

UNIVERSITY OF ENGINEERING AND MANAGEMENT, KOLKATA

**B.Tech (CSE(AI & ML)) 2021 – 2025 Batch
6th SEMESTER STRUCTURED SYLLABUS**

DEPARTMENT OF CSE (AI & ML)



**University Campus: University Area, Plot No. III,
B/5, New Town Rd, Action Area III,
Newtown, West Bengal 700160**



University of Engineering and Management, Kolkata
Department of Computer Science and Engineering
(Artificial Intelligence and Machine Learning)
B.Tech (CSE(AI & ML)) 2021 - 2025 Batch
6th Semester Structured Syllabus

Sr. No	Course Code	Course Title	Credits
1	PCCCSE601	Compiler Design	3
2	PCCCSE691	Compiler Design Laboratory	2
3	PCCCSE602	Computer Networks	3
4	PCCCSE692	Computer Networks Laboratory	2
5	PECCSE601A	Professional Elective - II : Soft Computing	3
6	PECCSE602A	Professional Elective - III : Data Analytics	3
7	OECCSE601A	Open Elective - I : Finance & Accounting	3
8	HSMC(CS)602	Essential Studies for Professionals - VI	2
9	HSMC682	Skill Development for Professionals - VI	1
10	MC681	Mandatory Additional Requirements (MAR)	1
11	PROJCSE681	Project - I	3
12	MOOC 6	Massive Open Online Courses (Mandatory for B.Tech(Honours))	3
Total Credit Points of Semester [for B.Tech]			26
Total Credit Points of Semester [for B.Tech (Hons.)]			29



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Subject Name: Compiler Design

Credit: 3(Th) + 2(Pr)

Subject Code:

Theory: PCCCSE601

Practical: PCCCSE691

Lecture Hours: 36 (Th)

Course Outcomes:	
On completion of the course students will be able to	
CO 1	To understand the difference between abstraction levels of a high level language and a machine language, to get a first-hand experience of a practical application of elegant data structures, algorithms, and other core CS concepts such as automata theory, and to make effective use of tools such as LEX and YACC.
CO 2	To understand the role, functionality and structure of program translation and interpretation in software development and to understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table. Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.
CO 3	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
CO 4	To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the process of language translation, to become a much better programmer by appreciating all that happens behind the scenes in making an HLL program run and to understand some of the critical aspects of machine code generation and to understand the issues in efficient code generation.



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Module Number	Topic	Sub-Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Compiling and Lexical Analysis	<p><i>Introduction:</i> Compilers, Analysis-synthesis model, The phases of the compiler, Cousins of the compiler. Comparing abstractions of a high level language and a low level language; compilation as a series of steps for lowering the abstraction level through stepwise refinement; phases of compilation; bootstrapping; cross-compilation.</p> <p><i>Lexical Analysis:</i> The role of lexical analysis; Token, lexemes, and token codes; Regular Expressions (RE) to represent tokens, Deterministic finite automata (DFA), Traversing a DFA for recognizing tokens; Generating a lexical analyzer using LEX/Flex. 4-arrays representation, observing the data structures in the scanner generated by LEX.</p>	<p><i>International Academia:</i> (https://ocw.mit.edu/courses/6-035-computer-language-engineering-spring-2010/pages/syllabus/)</p> <p>(https://web.stanford.edu/class/cs143/syllabus.html)</p> <p><i>AICTE-prescribed syllabus:</i> (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)</p> <p><i>Industry Mapping:</i> Design of Compiler Scanner using Ubuntu, Dev C++,GCC, Flex, Bison tools or Java, Apache Ant, GCC tools.</p>	8	<p>Implementation of Symbol Table</p> <p>Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)</p> <p>Implementation of Lexical Analyzer using Lex Tool</p> <p>Installation of Flex</p>
2	Syntax Analysis and Semantic Analysis	<p><i>Syntax Analysis:</i> <i>Context Free Grammars (CFG):</i> Context Free Grammars (CFG), Concept of parsing, sentences and sentential forms, leftmost and rightmost derivations, parse trees, ambiguous grammars;</p>	<p><i>International Academia:</i> (https://ocw.mit.edu/courses/6-035-computer-language-engineering-spring-2010/pages/syllabus/)</p>	10	<p>Generate YACC specification for a few syntactic categories.</p> <p>Implementation of Calculator using LEX</p>



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		<p><i>Overview Of Top-Down And Bottom-Up Parsing:</i> Introduction to shift reduce parsing; viable prefixes and valid items, Constructing LR(0) sets of items; Constructing SLR parsing tables; LR(1) and LALR(1) parsing; Generating a parser using a parser generator such as YACC/Bison. Top-down parsing, Left factoring, Elimination of Left-recursion, predictive parsing, recursive descent parsing, LL(1) parsing. Generating a parser using a parser generator such as ANTLR, JavaCC, etc.</p> <p><i>Semantic Analysis:</i> The need of semantic analysis; abstract syntax trees for expressions, assignment statements and control flow statements; attribute evaluation, syntax directed translation schemes (STDS); Applications of SDTS for (a) declaration processing and type checking, (b) generating three-address code</p>	<p>(https://web.stanford.edu/class/cs143/syllabus.html)</p> <p><i>AICTE-prescribed syllabus:</i> (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)</p> <p><i>Industry Mapping:</i> Design of Compiler Parser using Ubuntu, Dev C++, GCC, YAAC, Bison toolsor Java, Apache Ant, GCC, ANTLR, JavaCC tools.</p> <p>Design of Semantic Checker using Ubuntu, Dev C++, GCC, YAAC, Bison toolsor Java, Apache Ant, GCC tools</p>		<p>and YACC</p> <p>Installation of YACC and Bison</p> <p>Convert the BNF rules into YACC form and write code to generate Abstract Syntax Tree.</p>
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3	Type Checking and Run Time Environments	<p><i>Type Checking:</i> Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions</p> <p><i>Run Time Environments:</i> Parameter passing by value, reference, and name; activation records, stack and static allocation of activation records; translating a function call, allocating offsets to variables, generating code for function prologue, function epilogue, call sequence, and return sequence.</p>	<p><i>International Standards:</i> (https://ocw.mit.edu/courses/6-035-computer-language-engineering-spring-2010/pages/syllabus/)</p> <p>(https://web.stanford.edu/class/cs143/syllabus.html)</p> <p><i>AICTE prescribed syllabus:</i> (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)</p> <p><i>Industry Mapping:</i> Design of control flow and Data flow analysis using GCC, Dev C++ tools or Java, Apache Ant, GCC tools.</p>	10	<p>Implement type checking</p> <p>Implement control flow analysis and Data flow Analysis</p> <p>Implement any one storage allocation strategies (Heap, Stack, Static)</p>
4	Intermediate Code Generation, Code Optimization and Code Generation	<p><i>Intermediate Code Generation:</i> Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).</p> <p><i>Code Optimization:</i> Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag</p>	<p><i>International Standards:</i> (https://ocw.mit.edu/courses/6-035-computer-language-engineering-spring-2010/pages/syllabus/)</p> <p>(https://web.stanford.edu/class/cs143/syllabus.html)</p>	8	<p>Construction of DAG</p> <p>Implement the back end of the compiler which takes the three-address code and produces the 8086 assembly language instructions that can</p>



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		<p>representation of basic blocks, The principle sources of optimization, Loops in flow graph,. Control flow graphs; Local optimizations (common sub expression, Copy Propagation, dead code elimination), Global optimization (constant propagation, common sub expression elimination, copy propagation, dead code elimination, strength reduction, Peephole Optimization)</p> <p><i>Code Generation:</i> Issues in the design of code generator, a simple code generator, Register allocation & assignment. Generating assembly code from three address codes using simple register allocation and instruction selection. Register allocation using graph coloring, Optimal code generation for expression trees, Sethi Ullman, algorithm, Aho Johnson algorithm.</p>	<p><i>AICTE prescribed syllabus:</i> (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)</p> <p><i>Industry Mapping:</i> Design of Code Generator using GCC, Dev C++ or Java, Apache Ant, GCC tools.</p>		<p>be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also, simple addressing modes are used.</p>
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Text Books:

1. Compilers: Principles, Techniques, and Tools - Alfred Aho, Monica Lam, Ravi Sethi, Jeffrey Ullman - Pearson, ISBN Number: 9789357054119, 1st Edition
2. Compilers (Principles and Practice) - Dave and Dave, Pearson, ISBN Number - 9788131764916, 5th Edition
3. Programming Language Pragmatics - Michael Scott, Morgan Kaufmann Publishers, ISBN Number - 9780124104099, 4th Edition
4. Engineering a Compiler - Keith Cooper, Linda Torczon, Morgan Kaufmann Publishers, ISBN Number - 9780128154120, 3rd Edition



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5. Principles of Compiler Design - ITL Education Solutions Limited, Pearson, ISBN Number - 9788131761267, Latest Edition

Reference Books:

1. Modern Compiler Implementation in C, Andrew W. Appel, Cambridge, ISBN Number - 9788175960718, Revised Edition
2. Compiler Design - S. Chattopadhyay, PHI, ISBN Number - 9788131761267, 2nd Edition
3. Compiler Design - M. B. Chandak, K. P. Khurana, University Press ISBN Number - 9789386235640, Latest Edition
4. Compiler Design - S. Saxena, R. S. Rathore, and S. Chand, ISBN Number - 9788121998505, Latest Edition
5. Elements of the Theory of Computation - Harry Lewis, Christos Papadimitriou, Pearson, ISBN Number - 9788131761267, Latest Edition



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Subject Name: Computer Networks

Credit: 3(Th) + 2(Pr)

Subject Code:

Theory: PCCCSE602

Practical: PCCCSE692

Lecture Hours: 36 (Th)

Course Outcomes:	
On completion of the course students will be able to	
CO 1	Explain data communication system, components and the purpose of layered architecture. Illustrate the functionalities of each layer of OSI and TCP/IP reference model including their associated protocols.
CO 2	Apply the thoughts toward building the networks, secure devices in virtue of analyzing data.
CO 3	Support the growing demand of skilled people in the field of network and system administration. Justify today's market of digital economy which is very much dependent on computer network skill to provide services in the field of finance, education, transportation, manufacturing, healthcare, retail and so on.
CO 4	Analyze the requirements of enterprises or global corporations to be placed there.



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1	Introduction And Physical Layer	<p>History and development of computer networks, Network Topologies Layering and protocols. The OSI Models(Layered Architecture , Peer to Peer process) , Addressing (Physical Address , Logical Address and Port Address), Different Types of transmission medium , Transmission Impairments, Repeaters, Encoding (NRZ, NRZI, Manchester, 4B/5B etc)</p> <p>LAN: Design , Specifications of popular technologies, Switching, Design Of LAN of a campus or buildings, FDM & TDM</p>	<p>International Academia: https://www.scs.stanford.edu/10au-cs144/sched/</p> <p>AICTE prescribed syllabus: https://www.aicteindia.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf</p> <p>Industry mapping: Cisco Packet Tracer, Router, Cable https://www.netacad.com/courses/packet-tracer</p>	12	<p>i)Familiarization with Network Cable and Routers ii) IPC Chat (Message Queue iii) Peer to peer connections</p>



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2	Data Link Layer	<p>Error detection (Parity, CRC) & Correction (Hamming distance), Sliding Window, Stop and Wait protocols, Go-back–NARQ, Selective Repeat ARQ, HDLC, Point to Point Protocol, Multiplexing, Medium Access control, SubLayer: MacLayer: Random Access ALOHA, CSMA, CSMA/CD, CSMA/CA protocols, Controlled Access, Channelization</p> <p>Examples: Ethernet, Including Gigabit Ethernet And WiFi (802.11), Token Ring, Bluetooth and WiMax</p>	<p>International Academia: https://www.scs.stanford.edu/10au-cs144/sched/</p> <p>AICTE prescribed syllabus: https://www.aicteindia.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf</p> <p>Industry mapping: Cisco Packet Tracer https://www.netacad.com/courses/packet-tracer</p>	8	<p>i) Router Set Up by Cisco Packet Tracer</p> <p>ii) HUB Set Up by Cisco Packet Tracer</p> <p>iii) Switch Set Up by Cisco Packet Tracer</p>
3	Network Layer And Transport Layer	<p>Internet Protocol, IPV4, IPV6, ARP, RARP, BOOTP, DHCP, ICMP, Routing Algorithms: Distance Vector, Link state, Metrics, Interdomain Routing. Subnetting, Classless Addressing, Network Address Translation (NAT), Unicast Routing</p> <p>Protocols: RIP, OSPF, BGP, Multicasting protocols.</p> <p>UDP, TCP Connection establishment and termination, Sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.</p> <p>Congestion Control: Open Loop, Closed</p>	<p>International Academia: https://www.scs.stanford.edu/10au-cs144/sched/</p> <p>AICTE prescribed syllabus: https://www.aicteindia.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf</p> <p>Industry mapping: Cisco packet tracer</p>	10	<p>i) DHCP Set Up by Cisco Packet Tracer</p> <p>ii) TCP Connection (Client server communications)</p> <p>iii) UDP Connections (Client server communications)</p>



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		Loop, Quality of Services, Leaky bucket algorithm, Token bucket algorithm.	https://www.netacad.com/courses/packet-tracer		
4	Application Layer	<p>Examples: DNS, SMTP, IAMP, WWW, HTTP etc.</p> <p>Basics of Firewalls and cryptography: Symmetric-Key Cryptography, Asymmetric-Key Cryptography, Digital Signature.</p> <p>ISDN services, Bluetooth, Network Programming: Socket Programming</p>	<p>International Academia: https://www.scs.stanford.edu/10au-cs144/sched/</p> <p>AICTE prescribed syllabus: https://www.aicteindia.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf</p> <p>Industry mapping: Cisco Packet Tracer, Linux</p> <p>https://www.netacad.com/courses/packet-tracer</p>	6	<p>i) TELNET Configuration</p> <p>ii) Stop and Wait protocol Establishment</p>

Text Books:

1. Computer Networks: A topdown approach: Behrouz A. Forouzan, Firooz Mosharraf Mc.GrawHill
2. Computer Networks (Sixth Edition): Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall, Pearson Publication

Reference Books:

Data communications and Networking with TCP/IP protocol suite: Behrouz A. Forouzan McGraw Hill



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Subject Name: Professional Elective - II: Soft Computing

Credit: 3

Subject Code: PECCSE601A

Lecture Hours: 36

Course Outcomes:	
On completion of the course students will be able to	
CO 1	Learn soft computing techniques and their applications and define the fuzzy systems
CO 2	Understand the genetic algorithm concepts and their applications
CO 3	Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution
CO 4	Analyze various neural network architectures and their applications using machine learning



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Module Number	Topic	Sub-Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Soft Computing and Fuzzy Logic	<p>Introduction to Soft Computing: Concept of computing systems. "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of soft computing techniques</p> <p>Fuzzy logic: Introduction: Fuzzy Sets, Fuzzy Model, Fuzzy Rule Generations, Fuzzy Inference System, Defuzzification, Architecture of Neuro-Fuzzy System and its applications</p> <p>Classical Sets and Fuzzy Sets and Fuzzy relations: Operations on Classical sets, properties of classical sets,</p>	<p>International Academia: (https://ocw.mit.edu/courses/s/9-641j-introduction-to-neural-networks-spring-2005/pages/syllabus/) https://ocw.mit.edu/courses/hst-951j-medical-decision-support-spring-2003/e8b89330a95f25d5f1f5275b07a7ec38_lecture3.pdf https://ocw.mit.edu/courses/hst-951j-medical-decision-support-spring-2003/cfe2e9d064c7f3bb17e3b195de9f1e44_lecture4.pdf https://ocw.mit.edu/courses/s/6-034-artificial-intelligence-fall-</p>	10	<p>Fuzzy Logic:</p> <ol style="list-style-type: none"> 1. Fuzzy Logic Fundamentals and Basic Operations 2. Fuzzy Inference System(FIS) 3. Fuzzy Weighted Average 4. Fuzzy Control 5. Artificial Neural Networks 6. Fuzzy Expert System for assessing mortgage applications 7. Implementation of Type II Fuzzy Logic 8. Write a program to implement the McCulloch-Pitts Model by MATLAB Program. 9. Generate AND and NOT function using McCulloch-Pitts neural



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		<p>Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations</p> <p>Membership Functions: Features of membership functions, standard forms and boundaries, Different Fuzzification methods</p> <p>Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods</p> <p>Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy</p> <p>Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules</p>	<p>2010/resources/lecture-13-learning-genetic-algorithms/ (https://plato.stanford.edu/Archives/win2010/Entries/logic-fuzzy/)</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/flipbook/CS%20(AI&ML)/index.html)</p> <p>Industry Mapping:</p> <ol style="list-style-type: none"> 1. Robotics and Automation 2. Decision Support Systems 3. SCADA (Supervisory Control and Data Acquisition) Systems 	<p>network by MATLAB Program.</p> <ol style="list-style-type: none"> 10. Generate XOR function using McCulloch-Pitts neural network by MATLAB program. 11. Write a program to implement fuzzy set operations. 12. Write a program to implement fuzzy relational operations. 13. Write a program to design and implement fuzzy temperature controller 14. Write a program to write and illustrate the concept of Fuzzy C-means Clustering <p>(http://vlabs.iitkgp.ernet.in/scite/)</p>
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			Software: <ol style="list-style-type: none"> 1. Fuzzy Logic Toolbox (MatLab) 2. Lab VIEW 3. Python 		
2	Genetic Algorithms and GA Operators	<p>Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures.</p> <p>GA Operators: Encoding, Crossover, Selection, Mutation, etc. Solving single-objective optimization problems using GAs.</p>	<p>International Academia: (https://ocw.mit.edu/course/s/9-641j-introduction-to-neural-networks-spring-2005/pages/syllabus/) (https://ocw.mit.edu/course/s/hst-951j-medical-decision-support-spring-2003/e8b89330a95f25d5f1f5275b07a7ec38_lecture3.p df https://ocw.mit.edu/courses/hst-951j-medical-decision-support-spring-2003/cfe2e9d064c7f3bb17e3b195de9f1e44_lecture4.p df) (https://ocw.mit.edu/course/s/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p>	10	<p>Evolutionary Algorithms (EA):</p> <ol style="list-style-type: none"> 1. Implementation of EA 2. Implementation of Genetic Expression Programming 3. Implementation of binary and real coded GA on real life dataset 4. Write a MATLAB program to plot a few activation functions that are being used in Genetic Algorithm. 5. Illustrate different types of generalized bell membership functions using the MatLab program. <p>(http://vlabs.iitkgp.ernet.in/scite/)</p>



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			<p><i>AICTE-prescribed syllabus:</i> (https://www.aicte-india.org/sites/default/files/Model_Curriculum/flipbook/CS%20(AI&ML)/index.html)</p> <p><i>Industry Mapping:</i> Optimize the location of resources and minimize production costs</p> <p><i>Software:</i></p> <ol style="list-style-type: none">1. Open Genetic Algorithm Toolbox (MatLab)2. GA Toolbox (MatLab)3. R-Libraries(GA(genalg))4. Python Libraries (DEAP(Distributed Evolutionary Algorithms in Python))		
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3	Multi-Objective Optimization Problem Solving	<p>Multi-objective Optimization Problem Solving:</p> <p>Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs</p>	<p>International Academia: (https://ocw.mit.edu/course/s/9-641j-introduction-to-neural-networks-spring-2005/pages/syllabus/) (https://ocw.mit.edu/course/s/hst-951j-medical-decision-support-spring-2003/e8b89330a95f25d5f1f5275b07a7ec38_lecture3.pdf df df) (https://ocw.mit.edu/course/s/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p> <p>AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/flipbook/CS%20(AI&ML)/index.h</p>	6	<p>Multi-objective Optimization Problems:</p> <ol style="list-style-type: none"> 1. Implementation of Ant Colony Optimization on real life dataset 2. Implementation of Particle Swarm Optimization on real life dataset <p>(http://vlabs.iitkgp.ernet.in/scite/)</p>
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			tml) Industry Mapping: MOGA Toolbox, ev-MOGA Multi-objective Evolutionary Algorithm		
4	Artificial Neural Networks	Introduction to Artificial Neural Networks: Structure and working of Biological Neural Network, Fundamentals of Artificial Neural Networks & Applications, Characteristics of Artificial Neural Networks, History of Neural Network research, Characteristics of Neural Networks terminology Neural Network Models and Learning Methods: Models of neuron McCulloch, Pitts Model, Perceptron Model, Adaline Model, Madaline Networks, Topology of Neural Network Architecture, Multilayer Neural Networks, Learning Methods, Backpropagation, Counter Propagation, ART, BAM, Associative Memories	International Academia: (https://ocw.mit.edu/course/s/9-641j-introduction-to-neural-networks-spring-2005/pages/syllabus/)) https://ocw.mit.edu/course/s/hst-951j-medical-decision-support-spring-2003/e8b89330a95f25d5f1f5275b07a7ec38_lecture3.pdf https://ocw.mit.edu/courses/hst-951j-medical-decision-support-spring-2003/cfe2e9d064c7f3bb17e3b195de9f1e44_lecture4.pdf) (https://ocw.mit.edu/course/s/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/))	10	Neural Network: <ol style="list-style-type: none"> 1. Implementation of Back Propagation Algorithm for solving face recognition problem 2. Implementation of Radial Basis Function Network 3. Implementation of Probabilistic Neural Network for classification of facial images 4. Implementation of Self-Organizing Map 5. Classification of two inputs XOR using Multilayer Perceptron Algorithm 6. Introduction to Probabilistic Reasoning and Bayesian Networks Application 7. Implementation of Neuro-Fuzzy-GA methods on real life dataset



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		<p>Introduction to Machine Learning:</p> <p>Supervised Learning: Primitive Algorithms, Generative Algorithms, Support Vector Machine, Ensemble Methods,</p> <p>Unsupervised Learning: K-means, Principal Component Analysis, Independent Component Analysis</p> <p>Reinforcement Learning and control</p>	<p>(https://ocw.mit.edu/courses/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/resources/lecture-11-introduction-to-machine-learning/)</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/flipbook/CS%20(AI&ML)/index.html)</p> <p>Industry Mapping: Manufacturing and Industry 4.0 AI applications IOT applications</p> <p>Software:</p> <ol style="list-style-type: none"> 1. Neural Network Toolbox (MatLab) 2. PyTorch 3. Tensorflow 		<ol style="list-style-type: none"> 8. Write programs to test the learning rules of Hebb, Perceptron, Delta, and Widrow Hoff 9. Write a program for learning rule to implement the Backpropagation algorithm. 10. Write a program to write and test a program for the linear separability of the input domain 11. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 12. For a given set of training data examples stored in a .CSV file, 13. Implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. 14. Other Real time case studies.
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			4. Scikitlearn(Python) 5. TensorFlow(Python) 6. Keras(Python) 7. Microsoft Azure Machine Learning(Python)		(http://vlabs.iitkgp.ernet.in/scite/)
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Text Books:

1. Soft Computing: Fundamentals and Applications - D. K. Pratihari, Narosa, ISBN Number - 9788184874952, Revised Edition (PB)
2. Neuro-Fuzzy & Soft Computing - E. Mizutani, Pearson, ISBN Number - 9789332549883, Latest Edition
3. Fuzzy Sets & Fuzzy Logic - G. J. Klir, Pearson, ISBN Number - 9789332549425, Latest Edition
4. Fuzzy Logic with Engineering Applications - Timothy J. Ross, Wiley, ISBN Number - 9780470743768, 3e
5. Neural Networks, Fuzzy Logic, And Genetic Algorithms : Synthesis And Applications - S. Rajasekaran , G. A. Vijayalakshmi Pai, PHI, ISBN Number - 9788120353343, Latest Edition

Reference Books:

1. Soft Computing with MatLab Programming - S. P. Simon, Oxford ISBN Number - 9780199455423, Latest Edition
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow - Aurélien Géron, O'Reilly Media, Inc., ISBN Number - 9781492032649, 2nd Edition
3. Machine Learning with Python Cookbook, Chris Albon, O'Reilly Media, Inc., ISBN Number - 9781491989388, Released March 2018



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Subject Name: Professional Elective - III : Data Analytics

Credit: 3

Subject Code: PECCSE602A

Lecture Hours: 36

Course Outcomes:	
On completion of the course students will be able to	
CO 1	Discuss with illustration the techniques and methods related to the area of data collection, pre-processing, and exploratory data analytics..
CO 2	Discuss important terms and techniques on statistics to enable student to understand the background of different tools or methods used in data analytics.
CO 3	Use at beginning level of proficiency on the tools of machine learning to ask questions of and explore patterns in data.
CO 4	Demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.



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Module Number	Topic	Sub-Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Data Analytics	Data science workflow, Automated methods for data collection, Data and Visualization Models, Data wrangling and cleaning, Exploratory data analysis, Dimensionality Reduction. Building and evaluation of models for: Association Analysis, Recommendation Systems, Time-series data, Text Analysis, Data Mining.	<p>International Academia: https://executive-ed.xpro.mit.edu/professional-certificate-in-data-science-and-analytics https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/syllabus/ https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20(AI DS).pdf</p> <p>Industry Mapping: Python, Google Colab, Tableau, R Programming</p>	6	Not included as lab paper. Students can implement important functions or models in R, Tableau, Python, or Google Colab.



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2	Probability, Statistics and Random Processes	Probability, Statistics and Random Processes: Probability theory and axioms, Random variables, Probability distributions and density functions (uni-variate and multivariate), Expectations and moments, Covariance and correlation, Statistics and sampling distributions, Hypothesis	<p>International Academia: (https://executive-ed.xpro.mit.edu/professional-certificate-in-data-science-and-analytics) (https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/syllabus/) (https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p> <p>AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20(AI DS).pdf)</p> <p>Industry Mapping: Python, Google Colab, Tableau, R Programming</p>	8	Not included as lab paper. Students can implement important functions or models in R, Tableau, Python, or Google Colab.
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3	Foundation of Machine Learning	<p>Introduction, types of machine learning (supervised learning, unsupervised learning, and reinforcement learning) regression Regression (Linear, Logistic, Ridge, and Polynomial), Classification, Naïve bias classifier, KNN, Support Vector Machine, clustering, K-Means, ISODATA, Unconstrained optimization, Necessary and sufficiency conditions for optima, Optimization Models (Integer, Nonlinear, and Discrete), Gradient descent methods, Constrained optimization, KKT conditions, Introduction to nongradient techniques, Introduction to least squares optimization, Heuristic optimization, Meta-heuristic optimization. Introduction to ANN, Feed Forward Neural Network, Feedback Neural Network</p>	<p>International Academia: https://executive-ed.xpro.mit.edu/professional-certificate-in-data-science-and-analytics https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/syllabus/ https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20(AI DS).pdf</p> <p>Industry Mapping: Python, Google Colab, Tableau, R Programming</p>	12	<p>Not included as lab paper. Students can implement important functions or models in R, Tableau, Python, or Google Colab.</p>
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4	Data Visualiza- tion	<p>Visual Representation of Data, Gestalt Principles, Visualization Software and Tools, Information Overloads, Creating Visual Representations: Visualization Reference Model, Visual Mapping, Visual Analytics; Classification of Visualization Systems: Interaction and Visualization Techniques, Visualization of One, Two and Multi-Dimensional Data, Visualization of Groups: Trees, Graphs, Clusters, Networks; Text Visualization, Visualization of Maps, Geographic Information, GIS systems.</p>	<p>International Academia: https://executive-ed.xpro.mit.edu/professional-certificate-in-data-science-and-analytics https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/syllabus/ https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/resources/lecture-13-learning-genetic-algorithms/)</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20(AI DS).pdf)</p> <p>Industry Mapping: Python, Google Colab, Tableau, R Programming</p>	10	<p>Not included as lab paper. Students can implement important functions or models in R, Tableau, Python, or Google Colab.</p>
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Text Books:

1. Doing data science: Straight talk from the frontline , C. O'Neil, R. Schutt, O'Reilly Media
2. Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, Glenn J. Myatt, Wayne P. Johnson, John Wiley & Sons
3. Statistics for Data Science, James D. Miller, Packt Publishing Limited
4. Soft Computing :Fundamentals And Applications, D. K. Pratihar, Narosa

Reference Book

1. Making Sense of Data II: A Practical Guide to Data Visualization, Advanced Data Mining Methods, and Applications, Glenn J. Myatt, Wayne P. Johnson, John Wiley & Sons
2. Hands-On Machine Learning with Scikit- Learn, Keras, and TensorFlow, Aurélien Géron, O'Reilly Media, Inc.



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Subject Name: Finance & Accounting

Credit: 3

Subject Code: OECCSE601A

Lecture Hours:36

Course Outcomes:	
On completion of the course students will be able to	
CO 1	Students will be able to have knowledge about depreciation
CO 2	Students will have knowledge about preparation of Final accounts and its implications
CO 3	Students will have knowledge and understanding of preparation of cost sheet and store ledgers
CO 4	Students will get an idea of capital budgeting and its application.



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Module Number	Topic	Sub- Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Depreciation Concept	Concept of depreciation; Causes of depreciation; depletion.	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: Industry Mapping: Designing an accounting system	6 hours	Not included as lab paper.
2	Depreciation Accounting	Depreciation accounting; Methods of recording depreciation; Straight line and diminishing balance method	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: Industry Mapping:	8 hours	Not included as lab paper.



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			Financial long term forecasting		
3	Final Accounts for sole proprietorship business (Sums and Theory)	Manufacturing account; Trading account; Profit and Loss Account; Balance Sheet; Adjustment entries Closing stock, outstanding, prepaid Expenses, Pre received, Depreciation, Provision, Stock lost by Fire, Goods withdrawal by proprietors, Free sample.	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: Industry Mapping: Financial daily or short term fund planning and management	10 hours	Not included as lab paper.
4	Cost Accounting	Essentials of a good cost accounting system: Difference between cost and Management accounting, LIFO/ FIFO, Materials (EOQ & Store Ledger) Preparation of Advanced cost sheet & estimation	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: Industry Mapping: Analysis of sales and cost dependency on	8 hours	Not included as lab paper.



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			profit margin using cost analysis methods.		
5	Capital Budgeting	Time value of money; Methods- Profitability Index, Net Present Value and Internal Rate of Return	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: Industry Mapping: Design and analysis of company health using Balance sheet using available tools and techniques	4 hours	Not included as lab paper.

Text Books:

1. Hanif & Mukherjee: Financial Accounting-1, Mcgrawhill.
2. Basu & Das: Cost & Management Accounting-1, Rabindra Library.



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Reference Books:

1. Dey, Dutta & Mukherjee: Cost & Management Accounting-1, Bhattachrjee Brothers.
2. Kar & Bagchi: Financial Management, Dey Book Concern.

Subject Name: Essential Studies for Professionals - VI

Subject Code: HSMC(CS)602

Credit : 2

Based on GATE exam Syllabus 2024

Subject Name: Skill Developments for Professionals - VI

Subject Code: HSMC682

Credit : 1

Will be shared shortly.