

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M17CS121	Semester Odd (specify Odd/Even)	Semester III Session 2021 -2022 Month from July to Dec	
Course Name	Project Based Learning-II (Software Development Automation)			
Credits	4	Contact Hours	0-0-8	
Faculty (Names)	Coordinator(s)	Kashav Ajmera		
	Teacher(s) (Alphabetically)	Kashav Ajmera, Dr. Tribhuvan Kumar Tewari		
COURSE OUTCOMES At the completion of the course, Students will be able to			COGNITIVE LEVELS	
C210.1	Develop a project on live problems by applying automated software development process.		Create Level (C6)	
C210.2	Confront the issues related to development of project which includes team work, test driven design, data collections etc.		Analyze Level (C4)	
C210.3	Develop oral communication skill and prepare technical report.		Apply Level (C3)	
C210.4	Critically review the projects developed by peers.		Evaluate Level (C5)	

CO-PO Mapping:

COs	PO1	PO2	PO3	PSO1	PSO2
C210.1	3	1	3	2	3
C210.2	3	1	2	2	2
C210.3	2	3	2	2	2
C210.4	2	1	3	1	3

Avg.	3	2	3	2	3
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Course Plan

SN	Activity	Details	Date
1	Group Allocation	a) 3 – 6 students in a batch and a maximum of 5 – 6 batches b) average CGPA of the batches should be roughly same	31 Aug - 4 Sep
2	Problem Identification	a) Automation Problems (live problem relevant to the Indian society) b) Economic considerations c) Aim d) Scope e) Open Source Automation Building & Testing Tools: E.g.: JUnit is an open source unit testing tool for Java programming language	6 - 11 Sep
3	Assessment-1		13 - 18 Sep
4	Problem Formulation	a) Design and Implementation Constraints b) Assumptions and Dependencies c) Functional Requirements d) <u>Non-functional Requirements</u>	20 - 25 Sep
5	Assessment-2		27 Sep
6	Lab Class	Implementation, Testing and Analysis	4 – 9 Oct
7	Assessment-3		11-14 Oct
8	Lab Class	Implementation, Testing and Analysis	20 Oct
9	Assessment-4		25 Oct- 6 Nov
10	Lab Class	Implementation, Testing and Analysis	8 -13 Nov
11	Assessment-5 (Mid Term Viva)	a) Presentation by Students b) Viva	15- 18 Nov
12	Lab Class	Implementation, Testing and Analysis	29 Nov
13	Assessment-6		22-27 Nov

14	Lab Class	Testing, Analysis, and Report Preparation	6 -11 Dec
15	End Term	a) Presentation by Students b) Viva c) Report Submission d) Self Assessment Report Submission e) Peer Evaluation	15 Dec

Evaluation Scheme:

Parameters	Marks
6-Reviews (8 Marks each)	48
Report	10
Presentation	10
Viva	16
Peer Assessment	8
Self Assessment	8
Total Marks	100

ORDINANCE

3.3A Project Based Learning

(a) In PBL (Project Based Learning) Courses, students will learn a new subject through execution of project(s).

(b) Students will be divided into batches ranging from **3 – 6 students in a batch** and a **maximum of 5 – 6 batches** for the whole class. The students in batches will be decided by the instructor. Choice of batch formation shall not be given to the students. The **average CGPA of the batches should be roughly same** meaning thereby that each batch will consist of students with high average and low CGPA. (c) The projects to be given shall be decided by the instructor in such a manner that it involves gaining knowledge of the subject and additionally forces students to demonstrate skill acquisition at least in the following areas:

- (i) Problem solving
- (ii) Team working
- (iii) Communication skills (both oral and written)
- (iv) Economic considerations
- (v) Acquisition of knowledge in allied areas as required by the Project

The Project should preferably be a **live problem relevant to the Indian society**.

(d) The instructor shall help the students in developing the project by giving hints and suggestions, but normally should refrain from giving readymade solution. If need be, the instructor may deliver short lectures.

(e) In order to force the students to work consistently throughout the semester, an assessment-cum-assistance session should be carried out on fortnightly basis or more frequently, if felt necessary by the instructor. (f)

The evaluation scheme for Project Based Learning courses shall be as under:

(i) Each fortnightly assessment - 8%

(First assessment should be at the end of 3rd week from the beginning of the semester and thereafter fortnightly assessment. A total of six assessments giving a total percentage $6 \times 8 = 48\%$) - 48%

(ii) Report at the end of the semester - 10%

(iii) Semester end presentation by the students - 10%

(iv) Viva-voce at the end of the semester - 16%

(v) Peer group evaluation (i.e. evaluation by the fellow - 8% students not belonging to the same batch)

(vi) Self assessment by the student concerned (can be - 8% moderated by the instructor by discussing with the student concerned)

RUBRICS for Evaluation

Assessment-1	Exemplary ($\geq 80\%$)	Competent ($\geq 50\%$ & $< 80\%$)	Unsatisfactory ($< 50\%$)
Literature Survey	Insightful and in-depth background information is provided to illuminate the issues through inclusion of history relevant to the presentation, the "big picture" and a succinct description of the significance of the project.	Background information is provided, including references to the work of others and an explanation of why the project was undertaken, to help put the presentation in context.	Little or no background information is presented to help the audience understand the history and significance of the project.
Problem Identification	The problem has been shown (not just stated) to exist with supporting factual evidence.	The problem has stated but has weak support.	Problem has not been stated clearly and lacks supporting evidence.

Assessment-2	Exemplary ($\geq 80\%$)	Competent ($\geq 50\%$ & $< 80\%$)	Unsatisfactory ($< 50\%$)
Literature Survey	Existing solutions to the problem, including their good and bad points, have been stated.	Existing solutions have been stated. Additional discussion may be warranted in places.	Connection between references and what is written is not clear. Little investigation has been done.

Problem Formulation	The project's objectives are clearly stated. Motivation for pursuing the project and its relevance are clearly established. There are clear expectations of the specific outputs or deliverables for the project. A set of measurable performance requirements has been created.	The project's objectives are presented. The motivation for pursuing the project and its relevance are addressed. Expectations have been stated. Some objectives may not be measurable.	The project's objectives are missing or incomplete. There is little or no discussion of motivation or relevance. Expectations have been stated but needs clarity. Most objectives are not measurable.
Gantt Chart	A plan stating the completion date, and required resources has been presented. Gantt chart has been generated.	Some aspects of the plan have not been fully developed.	Lack of planning is evident.

Assessment-3	Exemplary (>=80%)	Competent (>=50% & <80%)	Unsatisfactory (<50%)
Methodology	A system block diagram has been developed to assist the team in solving the design. All blocks have been broken down to a manageable level. <i>For web/ mobile applications:</i> Pages are attractive and consistent in style throughout the site. Site is well organized and is easily navigated from any page. Graphic elements are appropriate, of high quality, and are creatively used to enhance content.	A system block diagram has been developed to assist the team in solving the design. Not all blocks have been broken down to a manageable level. <i>For web/ mobile applications:</i> Pages are attractive, but not consistent in style throughout the site. Site is well organized. Graphic elements are appropriate and are of acceptable quality to enhance content.	A system block diagram has not been fully developed. Problem has not been broken down to manageable tasks and blocks. <i>For web/ mobile applications:</i> Pages are unattractive Site is not organized or consists of a single page. Graphic elements are not appropriate or not used, or are of such poor quality that they detract from content.
Coding/ Implementation	All major points of the project were completed as per planning.	Most points of the project were completed as per planning.	Little or none of the project was completed as per planning.

Assessment-4	Exemplary (>=80%)	Competent (>=50% & <80%)	Unsatisfactory (<50%)
Coding/ Implementation	All major points of the project were completed as per planning.	Most points of the project were completed as per planning.	Little or none of the project was completed as per planning.

Assessment-5	Exemplary (>=80%)	Competent (>=50% & <80%)	Unsatisfactory (<50%)
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Coding/ Implementation	All major points of the project were completed as per planning.	Most points of the project were completed as per planning.	Little or none of the project was completed as per planning.
Presentation	Clearly heard and polished. Attitude indicates confidence and enthusiasm and audience attention is constantly maintained. Presenters demonstrate full knowledge of the material and can explain and elaborate on expected questions.	Clearly heard but not polished. Attitude indicates confidence but not enthusiasm and audience attention is mostly maintained. Presenters have sufficient knowledge of the material to answer expected questions.	Difficult to hear and/or moments of awkwardness. Attitude indicates some lack of confidence and/or disinterest in subject and audience attention is minimally maintained. Presenters cannot answer expected questions.
Peer Evaluation	To greatest extent	To great extent	To some extent or no contribution

Assessment-6	Exemplary ($\geq 80\%$)	Competent ($\geq 50\%$ & $< 80\%$)	Unsatisfactory ($< 50\%$)
Coding/ Implementation	All major points of the project were completed as per planning.	Most points of the project were completed as per planning.	Little or none of the project was completed as per planning.

End Term Assessment	Exemplary ($\geq 80\%$)	Competent ($\geq 50\%$ & $< 80\%$)	Unsatisfactory ($< 50\%$)
Viva	Answers the questions to greatest extent	Answers the questions to a great extent	Answers the questions to some extent
Report	Addresses all specified content areas. Material abundantly supports the topic. All items are labelled in accordance with engineering standards and are referred to in the text. Prior work is acknowledged by referring to sources for theories, assumptions, quotations, and findings. References are in IEEE format.	Addresses most of the specified content areas. Material minimally supports the topic. Use of engineering terms and jargon With some minor exceptions, references are in IEEE format.	Addresses few of the content areas. Material does not support the topic. There is no corresponding explanatory text for included items. Little attempt is made to acknowledge the work of others. Most references that are included are inaccurate or unclear.

Presentation	Clearly heard and polished. Attitude indicates confidence and enthusiasm and audience attention is constantly maintained. Presenters demonstrate full knowledge of the material and can explain and elaborate on expected questions.	Clearly heard but not polished. Attitude indicates confidence but not enthusiasm and audience attention is mostly maintained. Presenters have sufficient knowledge of the material to answer expected questions.	Difficult to hear and/or moments of awkwardness. Attitude indicates some lack of confidence and/or disinterest in subject and audience attention is minimally maintained. Presenters cannot answer expected questions.
Peer Evaluation	To greatest extent.	To great extent.	To some extent or no contribution.

Software development automation

The automated software development process is characterized by the following characteristics:

1. **A single common code repository** is put in place. All developers place the code they write in the repository. Currently, Git is the most popular version control system. The code in the repository is the sole source of software in the project.
2. **There is the so-called “build process”** in place. The build process is a standardized method for creating and building subsequent software copies. Every developer, tester, testing script and mechanism uses the exact same process.
3. **The build process is automated.** Obtaining the current version of the software does not require anybody to perform a large number of manual actions. In an ideal situation, the build process is another script or a piece of software, which is also versioned in the code repository. A developer downloads the latest code from the repository, starts the build process (for example by starting a script) and obtains the current state of the application. The same script should be used by all the testing tools and testing environments, as well as for building demo versions.
4. **The build process is fast.** Building the software package does not last too long. This allows for testing results and implementing fixes multiple times.
5. The team commits changes often, every day or several times per day at best. The working code is pushed to the master branch in the version control system on an ongoing basis.
6. **The testing environment should resemble the production** environment as closely as possible. In an ideal situation, it would be a direct copy of a production environment.
7. **The process of pushing software to production is automated.** In a best case scenario, pushing new changes to production should be done by clicking a single button or running a single script.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M17CS212	Semester Odd 2021 (specify Odd/Even)	Semester 3rd Session 2021 -2022 Month from July, 2021 to Dec., 2022
Course Name	Seminar and Term Paper		
Credits	4	Contact Hours	

Faculty (Names)	Coordinator(s)	Kavita Pandey
	Teacher(s) (Alphabetically)	Kavita Pandey

COURSE OUTCOMES		COGNITIVE LEVELS
C212.1	Identify the relevant research problem and its associated literature in the field of computer science.	Understand (level 2)
C212.2	Examine the research gaps by analyzing the research articles.	Analyze (level 4)
C212.3	Improve the communication and writing skills by compiling the findings in the form of report and seminar.	Evaluate (level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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Evaluation Criteria	
Components	Maximum Marks
Day to day work prior to Midterm	20
Mid term Seminar and Report	20
Day to day work after Midterm	20
End term Seminar	20
Term Paper	20
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,

Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
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Detailed Syllabus
Lecture-wise Breakup

Course Code	17M22CS113	Semester Odd (specify Odd/Even)	Semester X Session 2021 -2022 Month from Sep '21 to Dec '21
Course Name	Soft Computing and Applications		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Shikha Jain
	Teacher(s) (Alphabetically)	Shikha Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C130.1	Select defuzzification and other methods in fuzzy decision making	Apply Level (Level 3)
C130.2	Analyze different fuzzy inference systems for various real world problems.	Analyze Level (Level 4)
C130.3	Develop solutions for different problems using genetic algorithm and it's extensions	Apply Level (Level 3)
C130.4	Apply different neural network based algorithm	Apply Level (Level 3)
C130.5	Analyze the suitability of hybrid systems for a given problem	Analyze Level (Level 4)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Soft Computing	Definition, Goals, Importance of Soft Computing and its applications	2
2.	Fuzzy Logic	Introduction to fuzzy logic, memberships functions, fuzzy relation, fuzzification and defuzzification, fuzzy inference System, fuzzy decision making: individual, multi objective, multi attribute and its applications to different branches of Science and Engineering.	12
3.	Genetic Algorithms in Problem Solving	introduction, Elements of Genetic Algorithms, Types of Genetic Algorithms, Multi objective Genetic algorithm , Problem solving using GA	10
4.	Artificial Neural Networks	Introduction to artificial intelligent network, network architectures , Back propagation networks, Learning Vector Quantization , Counter Propagation Networks, Auto encoders, RNN, LSTM and its applications	12
5.	Hybrid System	Integration of neural networks, fuzzy logic and genetic algorithms. Neuro-Fuzzy, Neuro-Genetic and Fuzzy-Genetic systems, Applications of Soft computing in different fields of research specially in Data Analysis and Communications.	6
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (10 Marks), Assignment/Mini-project (15 Marks)]
Total	100
<p>Project based learning: Each student in a group of 3-4 students will choose a real world problem where hybrid soft computing could be designed. The skills developed in mini-project will enhance their knowledge on various soft computing techniques used in hybrid system and helps their employability in IT industries .</p>	
<p>Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)</p>	
Text Books	
1.	Sivanandam, S. N., and S. N. Deepa. Principles of soft computing , Third Edition John Wiley & Sons, 2019.
2.	Haykin, Simon. Neural Networks and Learning Machines, 3/E. Pearson Education India, 2019.
3.	Deb, Kalyanmoy. Multi-objective optimization using evolutionary algorithms. Vol. 16. John Wiley & Sons, 2010.
Reference Books	
1.	Ross, Timothy J. Fuzzy logic with engineering applications. Vol. 2. New York: wiley, 2010.(Third Edition)
2.	Wilusz, Tadeusz. "Neural networks—A comprehensive foundation: By Simon Haykin. Macmillan, pp. 696, ISBN 0-02-352761-7, 1994." (1995): 359-360.
3.	Jyh-Shing Roger Jang et al., Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, First Edition, Prentice Hall, 1997
4.	Hassoun, Mohamad H. Fundamentals of artificial neural networks. MIT press, 1995.
5.	Rajasekaran, Sanguthevar, and GA Vijayalakshmi Pai. Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd., 2003.
6.	Mehrotra, Kishan, Chilukuri K. Mohan, and Sanjay Ranka. Elements of artificial neural networks. MIT press, 1997.
7.	Mitchell, Melanie. An introduction to genetic algorithms. MIT press, 1998.
8.	Klir, George, and Bo Yuan. Fuzzy sets and fuzzy logic. Vol. 4. New Jersey: Prentice hall, 1995.
9.	IEEE Transactions on Knowledge and Data Engineering Mitchell, Melanie. An introduction to genetic algorithms. MIT press, 1998.
10.	IEEE Transactions on Systems, Man and Cybernetics

Detailed Syllabus
Lecture-wise Breakup

Course Code	18M12CS115	Semester (Even)	Semester II Session 2021 -2022 Month from Jan to June, 2022
Course Name	Internet of Things		
Credits	3	Contact Hours	3 Lectures

Faculty (Names)	Coordinator(s)	Dr. K. Rajalakshmi
	Teacher(s) (Alphabetically)	Dr. K. Rajalakshmi

COURSE OUTCOMES		COGNITIVE LEVELS
C150.1	Identification of purpose, requirements and description of various components and specifications of IoT devices, applications and protocols.	Understand (level 2)
C150.2	Develop the Process Model, Domain Model, Information Model and Service Model specifications using IoT communication protocols.	Apply (level 3)
C150.3	Analyze the characteristics and functioning of various IoT specific communication protocols used in different layers of IoT devices.	Analyze (level 4)
C150.4	Evaluate various IoT protocols and components for building IoT applications for real world problems and sustainable solutions.	Evaluate (level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Internet of Things	Introduction to Internet of Things, Layers in IoT, IoT Communication Protocols at different layers, Design steps for IoT, IoT Enabling Technologies, IoT Levels.	5
2.	IoT platforms design methodology	IoT Design methodology, Purpose and requirement specifications, Process, Domain, Information Model specifications, Service specifications and application development.	5
3.	IEEE 802.15.4	The Physical Layer, MAC Layer, MAC Layer Frame Format and their uses.	3
4.	ZigBee	ZigBee Architecture, Association, ZigBee Network Layer, APS Layer, ZDO, Security, ZCL etc.	3
5.	Internet Connecting Principles	Introduction to Arduino and Raspberry Pi, Connectivity with other components, internet connectivity, IP addressing in IoT, Media Access Control, and Application Layer Protocols: MQTT, CoAP, XMPP.	9
6.	Design Principles for Web Connectivity	Web Communication Protocols for Connected Devices, Message communication Protocols, Web connectivity : SOAP, REST, HTTP RESTFUL, Web Sockets	4
7.	Data Acquiring , Organizing, Processing and Analytics	Data Acquiring and Storage, Organizing the data, Transactions, Business Processes, Integration and Enterprises Systems, Analytics, Knowledge Acquiring, Managing and Storing process	4
8.	Data Collection, Storage and Computing using	Cloud computing paradigms for Data Collection, Storage and Computing, Cloud Service Models, IoT Cloud-based Services.	6

	Cloud Computing		
9.	IoT Applications for Sustainable developments.	Energy Savings in IoT, Green IoT Applications developments for sustainability.	3
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 07, Quizzes /Assignments /Mini-Project = 18)
Total	100

Project based learning: Students form group of size 2-3 members. Each group will identify several real life issues in various thrust areas like healthcare, industrial, education, smart city, logistics, environment, governance and etc. Once problem has been identified, the group will analyze the problem and synthesize IoT system based solutions to the identified problem. Each group will apply different IoT based approaches such as smart sensor and heterogeneous devices. This approach will enhance skills of each student and increase the understanding of IoT systems in distributed applications. Moreover, candidate will gain the enough knowledge to provide the IoT solution to enhance the quality of life in human/organization. After this course, a student will be able to undertake any work in this area in the industry or research.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Internet of Things: A Hands-On Approach, Arshadeep Bagha and Vijay Madiseti.
2.	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, and Patrick Grossetete
3.	The Internet of Things: Key Applications and Protocols, Oliver Hersent, David Boswarthick, Omar Elloumi, Wiley.
4.	Internet of Things: Architecture and Design Principles, Raj Kamal, McGrawHill
5.	6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
6.	Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications, Daniel Minoli John Wiley & Sons

Detailed Syllabus
Lecture-wise Breakup

Course Code	18M12CS117	Semester (Odd)	Semester I Session 2021 -2022 Month from July – December 2021
Course Name	Blockchain Technology and Applications		
Credits	03	Contact Hours	(L+T) (3+1)

Faculty (Names)	Coordinator(s)	Dr. P. Raghu Vamsi
	Teacher(s) (Alphabetically)	Dr. P. Raghu Vamsi

COURSE OUTCOMES (NBA CODE: C141)		COGNITIVE LEVELS
C141.1	Define what is blockchain and cryptocurrency, and when and why blockchain is required with its application areas.	Remember Level (Level 1)
C141.2	Understand and describe how blockchain works. Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building.	Understand Level (Level 2)
C141.3	Identify and analyze the real world problems that the blockchain is trying to solve.	Understand Level (Level 2)
C141.4	Examine and implement tools and techniques to build a blockchain application.	Apply Level (Level 3)
C141.5	Explore the platforms such as Bitcoin, Ethereum, and Hyperledger to create and evaluate the blockchain applications.	Apply Level (Level 3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Blockchain	<p>Conventional business models, Industry 4.0, Advantages of intermediary in the business model, Conventional ledger model, Problems with the existing business models. Distributed ledger technology, Example games – 1) Average age of the customers, 2) rating a product, and 3) Secure donation. SWOT analysis of Games.</p> <p>Cryptographic primitives: CIA properties, Asymmetric key cryptography, Elliptic curve cryptography, Digital Signatures, Cryptographic hash function, Merkle Tree</p> <p>Distributed consensus: Network models, properties, advantages and limitations of distributed consensus, Byzantine generals problem, Various consensus protocols explored by Distributed Systems.</p>	8
2.	Bitcoin Case study	<p>Recap of cryptographic primitives, introduction to Bitcoin cryptocurrency.</p> <p>Mechanics of Bitcoin: Bitcoin transactions; Bitcoin scripts; Applications of Bitcoin scripts; Bitcoin blocks; Bitcoin network; Limitations and improvements</p> <p>Consensus without identity using Blockchain: Incentives and Proof of Work (PoW); Attacks on PoW.</p> <p>Advantages and Limitations of PoW; Bitcoin – NG</p> <p>Bitcoin Mining: Task of Bitcoin miners; Mining Hardware;</p>	6

		Energy consumption and Ecology. Mining pools; Mining Incentives and strategies.	
3.	Blockchain Development	Blockchain categories, how to chose blockchain projects, Blockchain vs. Database. Blockchain frameworks, Blockchain application use cases, Python program for understanding Blockchain creation, Miscellaneous concepts in Blockchain	4
4.	Ethereum blockchain	Ethereum vs. Bitcoin, Introduction to smart contracts and Ethereum Virtual Machine, Introduction to Remix IDE, Solidity Programming, Decentralized applications (DApps), environment setup (web3js), Truffle development (UI and deployment), Application models and standards	10
5.	Other Blockchain Frameworks	IBM Hyperledger, Flow Blockchain, Corda Blockcahin, Stratis Blockchain, Deploying private Blockchain	10
9.	Research aspects in Blockchain	Consensus protocols, Identity management, Strong and weak synchronization, avoiding forks, Mining improvements. Research directions in Blockchain applications.	4

Total number of Lectures

42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (PBL(10)+Quiz(5)+Attendance(10))
Total	100

PBL : A blockchain use case to be identified by students and they can chose a blockchain platform studied in the course for design and implementation.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Drescher, Daniel. "Blockchain basics", Apress, 2017.
2.	Mougayar, William. "The business blockchain: promise, practice, and application of the next Internet technology", John Wiley & Sons, 2016.
3.	Dannen, Chris. "Introducing Ethereum and Solidity", Berkeley: Apress, 2017.
4.	Prusty, Narayan. "Building Blockchain Projects", Packt Publishing Ltd, 2017.
5.	Pilkington, Marc. "Blockchain technology: principles and applications" Research handbook on digital transformations, 2016.
6.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
7.	Swan, Melanie, "Blockchain: Blueprint for a new economy", O'Reilly Media, Inc., 2015.
8.	Antonopoulos, Andreas M. "Mastering Bitcoin: unlocking digital cryptocurrencies", O'Reilly Media, Inc., 2014.

Detailed Syllabus

Subject Code	19M12CS111	Semester odd	Semester: First Session: 2021- 2022 Month from July to December
Subject Name	Web Intelligence		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr. Niyati Aggrawal	
	Teacher(s) (Alphabetically)	Dr. Niyati Aggrawal	

Course Outcomes:

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

CO#	CO Description	COGNITIVE LEVELS
C121.1	Outline the various web technologies, methods, and models used to design an intelligent web.	Understand (Level-2)
C121.2	Make use of web caching strategies at varied level: user, web server, and gateway server.	Apply Level (Level-3)
C121.3	Analyze and Model the users' browsing behavior on web.	Analyze (Level- 4)
C121.4	Evaluate various Web content mining algorithms, Web language models and learning to rank models to handle complex Web.	Evaluate Level (Level-5)
C121.5	Design and develop the computational intelligent web algorithms to handle complex real problems	Create Level (Level-6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Web Content Feature Engineering	Frequency Filter, POS Tag, Unigram, Ngram, Collocation, Levenstein Distance, KL-Divergence, T-Test.	4
2	Web Language Models	Vector Space Models: TF-IDF, SGRank, SGRank-IDF, Single Rank, Word-Word occurrence matrix; Word Embedding with GloVe, Word2Vec, CBoW, Skip Gram Model Probabilistic models: Bayes model, BM25 Ranking model;	8
3	Web Content Searching	Link Based Search Algorithm, Power Iteration Method for ranking nodes on web, Handling Spider Traps and Dead ends, Topic Sensitive Page Ranking.	4
4	Ranking Algorithm and performance measures	Point wise ranking, Pair wise Ranking, Listwise ranking.	4

		Metrics for Learning to rank: CG, DCG, NDCG, P@K, MAP, AP	
5	Web caching Algorithm	LRV, FIFO, LRU, Random, OPT, Size based, PSS	4
6	Matrix Factorization Techniques	Matrix decomposition, Eigenvalue decomposition, non-Negative matrix factorization, Singular value decomposition, objective functions, UV decomposition, CUR decomposition	5
7	Tensor Factorization	Multidimensional Matrix Factorization, Matricization, Tucker decomposition, High Order SVD, clustHOSVD, other methods	4
10	Collective Intelligence	Crowd Sourcing, Local-Global Behavioral Interactions, Self-Organizing Systems, Self-Adaptive Evolutionary Systems, Information Extraction from Deep Web, Decision Making Under Uncertainty	4
11	Graph Structure in the Web	Social Network Analysis, Google Patent Algorithm, News Feed Algorithm, Edge Rank Algorithm, Web of Things, Situational Awareness	5
Total number of Lectures			41

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance/ Class Assignments/Quiz/ Internal assessment & Mini-Project)
Total	100

Project Based Learning: Students will develop small size project in order to build an intelligent web concept in a group of 2-3. Basically, small size projects are given to students in form of assignments to provide solution out of topics discussed in the course. Understanding usage of appropriate methodology, then implementation of those selected methodology to handle real scenario intelligent web problem and evaluation of applied methodology using various performance measures is the prime concept to enhance students' knowledge towards intelligent web.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1	Web Intelligence Journal: https://www.iospress.nl/journal/web-intelligence-and-agent-systems/
2.	Soumen Chakrabarti., Mining the Web: Discovering knowledge from hypertext data. Morgan Kaufmann, 2003.
3.	Scime, Anthony, ed. Web mining: applications and techniques. IGI Global, 2005.
4.	Hitzler, Pascal, Markus Krotzsch, and Sebastian Rudolph. Foundations of semantic web technologies. CRC Press, 2011.

5.	Sponder, M., & Khan, G. F. (2017). Advanced Web Analytics and Web Intelligence. In Digital Analytics for Marketing (pp. 115-144). Routledge.
6.	Symeonidis, P., & Zioupos, A. (2016). Matrix and Tensor Factorization Techniques for Recommender Systems (Vol. 1). New York: Springer International Publishing.
7.	Aggarwal Charu.C, Social Network Data Analytics, Springer Science+Business Media, LLC 2011
8.	Velásquez, J. D. (2010). Advanced techniques in web intelligence (Vol. 311). L. C. Jain (Ed.). Springer.
9.	Zhong, N., Liu, J., & Yao, Y. (2003). Web intelligence. Springer Science & Business Media.
10	Borgatti Stephon. P., Everett Martin G and Johnson Jeffery C , Analyzing Social Networks, Sage Publications, 2013

Detailed Syllabus
Lecture-wise Breakup

Course Code	19M12CS113	Semester Odd (specify Odd/Even)	Semester I sem (M.TechCSE) Session 2021 -2022 Month from Aug'21 to Dec'21
Course Name	ADVANCED WIRELESS NETWORKS		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. K. RAJALAKSHMI
	Teacher(s) (Alphabetically)	Dr. K. RAJALAKSHMI

COURSE OUTCOMES		COGNITIVE LEVELS
C143.1	Understand the fundamentals of Wireless Transmission Technology, and media access Technologies.	Understand (C2)
C143.2	Design a network using various protocols wireless networks WLAN, WiMAX	Create (C6)
C143.3	Analysethe GSM & UMTS Telecommunication Systems	Analyze (C4)
C143.4	Discuss the features of 4G and 5G networks	Apply (C3)
C143.5	Demonstrate the features of SDN framework	Apply (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Applications of Wireless Networks, history of wireless communication, open research topics, simplified reference model	3
2.	Wireless Transmission	Frequency for radio transmission, regulation, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems	3
3.	Medium Access Control	Specialized MAC, Hidden and exposed terminals, near and far terminals, SDMA, FDMA, TDMA, CDMA., comparison of S/T/F/CDMA	3
4.	Wireless LAN	Infra-red vs. radio transmission, Infrastructure and ad-hoc network, IEEE802.11: System architecture, protocol architecture, Physical Layer, Medium access control layer, MAC management, 802.11b, 802.11a, Bluetooth.	5
5	WiMAX	IEEE802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX - 802.16e – Network Infrastructure	7
6.	Telecommunication Systems	GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, Data Services, GPRS,EDGE, UMTS and IMT-2000: UMTS releases and standardization, UMTS system architecture, UMTS radio interface, UTRAN, Core Network, Handover	7

7.	LTE, 4G, 5G	LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks – Scheduling – Mobility Management and Power Optimization - LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced (3GPP Release 10) - Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G – Introduction to 5G	7
8.	Software Defined Networks	Introduction – Centralized and Distributed Control and Data Planes – Open Flow – SDN Controllers – General Concepts – VLANs – NVGRE – Open Flow – Network Overlays – Types – Virtualization – Data Plane – I/O – Design of SDN Framework	7

Total number of Lectures **42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 10, Quizzes /Assignments /Mini-Project = 15)
Total	100

Students form group of size 2-3 members. Each group will identify several wireless network issues in distributed applications in various thrust areas like healthcare, industrial, education, smart city, logistics, environment, governance and etc. Once problem has been identified, the group will analyze the problem and synthesize wireless network based solutions to the identified problem. Each group will apply different wireless network technology and concepts such as WIFI, Bluetooth, WiMAX, 4G/5G, and SDN. This approach will enhance skills of each student and increase the understanding of incorporating wireless networks in recent distributed applications. Moreover, candidate will gain the enough knowledge to provide the wireless network based solutions to enhance the scalability, mobility and coverage issues of any organization/company. After this course, a student will able to undertake any work in this area in the industry or research.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Reference Books	
1.	Jochen Schiller, “Mobile Communications”, second edition, Addison-Wesley, 2004.
2.	Martin Sauter, From GSM to LTE, An Introduction to Mobile Networks and Mobile Broadband, Wiley, 2014.
3.	Savo G Glisic, Advanced Wireless Networks – 4G Technologies, John Wiley & Sons, 2007.
4.	Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, Wiley, 2015.
5	Paul Goransson, Chuck Black, —Software Defined Networks: A Comprehensive Approach, Morgan Kauffman, 2014.
6.	Naveen Chilamkurti, SheraliZeadally, HakimaChaouchi, Next-Generation Wireless Technologiesl, Springer, 2013.
7.	IEEE, ACM Transactions, Journals and Conference papers on “Advance Wireless Network”

Detailed Syllabus
Lecture-wise Breakup

Course Code	19M12HS211	Semester: Odd (specify Odd/Even)	Semester: III Session: 2021 -2022 Month from: July-December
Course Name	Cost Accounting for Engineering Projects		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Praveen Kumar Sharma
	Teacher(s) (Alphabetically)	Dr. Praveen Kumar Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
C201.1	Understand basic concepts of Cost Accounting	Understand (C2)
C201.2	Apply concepts of cost in project management	Apply (C3)
C201.3	Analyze cost behaviour for decision making	Analyze (C4)
C201.4	Construct different budgets for controlling the cost	Create (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction & Overview of Strategic Cost Management Process	2
2.	Cost Concepts	Relevant Cost, Differential Cost, Incremental Cost, Opportunity Cost, Objectives of a costing system, Inventory Valuation, Provision of data for decision making	4
3.	Project execution	Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities.	5
4.	Project Execution & Quantitative	Pre project execution main clearances and documents Project team: Role of each member. Importance Project site	7

	techniques for cost management	Data required with significance, Project contracts, Types and contents, Project execution, Project cost control, bar charts, Project commissioning, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory	
5.	Cost Behavior	Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems.	6
6.	Profit Planning Marginal Costing	Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach,	6
7.	Material Planning	Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card& value chain analysis.	6
8.	Budgetary Control	Flexible budgets, Performance budgets, zero based budgets, Measurements of divisional profitability pricing decisions including transfer pricing.	6
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+ project)
Total	100

Project based learning: student will form the group of four to five students. To make subject application based, student will apply various concepts such as Cost management and various types of Costing, project execution & quantitative technique for cost management, cost behaviour and profit planning. Student will apply these concept on organization, or in any ongoing project or interdisciplinary base research project or any innovative idea in any particular industry along with feasibility.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	S. M. Datar and M. Rajan, <i>Hornegren's Cost Accounting: A Managerial Emphasis. 16th ed.</i> Pearson Education, 2018.

2.	B. M. L. Nigam and I. C. Jain, <i>Cost Accounting: Principles And Practice</i> , PHI Learning Pvt. Ltd. PHI Learning Pvt. Ltd., 2010.
3.	R. S. Kaplan and A. A. Atkinson, <i>Advanced management accounting</i> . PHI Learning, 2015.
4.	A. K. Bhattacharyya, <i>Principles and practice of cost accounting</i> . PHI Learning Pvt. Ltd., 2004.
5.	N. D. Vohra, <i>Quantitative Techniques in Management</i> , 3e. Tata McGraw-Hill Education, 2006.
6.	C. Drury, <i>Management and Cost Accounting</i> ,10th edition, Cengage Learning. 2017.
7.	P. Chandra, <i>Projects-Planning Analysis, Selection, Implementation & Review 9e</i> , Tata McGraw Hill, New Delhi. 2019.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19M13HS211	Semester: Odd	Semester: M.Tech III and M.Tech Integrated X Session: 2021 -2022 Month from: August-December 2021
Course Name	Constitution of India		
Credits	2	Contact Hours	2-0-0

Faculty (Names)	Coordinator(s)	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	Dr. Chandrima Chaudhuri Ms. Puneet Pannu

COURSE OUTCOMES		COGNITIVE LEVELS
C202.1	Demonstrate an understanding of the historical inheritances and institutional legacies of Indian Constitution	Understand (C2)
C202.2	Assess the nature of the Indian constitution and its applicability in the study of politics in India.	Evaluate (C5)
C202.3	Assess the devolution of powers and authority of governance of the Union government and the local government	Evaluate (C5)
C202.4	Demonstrate an understanding of the powers and functions of the Indian executive, legislature and judiciary	Understand (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	History of Making of the Indian Constitution	<ul style="list-style-type: none"> • History • Drafting Committee-Composition & Working 	2

2.	Philosophy of the India Constitution	<ul style="list-style-type: none"> • Preamble • Salient Features • Federalism 	2
3.	Fundamental Rights and Directive Principles	<ul style="list-style-type: none"> • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion • Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Conflict between DPSP and FR • Fundamental Duties 	5
4.	Organs of Governance	<ul style="list-style-type: none"> • Parliament-Composition, Qualifications & and Disqualification, Powers and Functions • Executive- President, Governor Council of Ministers • Judiciary-Appointment and Transfer of Judges, Qualifications, Power and Functions 	8
5.	Local Administration	<ul style="list-style-type: none"> • District's Administration head: Role and Importance • Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation • Panchayati raj: Introduction, PRI: Zila Panchayat. • Elected officials and their roles, CEO Zila Panchayat: Position and role • Block level: Organizational Hierarchy (Different departments) • Village level: Role of Elected and Appointed officials • Importance of Grass root democracy 	8
6.	Election Commission	<ul style="list-style-type: none"> • Election Commission: Role and Functioning 	3
Total number of Lectures			28

Evaluation Criteria	
Components	Maximum Marks
Mid Term:	30
End Semester Examination	40
TA	30 (Attendance, Quiz, Project)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Austin, G. (1996). <i>The Indian Constitution: Corner Stone of a Nation</i> . Oxford: Oxford University Press
2.	Bakshi, P.M.(2015). <i>The Constitution of India</i> . Delhi: Universal Law Pub. Co. Pvt. Ltd
3.	Bhuyan, D. (2016). <i>Constitutional Government and Democracy in India</i> . Cuttack:Kitab Mahal..
4.	Busi, S.N. (2016). <i>Dr. B. R. Ambedkar framing of Indian Constitution</i> . Hyderabad:Ava Publishers
5.	Basu, D.D. (2018). <i>Introduction to the Constitution of India</i> . Nagpur: Lexis Nexis
6.	Jayal, N.G. & Mehta, P.B. (eds.)(2010). <i>The Oxford Companion to Politics in India</i> . New Delhi: Oxford University Press.
7.	Constitution series by Rajya Sabha Television and discussion on Indian Constitution by Rajya Sabha Television

Project: Projects based on the different aspects of the Indian Constitution have to be submitted by the students as a part of the project-based learning. This would help the students learn about the nitty gritty of the Constitution, their rights and duties which would later on help them not only in their work place but in their general life.

Detailed Syllabus

Lab-wise Breakup

NOTE: All the entries (...) must be in Times New Roman 11.

Course Code	17M15CS113	Semester Odd 2021	Semester ... Session 2021-22 Month from July to Dec, 2021
Course Name	Cloud Technology Lab		
Credits	1	Contact Hours	2 Hours

Faculty (Names)	Coordinator(s)	Dr Prakash Kumar	
	Teacher(s) (Alphabetically)	Dr. Prakash Kumar	

COURSE OUTCOMES		COGNITIVE LEVELS
C171.1	Demonstrate the architecture and layers of Cloud Service Models, Deployment models etc.	Understand (level 2)
C171.2	Understand the working of CloudSim and run different scheduling algorithms.	Apply (level 3)
C171.3	Analyze various Scheduling algorithms and compare their performances	Analyze (level 4)
C171.4	Apply and evaluate the energy aware algorithms for using DVFS techniques.	Evaluate (level 5)

Module No.	Title of the Module	List of Experiments	CO
1.	CloudSim installations and Use	Create Virtual Machines (VMs) on CloudSim.	CO1
2.		Allocate different Cloudlets to VMs and Data Centers using different scheduling algorithms	CO2
3.	Analyze various Scheduling algorithms in different scenarios on cloudsim	Create different Data Centers and allocate the VMs to them and analyze the outcomes	CO3
4.		Assign the cloudlets and change the scheduling techniques for various scenarios	CO3
5.	Evaluate Energy Aware Simulations using DVFS	Apply and evaluate energy aware algorithms using DVFS techniques	CO4
<i>n.</i>

Evaluation Criteria

Components	Maximum Marks
Lab Test# 1	20
Lab Test# 2	20
D2D work	60
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	K. Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing- From Parallel Processing to the Internet of Things", Morgan Kauffman Publishers, Elsevier.
2	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'REILLY publication.
3	"Virtualization Overview", White paper, VM Ware.
4.	Rodrigo N. Calheiros, Rajiv Ranjan, Anton Beloglazov, Cesar A. F. De Rose, and Rajkumar Buyya, CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms , Software: Practice and Experience, Volume 41, Number 1, Pages: 23-50, ISSN: 0038-0644, Wiley Press, New York, USA, January 2011.
5.	Tom Guérout, Thierry Monteil, Georges Da Costa, Rodrigo Neves Calheiros, Rajkumar Buyya, Mihai Alexandru, Energy-aware Simulation with DVFS , Simulation Modelling Practice and Theory, Volume 39, No. 1, Pages: 76-91, ISSN: 1569-190X, Elsevier Science, Amsterdam, The Netherlands, November 2013.
6.	Rajkumar Buyya, Rajiv Ranjan and Rodrigo N. Calheiros, Modeling and Simulation of Scalable Cloud Computing Environments and the CloudSim Toolkit: Challenges and Opportunities , Proceedings of the 7th High Performance Computing and Simulation Conference (HPCS 2009, ISBN: 978-1-4244-4907-1, IEEE Press, New York, USA), Leipzig, Germany, June 21 - 24, 2009. - Keynote Paper.
<i>m.</i>	...

Detailed Syllabus
Lecture-wise Breakup

Course Code	19M12CS112	Semester Odd (specify Odd/Even)	Session 2021 -2022 Month from July to Dec
Course Name	Metaheuristics in Modelling and Optimization		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Anita Sahoo
	Teacher(s) (Alphabetically)	Dr. Anita Sahoo

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C131.1	Interpret and explain the concepts of Metaheuristics based optimization and it's application in a diverse range of applications.	Understand Level (C2)
C131.2	Model single solution and population based Metaheuristic algorithms to solve a given optimization problem.	Apply Level (C3)
C131.3	Model Metaheuristic algorithms to solve Multi-objective optimization problems.	Apply Level (C3)
C131.4	Model hybrid Metaheuristic algorithms to solve a given optimization problem.	Apply Level (C3)
C131.5	Explain algorithms and architectures for parallel implementation of Metaheuristics.	Understand Level (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Optimization Models, Approximate Algorithms, When to use Metaheuristics?, Methods and Application	4
2.	Fundamentals of Metaheuristics	Representation, Objective Functions; Constraint Handling; Parameter Tuning; Performance Analysis.	5
3.	Single-Solution Based Metaheuristics	Basic Concepts, Fitness Landscape Analysis; Local Search; Tabu Search; Iterated and Guided Local search; Variable Neighborhood Search; Smoothing Methods; Noisy Methods	6
4.	Population-Based Metaheuristics Methods	Basic Concepts; Evolutionary Algorithms, Swarm Intelligence, Stochastic diffusion search, Social cognitive optimization	6
5.	Metaheuristics for Multi-objective Optimization	Basic concepts; Multi-objective Continuous and Combinatorial Problems, Multi-criteria Decision Making; Design Issues	3
6.	Fitness Assignment Strategies and Evaluation of Multi-objective Optimization	Scalar approach, Criterion-Based Methods; Dominance-Based Approaches; Indicator based Approaches; Diversity Preservation; Performance Evaluation	7
7.	Hybrid Metaheuristics	Design and Implementation Issues; Mathematical Programming Approaches; Classical Hybrid Approaches;	7

		Hybrid Metaheuristics with Machine Learning and Data Mining; Hybrid Metaheuristics for Multi-objective Optimization	
8.	Parallel Metaheuristics	Parallel Design and Implementation of Metaheuristics; Parallel Metaheuristics for Multi-objective Optimization	4
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Attendance(10), Assignments/Mini-project/Tutorials/Quiz (15))	
Total		100	

Project based learning: Each group of 3-4 students will be assigned an optimization problem at the beginning. They are required to apply the metaheuristic methods they study on the given problem.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Metaheuristics: From Design to Implementation by El-Ghazali Talbi, Wiley, June 2009.
2.	Sean Luke, 2013, Essentials of Metaheuristics, Lulu, second edition, available at http://cs.gmu.edu/~sean/book/metaheuristics .
3.	Gandomi, Amir; Yang, Xin-She; Talatahari, Siamak; Alavi, Amir; “Metaheuristic Algorithms in Modeling and Optimization”, Metaheuristic Applications in Structures and Infrastructures, Dec 2013.
4.	Kalyanmoy Deb; “Multi-Objective Optimization Using Evolutionary Algorithms: An Introduction”; https://www.egr.msu.edu/~kdeb/papers/k2011003.pdf
5.	Kalyanmoy Deb; “Single and Multi-Objective Optimization Using Evolutionary Algorithms”; https://www.iitk.ac.in/kangal/papers/2004002.pdf
6.	Paulo Cortez, Modern Optimization with R, Use R! series, Springer, September 2014, ISBN 978-3-319-08262-2.

Detailed Syllabus

Lecture-wise

Breakup

Subject Code	17M11CS112	Semester Odd (specify Odd/Even)	Semester Odd Session 2021-2022 Month from July to December
Subject Name	Machine Learning and Data Mining		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Archana Purwar
	Teacher(s)	Archana Purwar

COURSE OUTCOMES		COGNITIVE LEVELS
C112.1	Differentiate between Classification, Clustering and Association Rules techniques.	Level 4 (Analyze)
C112.2	Understand working of classification techniques, e.g., k-Nearest Neighbours, Naïve Bayes, ID3 Decision Trees, Support Vector Machine, Ensemble methods.	Level-2- (Understanding)
C112.3	Apply and compare different clustering techniques, e.g., k-means, k-medoids, etc.	Level-3 (Apply)
C112.4	Evaluate different dimensionality reduction techniques e.g. PCA, SVD, Factor Analysis, Linear Discriminant Analysis, etc., in big data scenarios.	Level-5 (Evaluate)
C112.5	Apply various Artificial Neural Network Models for classification and clustering	Level-3 (Apply)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1	Introduction	Introduction to Machine Learning, Data Mining and Knowledge Discovery in Data Bases, Data Types	2
2	Classification	Introduction to classification, k-Nearest Neighbours, Naïve Bayes, Decision Trees, Advanced classification techniques	6
3	Regression	Linear Regression with One Variable, Linear Regression with Multiple Variables, Logistic Regression	4
4.	Clustering	Introduction, Different type of Clustering Methods, Partitioning Clustering Methods, Hierarchical Clustering Methods, k-means, k-medoids, density based clustering, cluster validation	8
5.	Association Rules	Support, Confidence, Lift, Conviction; Apriori algorithm, Eclat algorithm, FP-growth algorithm	4
6.	Dimensionality Reduction	Introduction, Subset Selection, PCA, SVD, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis	6
7.	Artificial Neural Methods	Cost Function, Back propagation, Feed forward Network, Gradient Descent, Network training, Error Propagation, Application of Neural Networks, Introduction to quantum neural network	8
8.	Ensemble Methods	Ensemble methods of classification-Bagging, Boosting, and Random Forest	4

Total number of Lectures		42
Evaluation Criteria		
Components	Maximum	
Marks T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Attendance (10), Mini-project/Assignment (15))	
Total	100	
<p>Project based learning: Each student in a group of 3-4 will have to develop a mini project based on association mining, classification and clustering approaches. The students can choose any real-world application that requires some decision-making. The students have to implement the mini-project using any open-source programming language. Project development will enhance the knowledge and employability of the students in IT sector.</p>		
<p>Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc.)</p>		
1.	Han, Jiawei, Jian Pei, and Micheline Kamber. Data mining: concepts and techniques. Elsevier, 3rd edition ,2012	
2.	Kimball R. and Ross M ,The Data Warehouse Toolkit”, Wiley, 3rd edition,2013	
3.	Pujari, Arun K, Data mining techniques , Universities press, 3rd edition , 2013	
4.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, second edition, 2019	
5.	Soumen Chakrabarti, Mining the Web: Discovering knowledge from hypertext data”, Morgan Kaufmann, Elsevier	
6.	Mitchell, Tom, and Machine Learning McGraw-Hill. "Edition." (1997).	
7.	Wittek, Peter. Quantum machine learning: what quantum computing means to data mining. Academic Press, 2014.	
8.	Anahory S. and Murray D, Data Warehousing in the Real World, Addison- Wesley	
9.	Dunham, Margaret H. Data mining: Introductory and advanced topics. Pearson Education India, 2006.	
10.	Mattison R. ,Web Warehousing and Knowledge Management”, Tata McGraw- Hill.	
11.	David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI	
12.	Transactions on Database Systems (ACM)	
13	IEEE Transactions on Knowledge & Data Engineering	
14	The VLDB Journal The International Journal on Very Large Data Bases	

Detailed Syllabus
Lecture-wise Breakup

Course Code	18M12CS113	Semester 8 th Sem (Even)	Semester Intg. CSE VIII Sem Session 2021-22 Month from Feb to June
Course Name	Cryptography and Computer Security		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Jaspal Kaur Saini
	Teacher(s) (Alphabetically)	Dr. Jaspal Kaur Saini

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Understand principles & theories of cryptography and computer security; Classify symmetric encryption techniques	Understand Level (Level 1)
CO2	Apply the knowledge of number theory in public key cryptographic techniques	Apply Level (Level 2)
CO3	Analyze security mechanisms using rigorous approaches, including theoretical for intrusion detection systems	Analyze Level (Level 3)
CO4	Evaluate Authentication Techniques and Hash Algorithms	Evaluate Level (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to principles and theories of cryptography and computer security, Network security protocols at different layers with respect to TCP/IP security protocol stack, namely, FTPS, HTTPS, DNSSEC, SSL, SSH, SMIME,	4
2.	IPSec	IPSEC (IP Security – IP Authentication Header, Payload Encapsulation) and PPTP	4
3.	Vulnerabilities & Solutions	Techniques and approaches to discover network and system vulnerabilities. Unwanted traffic, Firewalls, VPNs, Intrusion Detection, filters, Protocol weakness exploits, malware vulnerabilities, Spams, Defensive solutions: Packet filtering, Attack Classification and Vulnerability Analysis, Detection, Containment and Response/Recovery	5
4.	Security Tools	Tools for improving system security, Security, Secure Socket Layer and Secure Electronic Transaction.	2
5.	Network Attacks & Classification	Implementation of supervised & unsupervised defensive solutions based on packet filtering, attack classification & vulnerability analysis, detection and mitigation.	3
6.	Cryptography Basics	Mathematics of Cryptography: Modular Arithmetic, Congruence and Matrices, Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm Requirements	4

		for Cryptography, Cryptanalysis and attacks	
7.	Symmetric Ciphers	Mathematics of Symmetric-Key Cryptography: Algebraic Structures, Conventional Symmetric Encryption Algorithms Symmetric vs Asymmetric Block and Stream ciphers, DES: DES Structure & DES Security, Double and Triple DES	8
8.	Asymmetric Ciphers	Cryptographic Modes Public Key Cryptography Principles & Applications Algorithms RSA, Diffe-Hellman Key Exchange, DSS Elliptic-curve, Stream Cipher: RC4 and RC5.	8
9.	Data Integrity	One way Hash Functions Message Digest MD5,SHA1 Digital Signatures Public Key Infrastructure (PKI) Digital Certificates Certificate Authorities	4
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments + Attendance)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Cryptography & Network Security, Forouzan, Tata McGraw Hill
2.	Botnets: The Killer Web App, Craig A. Schiller, Jim Binkley, David Harley, Gadi Evron Tony Bradley, Carsten Willems, Michael Cross, Syngress
3.	Cryptography and Network Security <i>Principles and Practice</i> , Sixth Edition, William Stallings, Pearson
4.	Understanding Cryptography, Christof Paar, Jen Pelzl, Springer
5.	USENIX Security Symposium
6.	ACM Transactions on Information and system security
7.	IEEE Press Computer Security and Privacy

Detailed Syllabus Lecture-wise Breakup

Subject Code	17M11CS111	Semester: ODD (specify Odd/Even)	Semester Odd Session 2021-2022 Month from July 21 to December 21
Subject Name	Data structure & Algorithms for Big Data		
Credits	3	Contact Hours	3(L) + 1 (T)

Faculty (Names)	Coordinator(s)	Manish K Thakur
	Teacher(s) (Alphabetically)	Manish K Thakur

COURSE OUTCOMES		COGNITIVE LEVELS
C110.1	Define basic concepts of Big Data and relating them to them with various Big Data technologies (e.g., Hadoop, Spark)	Remember Level (Level 1)
C110.2	Explain Hadoop cluster architecture and its components and Differentiate Hadoop Distributed File System (HDFS) from other storage techniques, e.g., NFS and UNIX file system	Understand Level (Level 2)
C110.3	Construct data structure and algorithms for HDFS and MapReduce and further applying them to different Big Data problems.	Apply Level (Level 6)
C110.4	Apply hashing on large scale multi-dimensional data sets using Locality Sensitive Hashing.	Apply Level (Level 3)
C110.5	Analyze and apply advance data structures and algorithms (e.g., B and B+ Tree, R and R+ Tree, Matrix multiplication) for solving big data problems	Analyze Level (Level 4)
C110.6	Evaluate Streaming Algorithms, Sublinear optimization, Machine Learning, Hadoop systems	Evaluate Level (Level 5)

S.N.	Subtitle of the Module	Topics in the module	No. of Lectures for the module	
1.	Introduction to Big Data	Motivation, Application, Domains for Big Data, Various tools and services	2	
2.	Basics of Hadoop	Introduction to hadoop. Introduction to HDFS, Read and write operation, Fault Tolerance-Failures and Recovery.:	3	
3.	MapReduce	Introduction to MapReduce, Mapreduce Job scheduling	3	
4.	Basic data structures concepts	Array: searching, sorting, aggregation on BIG DATA	4	
5.	Basic Statistics	Various types of parametric and non-parametric test	2	
6.	Matrix Multiplication	Matrix Multiplication for BIG DATA	2	
7.	Concurrency Control	Concurrency-control mechanisms, Multithreading, Transactions, logging, ACID compliant, crash recovery	5	
7.	Graphs	Spanning Tree (Min/Max), Searching (BFS), Shortest Path etc.	6	

8.	Indexing strategies Trees	large Arrays, Hashing, AVL, B-tree, Tries, R and R+ Trees, Prefix Trees, Accumulo, Bigtable, bLSM, Cassandra, HBase, Hypertable, LevelDB are LSM trees, divide & conquer, mapreduce	6	
9.	Bloom filters, HyperLogLog, Count- 2 min sketch	Bloom filters, HyperLogLog, Count-2 min sketch	4	
10	Applications (may use spark)	Streaming Algorithms, Sublinear optimization, Machine Learning Problems, Hadoop systems	2	
11	Mathematical Foundation	Sparse: Vector Spaces, Matrix algebra, LSI, SVD, PSD	3	
Total number of Lectures			42	

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester	35
TA	25 (Attendance = 05; Assignments/Projects in PBL mode = 20)
Total	100

Project based learning: Students in group of 3 to 4 students are required to develop mini-project based on the concepts taught in this course. In mini-project, students need to create the distributed environment either using Hadoop framework or multithreading using OpenMP. Problem statements need to be formulated in various applications domains of big data, proposing the solution approach and implemented over the created distributed environment.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Journals: IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Intelligent Systems and Technology (TIST), ACM Transactions on Knowledge Discovery from Data (TKDD)
2.	2. Tier-1 Conferences: SIGKDD, ICDE - International Conference on Data Engineering, CIKM - International Conference on Information and Knowledge Management, ICDM - IEEE International Conference on Data Mining, SDM - SIAM International Conference on Data Mining, PKDD - Principles of Data Mining and Knowledge Discovery, IEEE Big Data
3.	Online courses: http://grigory.us/big-data-class.html https://courses.engr.illinois.edu/cs598csc/fa2014/
4.	Book: Mahmoud Parsian, "Data Algorithms: Recipes for Scaling Up with Hadoop and Spark", O'Reilly Media, July 2015.
5.	Probabilistic Data Structures and Algorithms in Big Data Applications by <i>Andrii Gakhov</i>
6.	Algorithms and Data Structures for Massive Datasets by Dzejla Medjedovic, Emin Tahirovic, and Ines Dedovic, MEAP began July 2020

Detailed Syllabus
Lab-wise Breakup

Course Code	17M15CS111	Semester ODD	Semester I Session 2021 -2022 Month from July to Dec 2021
Course Name	Advanced Algorithms Lab		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Manish Kumar Thakur
	Teacher(s) (Alphabetically)	Manish Kumar Thakur

COURSE OUTCOMES		COGNITIVE LEVELS
C170.1	Implement algorithms and use appropriate advanced data structures for solving computing problems.	Level 3: Apply
C170.2	Design algorithms using divide-and-conquer, greedy and dynamic programming strategies, and further recite algorithms that employ these strategies.	Level 3: Apply Level 5: Evaluate
C170.3	Illustrate the mathematical foundation of network flows and some important flow algorithms.	Level 2: Understand Level 3: Apply
C170.4	Implement randomized algorithms to solve various problems, and validate their correctness and complexity.	Level 3: Apply Level 4: Analyze
C170.5	Understand P, NP, polynomial reduction, NP-hardness, and NP-Completeness.	Level 2: Understand Level 4: Analyze
C170.6	Comprehend and select algorithm design approaches in a problem specific manner.	Level 6: Create

Module No.	Title of the Module	List of Experiments	CO
1.	Fundamentals of data structures and algorithmic problem solving	Searching, Sorting, time complexity, Heaps, Arrays, Linked List, Trees, Fibonacci heaps, splay trees, dynamic trees.	CO1
2.	Divide and Conquer Technique	Solving Matrix multiplication problem and subset- sum problem using divide-and-conquer approach	CO2
3.	Greedy Algorithms	Greedy Approximation algorithms- Set Cover Problem, K Centers Problem, Fractional and 0/1 Knapsack, Coinage problem; Bin packing; Job scheduling, Graph coloring; and Text compression using Huffman coding and Shannon-Fanon coding.	CO2
4.	Dynamic Programming Technique	Fundamentals of Dynamic programming based solution approach, Printing Shortest Common Super sequence, Dynamic Programming on Trees, Maximum sum rectangle in a 2D matrix.	CO2
5.	Graph Algorithms	Solve and analyze Graph problems, Algorithms. All Pair Shortest Problem, Subset-sum problem. Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkstra's algorithm, K-clique problem, Graph Coloring problem.	CO1, CO2
6.	Flows in Network	Network flows - max flow and min-cost flow/circulation, Edmonds-Karp algorithm	CO3

7.	Tractable and Non- Tractable Problems	One Way of Coping with NP-Hardness. Randomized Rounding. Vertex Cover and Travelling Salesman Problem.	CO4, CO5
8.	Mini-Project	Mini-Project	CO6

Evaluation Criteria

Components	Maximum Marks
Lab Test# 1	20
Lab Test# 2	20
D2D work	60
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009
2.	Hochbaum “Approximation Algorithms for NP-Hard Problems”, 1996.
3.	Ahuja, Magnanti and Orlin, “Network Flows: Theory, Algorithms and Applications”, 1993.
4.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
5.	Study material on //fileserver2