FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

B.TECH. COMPUTER SCIENCE & ENGINEERING

(Under Credit Based Continuous Evaluation Grading System)

(SEMESTER: VII to VIII)

Session: 2017-18

Batch from Year 2017 to Year 2021

GURU NANAK DEV UNIVERSITY AMRITSAR

CSA1: B.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER SYSTEM
(Under Credit Based Continuous Evaluation Grading System)
Batch from Year 2017 to Year 2021

SEMESTER –VII

S. NO.	Course Code	Course	L	T	P	CREDITS
1.	CSL471	Formal Languages & Automata Theory	3	1	0	4
2.	CSL474	Cloud Computing	3	0	1	4
3.	CSL477	Artificial Intelligence	3	0	1	4
4.	CSL478	Machine Learning	3	0	1	4
5.		Departmental Elective–II	3	1	0	4
		Total	**15**	**2**	**3**	**20**
		List of Departmental Electives–II:				
1.	CSL472	Internet Protocol	3	1	0	4
2.	CSL473	Advanced Microprocessors	3	1	0	4
3.	CSL476	Robotics	3	1	0	4

SEMESTER –VIII

S. NO.	Course Code	Course	L	T	P	CREDITS
1.	CSD480	Industrial Training Cum Projects	0	0	30	30
		Total				**30**

CSA1: B.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER–VII
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CSL-471 FORMAL LANGUAGES & AUTOMATA THEORY

CREDITS		
L	**T**	**P**
3	1	0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

COURSE CONTENTS:
Basic Definitions

UNIT-I

Operations on Languages: Closure properties of Language Classes. Context Free Languages: The Chomsky Griebach Normal Forms. Linear Grammars and regular Languages. Regular Expressions Context Sensitive Languages; The Kuroda Normal Form, One sided Context Sensitive Grammars.

UNIT-II

Unrestricted Languages : Normal form and Derivation Graph, Automata and their Languages, Moore and Mealy Machines, Finite Pushdown 2-push down Automata and Turing Machines, The Equivalence of the Automata, Minimization of Automata and the appropriate grammars. The Dyck Language.

UNIT-III

Syntax Analysis: Ambiguity and the formal power Series, Formal Properties of LL(k) and L.R.(k) Grammars.

Derivation Languages: Rewriting Systems, Algebraic properties, Canonical Derivations, Context Sensitivity.

Cellular Automata: Formal Language aspects, Algebraic Properties Universality &Complexity Variants.

TEXTS/REFERENCES:

1. Jeffrey Ullman and John Hopcroft, Introduction to Automata Theory, Languages, and Computation, 3e, Pearson Education India (2008).
2. Peter Linz, An Introduction to Formal Languages and Automata, 6/e, Jones & Bartlett (2016).
3. K.L.P. Mishra, Theory of Computer Science: Automata, Languages and Computation, Prentice Hall India Learning Private Limited (2006).
4. John Martin, Introduction to Languages and the Theory of Computation, McGraw-Hill Higher Education (2007).
5. G.E. Reevsz, Introduction to Formal Languages, McGraw Hill, 1983.
6. M.H. Harrison, Formal Language Theory Wesley 1978.
7. Wolfman Theory and Applications of Cellular Automata, World Scientific, Singapore, 1986.

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CSL474: CLOUD COMPUTING

CREDITS		
L	**T**	**P**
3	0	1

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT–I

Introduction: Definition, Vision, Reference Model, Classification of Cloud Services, Cloud Deployment Models, Benefits, Limitations, Terminology, Open Challenges.

Historical Development: Distributed Systems, Grid Computing, Utility Computing, Service Oriented Computing, Web 2.0, Web Services Standards-SOAP, WSDL, UDDI.

Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance.

UNIT–II

Cloud Migration: The laws of cloudonomics, Measuring cloud computing costs, Seven step model of migration into the cloud, Migration Risks and Mitigation.

QoS and Service Level Agreement (SLA): QoS Metrics, Types of SLA, SLA Components, Life Cycle of SLA, Phases of SLA Management.

Cloud Security: Securing Data, Establishing Identity-user centric, open-identity systems, Information Cards.

UNIT–III

Programming Models in Cloud: Introduction to Thread Programming, Task Programming and Map–Reduce Programming.

Advance Topics in Cloud: Energy Efficiency in cloud, Market Oriented Cloud Computing, Federated Cloud Computing, Mobile Cloud Computing, Fog computing, Big Data Analytics.

Textbooks:

1. Raj Kumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing: Foundation and Application Programming, Tata McGraw Hill, ISBN–13: 978–1–25–902995–0, New Delhi, India, Feb 2013.

Reference Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd, ISBN–13: 978–8–12–6529803, New Delhi, India, 2011.
2. Raj kumar Buyya, James Broberg, Andrzej Goscinski ,Cloud Computing: Principles and Paradigms , Wiley India Pvt. Ltd, ISBN–13: 978–-81-265-4125-6, New Delhi, India, 2011.
3. Dr. Saurabh Kumar, Cloud Computing: Insights Into New–Era Infrastructure, Wiley India Pvt.Ltd, ISBN–13: 978–8–12–6528837, New Delhi, India, 2011.
4. Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Cloud Computing For Dummies, WileyIndia Pvt. Ltd, ISBN–13: 978–0–47–0597422, New Delhi, India, 2011.

Practicals:

1. Using public cloud service providers (e.g. Amazon Web Services and Google cloud) for exploring the usage of cloud services-IaaS,PaaS,SaaS.
2. Use of virtualization software for creating, migrating, cloning, managing VMs.
3. Setting up a private cloud using open source tools (Eucalyptus/Open Stack etc.).
4. Hands on Practical based on Programming model in cloud computing.

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CSL-477 ARTIFICIAL INTELLIGENCE

CREDITS		
L	**T**	**P**
3	1	0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents:

UNIT– I

Introduction: Definition, Foundations, History, Current AI systems. Intelligent Agents: Agents and environment, Rationality, PEAS, Nature of Environment, Different types of agents. Searching: Agent design, Toy Problems, Searching, Tree Search and Graph Search, Uninformed Search, Breadth First Search, Depth First Search, Depth-Limited Search, Iterative Deepening, Iterative Lengthening, Bidirectional Search, Contingency problems.

Informed Search: Informed/Heuristic Search, Heuristic Search, A* Search, Memory bounded heuristic search, heuristic functions, local search and optimization, hill-climbing, simulated annealing, local beam search, online search, online depth first search.

Introduction to knowledge-based intelligent systems: Intelligent machines, Journey from 'dark ages' to knowledge-based systems, Introduction to Expert Systems. Logic and Inferences: Propositional Logic, First Order Logic (FOL), Resolution in FOL, Types of Resolution, Forward and Backward chaining.

Introduction to Prolog Programming language: Syntax and meaning of Prolog Programs, Using Data Structures, Input and Output, Built-in Predicates.

UNIT– II

Constraint Satisfaction Problems: Constraint Satisfaction Problems, Backtracking, Minimum Remaining Values heuristic, Most Constraint Variable heuristic, Least Con-straining Value heuristic, Forward Checking, Constraint Propagation, local search, problem decomposition. Adversarial Search: Games, optimal decisions in games, minimax algorithm, multiplayer games, alpha-beta pruning, evaluation functions, cutting of search, expectiminimax algorithm.

Planning: The planning problem, language specification and PDDL, examples of planning problems, forward search, backward search, heuristics, partial order planning, planning graphs, heuristics from planning graphs, Graph plan algorithm. Uncertainty: Uncertainty, probability basics, axioms of probability, inference using full joint distributions, independence, Bayes' rule, Naive Bayes.

Knowledge Representation (KR): Approaches to KR: Relational knowledge, Procedural knowledge and knowledge represented as logic; Semantic Nets, Ex-tended Semantic Networks, Frames. Rule-based Expert systems: Structure of rule based expert system, Conflict resolution, Uncertainty Management, Advantages & disadvantages of rule-based expert systems, Example, Introduction to JESS. Using Prolog Grammar Rules, Controlling Backtracking.

UNIT– III

Probabilistic Reasoning: Representation, Bayesian Networks, Construction of Bayesian Networks, Conditional Independence, Bayesian Networks with continuous variables. Making Simple Decisions: Beliefs, Desires and Uncertainty, Utility Theory, Utility Functions, Multi-attribute Utility Functions, Decision Networks, Value of Information. Making Complex Decisions: Stochastic Problems, Value Iteration, Policy Iteration, Game Theory.

Frame-based Expert systems: Inheritance in frame-based expert systems, Methods and Continued demons, Interactions of frames and rules, Example. Artificial Neural Network and Neural Expert Systems: How brain works, the Neuron as a single computing element, Perceptron, Multilayer FFNN, Back propagation algorithm, Recurrent networks, Neural expert system.

Text Books:

1. S. Russell and P. Norvig, Artificial Intelligence, Pearson.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Pearson.
3. M. Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, Addison Wesley.
4. D. Khemani, A first course in Artificial Intelligence, McGraw Hill Education (India) Pvt. Ltd.
5. S. Kaushik, Artificial Intelligence, CENGAGE Learning.
6. I. Bratko, Prolog Programming for Artificial Intelligence, Pearson.
7. Clocksin, W.F. and Mellish, C.S., Programming in Prolog 2nd Edition, Springer - Verlag, 1984.

Lab Assignments:

Searching using Breath First Search, Heuristic Search, Programming in Prolog (based on following topics covered in the class): Syntax and meaning of Prolog Programs. Using Data Structures. Controlling Back-tracking. Input and Output. Built-in Predicates. Using Prolog Grammar Rules. Higher level assignments/exercises for implementation using Prolog. Expert system design: Using the Expert System Shell (JESS/CLIPS) for development of an Expert System (in domains like Financial, Industrial, Social or other Engineering problems).

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CSL – 478 MACHINE LEARNING

CREDITS		
L	**T**	**P**
3	0	1

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

COURSE CONTENTS:

UNIT– I

Introduction, Machine learning basics, Supervised Learning: Artificial Neural Network, Classifying with k-Nearest Neighbour classifier, Support vector machine classifier, Decision Tree classifier, Naive Bayes classifier, Bagging, Boosting, Improving classification with the AdaBoost meta algorithm.

UNIT–II

Forecasting and Learning Theory: Predicting numeric values: regression, Linear Regression, Logistic regression, Tree-based regression. Bias/variance tradeoff, Union and Chernoff/Hoeffding bounds, Vapnik–Chervonenkis (VC) dimension, Worst case (online) learning.

Unsupervised Learning: Grouping unlabeled items using k-means clustering, Association analysis with the Apriori algorithm, efficiently finding frequent item sets with FP-growth.

UNIT–III

Reinforcement learning: Markov decision process (MDP), Bellman equations, Value iteration and policy iteration, Linear quadratic regulation, Linear Quadratic Gaussian, Q-learning, Value function approximation, Policy search, Reinforce, POMDPs.

Dimensionality reduction: Feature extraction - Principal component analysis, Singular value decomposition. Feature ranking and subset selection, filter, wrapper and embedded methods

Text Books:

1. Introduction to Machine Learning Author E. Alpaydin Publisher MIT Press Edition 2nd Edition, 2009

Reference Book:

1. Machine Learning Author T. M. Mitchell Publisher McGraw-Hill Edition 1997
2. Machine learning in action Author P. Harrington Publisher Manning Publications Co Edition 2012
3. Pattern recognition and Machine Learning Author C. M. Bishop Publisher Springer, Edition 2007
4. Machine Learning for Big Data Author J. Bell.Wiley,Edition 2014.

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CSL - 472 INTERNET PROTOCOL
(ELECTIVE II)

CREDITS		
L	**T**	**P**
3	1	0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents:

UNIT-I

Introduction & Overview: The need for Internet, The TCP/IP Internet, Internet services, history & scope, protocol standardization.

Review of underlying Technologies: LAN, WAN, MAN, Archnet & Ethernet topology, Token Ring, ARPANET, PROnet technology.

UNIT-II

Internetworking concepts and architectural model, Application level Internet connection, Interconnection through IP Gateways, Users View.

Internet Address: Universal Identifiers, Three Primary classes of IP Addresses, network &Broadcasting Addresses, Address Conventions, Addressing Authority, Mapping Internet Addresses to physical Addresses, Determining Internet Address at startup (RARP).

UNIT-III

Internet as virtual Network, Detailed concept of Routers & Bridges. Protocols Layering, Difference between X.25 and Internet layering, gate to Gate Protocol (GGP), Exterior Gateway Protocol (EGP).Managing Internet, reliable transactions & Security on Internet.

Texts / References:

1. Internet working with TCP/IP Vol. - I
2. Principal Protocols & Architecture Comer & Stevens.

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CSL - 473 ADVANCED MICROPROCESSORS

(ELECTIVE II)

CREDITS		
L	**T**	**P**
3	1	0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

COURSE CONTENTS:

UNIT-I

Review of 8 bit microprocessor and support components.

Selected Case Studies of 16/32/64 bit microprocessors and support

Contents. RISC Architectures and Case Studies: RISC Vs CISC.

UNIT-II

Power PC 601 Alpha 21064, Pentium super space, Transputer Architectures and Case Studies:

High Performance Embedded Microcontrollers, Case Studies.

UNIT-III

403 GA Development Systems and support. Selected Applications.

TEXTS / REFERENCES:

1. J.T. Cain, Selected reprints on microprocessors and microcomputers, IEEE Computer Society Press., 1984.
2. Rafiquzzaman, Microprocessors & Micro Computers Development Systems, Harper Row, 1984.
3. Rafiquzzaman, Microprocessors & Micro Computers - Based System Design, Universal Book Stall, New Delhi, 1990.
4. INMOS Ltd., Transputer Development System, Prentice Hall, 1988.
5. INMOS Ltd. Communicating Process Architecture, Prentice hall, 1988.
6. Wunnava V. Subbarao, 16/32 Bit Microprocessors 68000/68010/68020, Software, Hardware & Design Applications, Macmillan Publishing Company, 1991.
7. Kenneth Hintz, Daniel Tabak, Microcontrollers : Architecture, Implementation & Programming McGraw Hill Inc., 1992.
8. Data Books By Intel, Motorola, etc.
9. Daniel Tabak, Advanced Microprocessors, McGraw Hill Inc., 1995.
10. Andrew m. Veronis, Survey of Advanced Micro Processors, van Nostrand Reinhold, 1991. McGraw Hill Inc., 1992.
11. Daniel Tabak, RISC Systems, John Willey & Sons, 1990.
12. The Power PC Architecture: A Specification for a New family of RISC Processors, Edited by Cathy May, Ed Silha, Rick Simpson, hank Warren, Morgan Kaufmann Publishers, Inc., San Francisco, California, 2^{nd} Edition (May 1994)
13. Charles M, Gilmore, microprocessors Principles and Applications, McGraw Hill International Editions, 2^{nd}Edtion, 1995.
14. PowerPC 403GA Embedded Controller User's Manual. PowerPC Tools - Development Tools For PowerPC Microprocessor (Nov. 1993).PowerPC 601 RISC Microprocessor User's Manual - 1993.

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CSL - 476 ROBOTICS
(ELECTIVE - II)

CREDITS		
L	**T**	**P**
3	1	0

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
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COURSE CONTENTS:

UNIT-I

Introduction to Robotics, Introduction to Manipulators & Mobile Robots, Classification of Robots, Robot Applications. Industrial application environment and workcells, feeders and Orienting devices.

Robot Anatomy, Robot and Effectors, Transmission and actuators, with special reference to servomotors.

UNIT-II

Robot Arm Kinematics, World, Tool and Joint coordinators, DH transformation and Inverse Kinematics.

Fundamentals of Closed loop control, PWM amplifiers, PID control.

Robotics Sensors: Range, Proximity, Touch, Force & Torque Sensing, Uses of sensors in Robotics.

UNIT-III

Machine Vision: Introduction to machine Vision, The sensing and digitizing function in Machine Vision, Image Processing and analysis, Training and Vision system, Robotics Application. Low- & High-Level vision.

Robot Programming & Languages &Environment: Different methods, Features of various programming methods, Case study, Robot Task Planning. : concept, Different Methods, Robots learning.

Mobile Robot: Introduction, Obstacle Representation, Motion Planning in fixed, Changing structured, Unstructured environment based on different requirements.

TEXTS / REFERENCES:

1. M.P. Groover, M. Weins, R.N. Nagel, N.C. Odrey, Industrial Robotics, McGraw Hill, 1986.
2. Klafter D. Richard, Chmielewski T. A. and Negin Michael “Robotic Engineering”, Prentice Hall of India Ltd., 1993.
3. K.S. Fu, RC Gonzalez, CSG Lee, Robotics Control, Sensing, Vision and Intelligence, McGraw Hill, International Edition, 1987.
4. Andrew C. Straugard, Robotics & AI, Prentice Hall, Inc.
5. S. Sitharama Iyengar, Alberto Elefes, Autonomous Mobile Robots, Perception, mapping & Navigation, IEEE Computer Society Press.
6. S. Sitharama Iyengar, Alberto Elefes, Autonomous Mobile Robots-Control, Planning and Architecture, IEEE Computer Society Press.
7. Various Research papers in area of Robotics.

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CSD - 480 Industrial Training-cum-Projects

CREDITS		
L	**T**	**P**
0	0	30

Industrial attachment & projects work in the same industry.

A candidate should work on the project for 5 months and 6-8 hours on each working day.

Ist synopsis (containing mainly literature survey corresponding to the problem taken up for the project work and line of attack to solve the problem) within one month of joining the training is to be submitted and will be evaluated for 4 credits.

IInd synopsis (containing essentially the progress of work in comparative details) within three months of joining the training is to be evaluated will be evaluated for 8 credits.

Credits for Final Project Report & Viva Voce: 18

The evaluation shall be done as per the common ordinances for courses Credit Based Evaluation and Grading System.