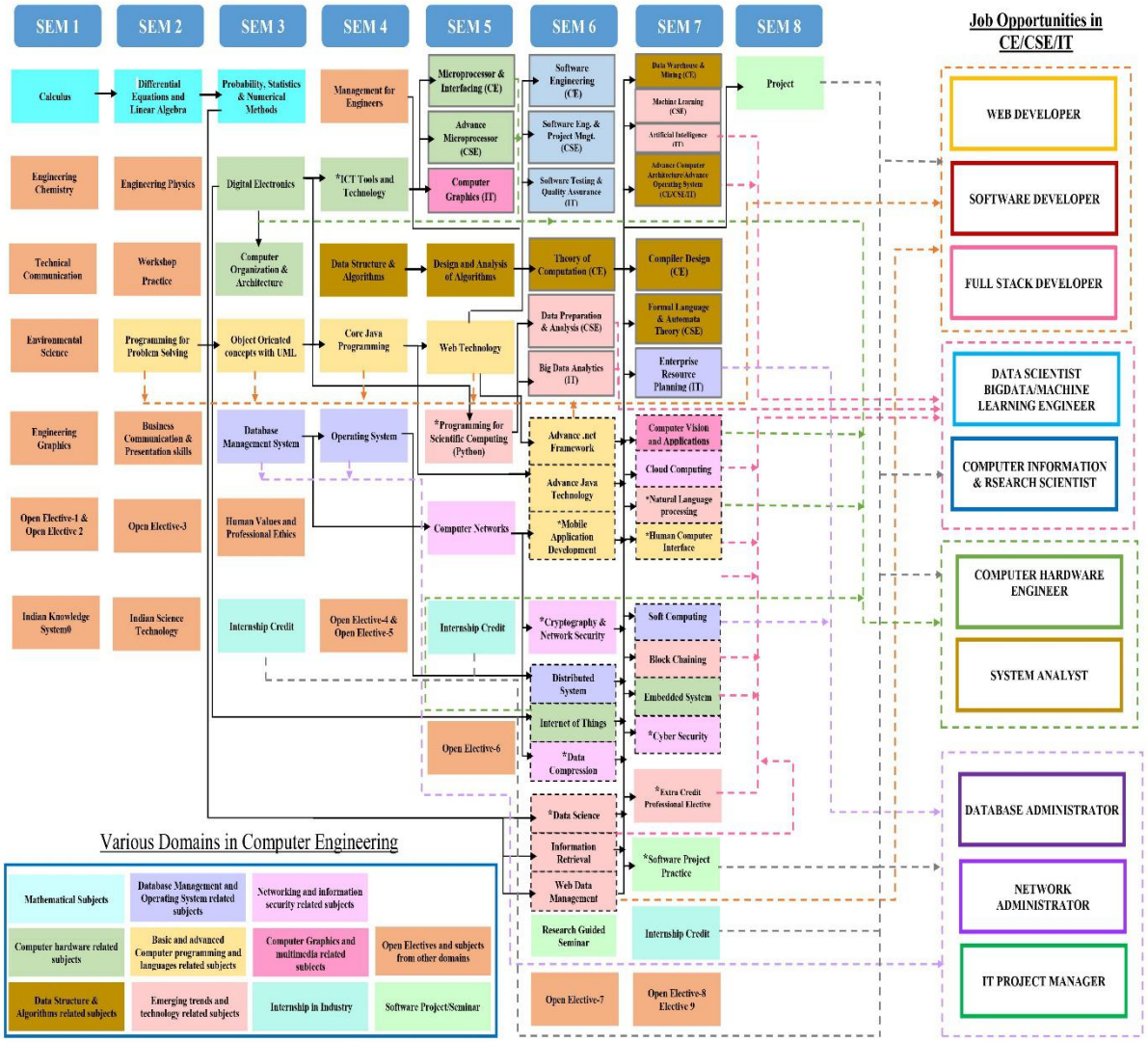
(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Introduction Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations.	CO1	Chalk & Board , PPT
	Weeks 2	Inductivebias, Supervised/Unsupervised Learning, Loss functions and generalization, Parametric vs Non-parametric methods, Evaluating Machine Learning algorithms and Model Selection	CO1, CO2	Chalk & Board , PPT
	Week 3	Introduction to Statistical Learning Theory, Ensemble Methods, Bagging, Boosting, Random Forest	CO4	Chalk & Board , PPT
	Week 4	Supervised Learning Regression/Classification) Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models.	CO3,CO4,CO5	Chalk & Board , PPT
	Week 5	Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs,	CO4,CO5	Chalk & Board , PPT

		Ranking Unsupervised Learning Clustering: K-means/Kernel K-means, Dimensionality Reduction -PCA, CCA, LDA, ICA, MNF		
	Week 6	Canonical Variates - Feature Selection vs Feature Extraction, Generative Models (mixture models and latent factor models)	CO5	Chalk & Board , PPT
	Week 7	Bayesian Learning Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximum likelihood hypothesis for Predicting Probabilities.	CO2,CO3,CO5	Chalk & Board , PPT
	Week 8	Minimum Description Length, Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes, Classifier.	CO4, CO6	Chalk & Board , PPT
	Week 9	Bayesian Belief Network, EM Algorithm, Case Study: Learning to classify text.	CO5	Chalk & Board , PPT
	Week 10	Artificial Neural networks Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptron, Multilayer Networks and Back Propagation,	CO2, CO3, CO5, CO7	Chalk & Board , PPT
	Week 11	Algorithms, Remarks on Back Propagation Algorithms, Case Study: face Recognition Advanced topics Semi-supervised,ActiveLearning, Reinforcement Learning,	CO2, CO5, CO7	Chalk & Board , PPT

	Week 12	Recent trends in various learning techniques of machine learning and classification methods, Overview of typical application areas, such as Recommender System.	CO2, CO5, CO7	Chalk & Board , PPT

COMPUTER ENGINEERING DEPARTMENT COURSE DEPENDANCY CHART



Name of Institute: IITE, Indus University Ahmedabad
Name of Faculty: Dr. Gaurav Kumar Ameta

Course code: **CS0702**
Course name: **Formal Language & Automata Theory**
Pre-requisites: Basic knowledge of Discrete Mathematics
Credit points: 3
Offered Semester: 7th

Course Coordinator (weeks 12)
Full Name: Dr. Gaurav Kumar Ameta
Department with sitting location: 4th floor Bhanwar Building
Telephone: 9413664420
Email: gauravameta.ce@indusuni.ac.in
Consultation times: 04.00 P.M. to 5.00 P.M. (Monday to Friday)

Course Lecturer (weeks 12)
Full Name: Dr. Gaurav Kumar Ameta
Department with sitting location: 4th floor Bhanwar Building
Telephone: 9413664420
Email: gauravameta.ce@indusuni.ac.in
Consultation times: 04.00 P.M. to 5.00 P.M. (Monday to Friday)
Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives

1. To provide a Basic understanding of the Lexical Phase of Compiler Design.
2. To provide the knowledge about Regular Language, and design of Finite Automata.
3. To provide the knowledge about Context Free Language, and design of Push down Automata.
4. To provide the knowledge about Turing Machine and Complexity.
5. To develop skill among students to design different types of automata and machines.

Course Outcomes (CO)

At the end of this subject, students should be able to:

1. To understand the concepts of Set, Relation and Functions, mathematical induction & recursive Function and to Design Deterministic finite automata, Nondeterministic finite automata, conversion of NFA to DFA, design of E- NFA and regular expressions.
2. Obtain minimized DFA and convert automata to regular expressions and regular expression to automata and proving languages are not regular.
3. Master context free languages, push-down automata. Student will be able to write

CFG's, Construction of parse trees, finding and removing ambiguity in grammars, designing problems on Pushdown Automata.

4. Student will be able to convert grammar to Chomsky Normal Form and conversion of grammar to PDA.
5. Prove that languages are not context free using pumping lemma.
6. Student will be able to design Turing Machines, understand the working of various types of Turing Machines and solving post correspondence problems be exposed to a broad overview of the theoretical foundation of computer science.

Course Outline

This course will provide the insights to the various topics related to computation like Automata, Types of Automata, Grammars, Normal Forms, PDA and Turing Machines.

Method of delivery

(Face to face lectures, Online Lectures, self-study material in form of PPT, Active Learning Techniques)

Study Time

(3 hours theory per week including class attendance)

CO-PO Mapping (PO: Program Outcomes)

1. Program Outcomes (PO's)

Engineering Graduates will be able to:

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.

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 con text of technological change.

2. Programme Specific Outcome

Computer Engineering

1. To understand the principles and working of computer systems.

2. To Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO110	PO111	PO112	PSO1	PSO2	PSO3
1	√	√	√							√			√	√	
2	√	√	√							√			√	√	
3	√	√	√							√			√	√	
4	√	√	√							√			√	√	
5	√	√	√							√			√	√	
6	√	√											√		

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

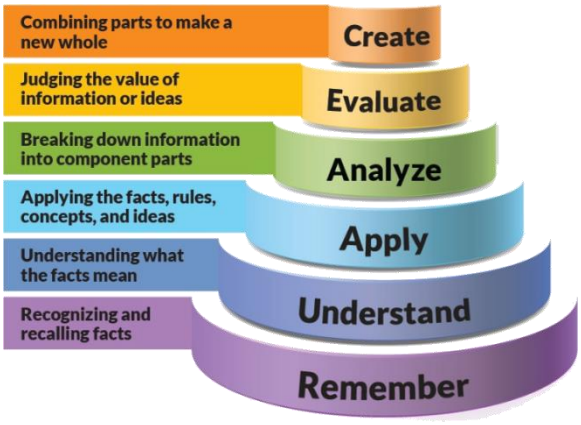


Figure 1: Blooms Taxonomy

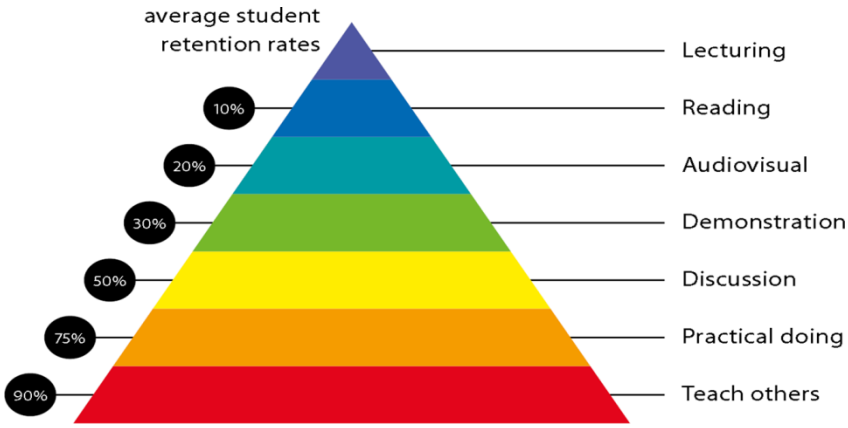


Figure 2: Knowledge retention

Lecture Timings:

Monday: 11:10AM to 12:10PM
Thursday: 11:10AM to 12:10PM
Friday: 11:10AM to 12:10PM

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Details of referencing system to be used in written work

Text books:

1. Introduction to languages and Theory of Computation by John C. Martin, Third Edition, TMH Publication.
2. Introduction to Automata theory, Formal Languages and Computations by Shyamalendu Kandar, Pearson Publication.
3. Theory of Computer Science by KLP Mishra and N. Chandrasekharan, PHI Publication.

Reference Books

1. Formal Languages and Automata Theory by C.K. Nagpal, Oxford Publication
2. Automata theory, Languages and computation by Hopcroft, Motwani, Ullman, Pearson Education.

Additional Materials

Web Resources:

1. http://nptel.iitm.ac.in/courses/106104028/
2. http://www.cse.iitb.ac.in/~supratik/courses/cs331/
3. http://nptel.iitm.ac.in/courses/106106049/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Theory:

Mid Sem Exam [40 Marks]

Assignment [10 Marks]

attendance bonus for all students having

attendance > 80% [05 Marks]

presentation [05 Marks]

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

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Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

Course schedule (subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Week 1	Sets, Logic Formulas, Functions & Relations	1, 6	Chalk & BB/Online Session with PPT
	Week 2	Basic to alphabet, string, languages and grammars , Mathematical induction and recursive definition	1, 6	Chalk & BB/Online Session with PPT
	Week 3	Regular language and regular expressions, Deterministic finite automata, Minimization of finite automata	*1*	Chalk & BB/Online Session with PPT
	Week 4	Operations on Finite automata, Nondeterministic Finite Automata, Conversion of NFA to DFA	1,2	Chalk & BB/Online Session with PPT
	Week 5	NFA-^, Conversion of NFA-^ to NFA and DFA, Kleene's Theorem, Pumping lemma for regular Languages	1,2,3	Chalk & BB/Online Session with PPT
	Week 6	Introduction to CFG, Derivation and Parse Tree, Ambiguity in CFG.	*3*	Chalk & BB/Online Session with PPT
	Week 7	Left factoring and Left Recursion, Simplification of CFG.	3,4	Chalk & BB/Online Session with PPT
	Week 8	Linear Grammar, Normal Forms (GNF and CNF), Applications of CFG Push-Down Automata (PDA): Introduction of PDA.	4	Chalk & BB/Online Session with PPT
	Week 9	DPDA and NPDA, Construction of PDA from CFG and vice versa, Parsing.	*4*	Chalk & BB/Online Session with PPT
	Week 10	Introduction to TM, Variations of TM, Non deterministic TM, Universal TM.	4,5	Chalk & BB/Online Session with PPT
	Week 11	Two Stack PDA and Turing machine, Models of Computation and the Church Turing Thesis	4,5	Chalk & BB/Online Session with PPT
	Week 12	Types of complexity, Different Notations, Complexity Classes, P and NP problems, Polynomial time reducibility	5,6	Chalk & BB/Online Session with PPT

PROGRAM MAP for Bachelor of Engineering
(CE / CSE / IT)

COMPUTER ENGINEERING DEPARTMENT COURSE DEPENDANCY CHART