SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Computer Science and Engineering IT
Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
Subject Category	Engineering Science Course (PCC)
SubjectCode:**AI-2071**	Subject Name: **Big Data Analytics**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	30	20		3		2	4

Prerequisites:

Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

Course Objective:

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hodoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Course Outcomes: After completion of this course students will be able to:

- Identify Big Data and its Business Implications.
- List the components of Hadoop and Hadoop Eco-System
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Analyze Infosphere BigInsights Big Data Recommendations.
- Apply Machine Learning Techniques using R.

UNITs	Descriptions	Hrs.	CO's
I	**UNIT I : INTRODUCTION TO BIG DATA AND HADOOP** Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	8	1,2
II	**UNIT II : HDFS(Hadoop Distributed File System)** The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.	8	3

III	**UNIT III : Map Reduce** Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	8	4
IV	**Hadoop Eco System** **Pig :** Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. **Hive :** Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. **Hbase :** HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. **Big SQL** : Introduction	8	5
V	**Data Analytics with R** Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.	8	6,7
Guest Lectures (if any)			
Total Hours 40			

Suggestive list of experiments:

1. Implement a program using Piglatin operators and user defined functions Implement a program using operators and Piglatin scripts Program using Hive manipulation and data definition languages. Implement a program using Hive queries with partitioning.
6 hours
2. Implement a program using Hive indexes. Implement a program using Hive views Implement a program using Hive external table by accessing the external file created by Pigor any other tool. Program using Hive scripts and aggregate functions
7 hours
3. Implement a program using Hive queries with bucketing and clustering. Implement a program for data transfer between Hadoop and external database using sqoop. Program to import data and incremental data in sqoop.
6 hours
4. Program to preserve the value in sqoop Program to export data from Hadoop using sqoop Program to import data to hive and using partitioned hive tables
6 hours
5. Program for inverted index using solr Program for indexing operations using csvfiles in solr. Program to search data using solr
5 hours

Total Laboratory Hours 30 hours

Text Book-

Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

• Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books-

Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
• Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
• Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
• Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
• Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
• Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
• Pete Warden, "Big Data Glossary", O'Reily, 2011.
• Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
• ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012
• Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

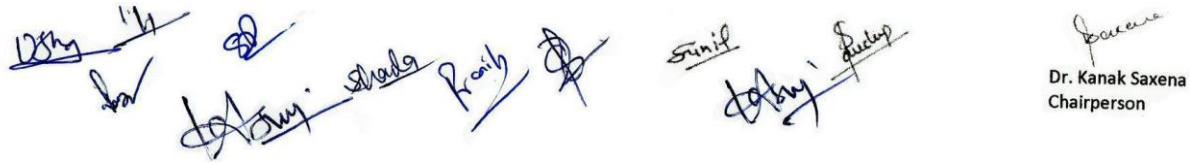
List and Links of e-learning resources:

1.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	CS & IT



Dr. Kanak Saxena
Chairperson

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Department of Computer Science and Engineering IT
Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
Subject Category	Engineering Science Course (PCC)
SubjectCode:**AI-2072**	Subject Name: **Probabilistic Graphical Methods**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10			100	3	1		4

Prerequisites:

Students are expected to have background in basic probability theory, statistics, programming, algorithm design and analysis

Course Objective:

The aim of this course is to develop the knowledge and skills necessary to design, implement and apply these models to solve real problems. The course will cover:
(1) Bayesian networks, undirected graphical models and their temporal extensions;
(2) exact and approximate inference methods;
(3) estimation of the parameters and the structure of graphical models.

Course Outcomes: After completion of this course students will be able to:
1. Solve real world problems
2. Creating both directed and undirected graphical models for data
3. Identifying conditional independencies in graphical models
4. Specifying distributions for parameters of model components that link the model to data
5. Applying exact inference methods to compute marginal probabilities and maximally probable configurations given a model (sum-product and max-sum algorithms, respectively)
6. Applying approximate inference to learn model parameters using expectation maximization (EM algorithm), variational inference, and various Markov chain Monte Carlo methods including Metropolis Hastings sampling, Gibbs sampling, and Hamiltonian Monte Carlo.
7. Use the various various concepts learnt to present a very influential recent probabilistic model called the *variational autoencoder*.

UNITs	Descriptions	Hrs.	CO's
I	Introduction: What is probabilistic graphical modeling? Review of probability theory: Probability distributions. Conditional probability. Random variables,Real-world applications: Image denoising. RNA structure prediction. Syntactic	8	1

	analysis of sentences. Optical character recognition. Language Modeling .		
II	**UNIT II: Representation** Bayesian networks: Definitions. Representations via directed graphs. Independencies in directed models. Markov random fields: Undirected vs directed models. Independencies in undirected models. Conditional random fields.	8	2,3
III	**UNIT III** *Inference* **Variable elimination The inference problem. Variable elimination. Complexity of inference. Belief propagation: The junction tree algorithm. Exact inference in arbitrary graphs. Loopy Belief Propagation. MAP inference: Max-sum message passing. Graphcuts. Linear programming relaxations. Dual decomposition. Sampling-based inference: Monte-Carlo sampling. Forward Sampling. Rejection Sampling. Importance sampling. Markov Chain Monte-Carlo. Applications in inference. Variational inference: Variational lower bounds. Mean Field. Marginal polytope and its relaxations.**	8	4,5
IV	**Unit *IV*** *Learning:***Learning in directed models: Maximum likelihood estimation. Learning theory basics. Maximum likelihood estimators for Bayesian networks. Learning in undirected models: Exponential families. Maximum likelihood estimation with gradient descent. Learning in CRFs. Learning in latent variable models: Latent variable models. Gaussian mixture models. Expectation maximization. Bayesian learning: Bayesian paradigm. Conjugate priors. Examples . Structure learning: Chow-Liu algorithm. Akaike information criterion. Bayesian information criterion. Bayesian structure learning .**	8	6
V	**UnitV:***Bringing it all together:* **The variational autoencoder: Deep generative models. The reparametrization trick. Learning latent visual representations. List of further readings: Structured support vector machines. Bayesian non-parametrics.**	8	7

Guest Lectures (if any)			
Total Hours 40			
Suggestive list of experiments: No Lab			
Text Books: ("PGM") *Probabilistic Graphical Models: Principles and Techniques* by Daphne Koller and Nir Friedman. MIT Press.			
Reference Books- • ("GEV") *Graphical models, exponential families, and variational inference* by Martin J. Wainwright and Michael I. Jordan. Available online. • *Modeling and Reasoning with Bayesian Networks* by Adnan Darwiche. Available online (through Stanford). • *Pattern Recognition and Machine Learning* by Chris Bishop. Available online. • *Machine Learning: A Probabilistic Perspective* by Kevin P. Murphy. Available online (through Stanford). • *Information Theory, Inference, and Learning Algorithms* by David J. C. Mackay. Available online. • *Bayesian Reasoning and Machine Learning* by David Barber. Available online.			
List and Links of e-learning resources: 1. https://ermongroup.github.io/cs228-notes/			
Modes of Evaluation and Rubric			
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.			

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	CS & IT

Dr. Kanak Saxena
Chairperson

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Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
Subject Category	Engineering Science Course (PCC)
SubjectCode:**AI-2073**	Subject Name: **Deep Learning**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	30	20	150	3	-	2	4

Prerequisites:

Course Objective:

This course will introduce the theoretical foundations, algorithms, methodologies, and applications of neural networks and deep learning. It will help to design and develop an application-specific deep learning models and also provide the practical knowledge handling and analysing real world applications.

Course Outcomes: After completion of this course students will be able to

1.Have a good understanding of the fundamental issues and basics of machine learning
2. Ability to differentiate the concept of machine learning with deep learning techniques
3. Understand the concept of CNN and transfer learning techniques, to apply it in the classification problems
4. Learned to use RNN for language modelling and time series prediction.
5. Use autoencoder and deep generative models to solve problems with high dimensional data including text, image and speech.
6. Design and implement various machine learning algorithms in a range of real-world applications.

UNITs	Descriptions	Hrs.	CO's
I	**Machine Learning Basics:** Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality.	5	1
II	**Introduction to Deep Learning & Architectures** Machine Learning Vs. Deep Learning, Representation Learning, Width Vs. Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders.	**5**	2
III	**Convolutional Neural Networks**	5	3

	Architectural Overview − Motivation - Layers − Filters − Parameter sharing − Regularization, Popular CNN Architectures: ResNet, AlexNet.		
IV	**Transfer Learning** Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet. **Sequence Modelling – Recurrent and Recursive Nets** Recurrent Neural Networks, Bidirectional RNNs − Encoder-decoder sequence to sequence architechures - BPTT for training RNN, Long Short Term Memory Networks.	7	3,4
V	**Auto Encoders** Under complete Autoencoders − Regulraized Autoencoders − stochastic Encoders and Decoders − Contractive Encoders **Deep Generative Models** Deep Belief networks − Boltzmann Machines − Deep Boltzmann Machine - Generative Adversial Networks. RecentTrends	9	5,6
Guest Lectures (if any)			
Total Hours			

Suggestive list of experiments:

1. Classification with Multilayer Perceptron using Scikit-learn (MNIST Dataset) 3 hours
2. Hyper-Parameter Tuning in Multilayer Perceptron 3 hours
3. Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch 2 hours
4. Classification of MNIST Dataset using CNN 2 hours
5. Parameter Tuning in CNN 2 hours
6. Sentiment Analysis using CNN 2 hours
7. Face recognition using CNN 2 hours
8. Object detection using Transfer Learning of CNN architectures 2 hours
9. Recommendation system using Deep Learning 2 hours
10. Dimensionality Reduction using Deep learning 2 hours
11. Language Modeling using RNN 2 hours
12. Time Series Prediction using RNN 2 hours
13. Sentiment Analysis using LSTM 2 hours
14. Image generation using GAN 2 hours

Total Laboratory Hours 30 hours

Text Book- 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning", MIT Press, 2017.

2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media,
2017

Reference Books-

1. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding
Deep Neural Networks” Apress, 2018.
2. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.
3. Ethem Alpaydin,"Introduction to Machine Learning”, MIT Press, Prentice Hall of India, Third
Edition 2014.
4. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow:
Explore neural networks with Python", Packt Publisher, 2017.
5. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
6. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

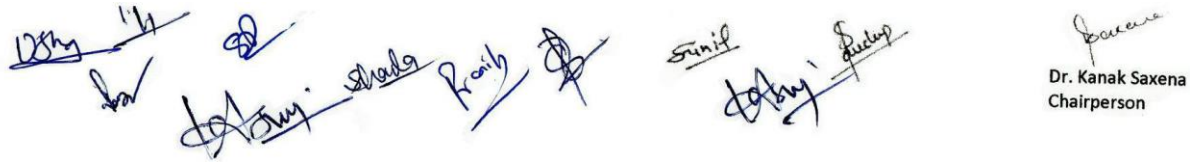
List and Links of e-learning resources:

1.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	CS & IT



Dr. Kanak Saxena
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Department of Computer Science and Engineering IT
Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4thYear 7thSemester
Subject Category	Engineering Science Course (OEC)
SubjectCode:**AI-2074(A)**	Subject Name: Automata Theory and Compiler Design

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10			100	3	-	-	3

Prerequisites:

Formal Languages and Automata Theory, Graph Theory.

Course Objective:

To provide an understanding of automata, grammars, language translators.
To know the various techniques used in compiler construction
To be aware of the process of semantic analysis.
To analyze the code optimization & code generation techniques

Course Outcomes: After completion of this course students will be able to
Explain deterministic and non-deterministic machines.
Comprehend the hierarchy of problems arising in the computer sciences.
Design a deterministic finite-state machine to accept a specified language.
Explain how a compiler can be constructed for a simple context free language.
Determine a language's location in the Chomsky hierarchy (regular sets, context-free, context-sensitive, and recursively enumerable languages).

UNITs	Descriptions	Hrs.	CO's
I	Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA.Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.	8	1
II	Context Free grammars and parsing : Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing Bottom up parsing, handle pruning, LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.Evaluating Classifiers, Cluster Analysis(k-Means, Alternatives to k-means), Association Rule Mining.	8	2

III	Semantics : Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow statements. Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.	8	3
IV	Symbol table, Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. Code optimization Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, optimization techniques.	8	4
V	Code generation : Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.	8	5
Guest Lectures (if any)			
Total Hours			

Suggestive list of experiments:
NO Lab
1. John E. Hopcroft, Rajeev M & J D Ullman: "Introduction to Automata Theory Languages &Computation", 3rd Edition, Pearson Education, 2007. 2. Aho, Ullman, Ravisethi: "Compilers Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2009.
Reference Books- 1.Tremblay J P, Sorenson G P: "The Theory & Practice of Compiler writing", 1st Edition, BSP publication, 2010. 2. Appel W & Andrew G M: "Modern Compiler Implementation in C", 1st Edition, Cambridge University Press, 2003. 3. Louden: "Compiler Construction, Principles & Practice", 1st Edition, Thomson Press, 2006. 4. Sipser Michael: "Introduction to Theory of computation", 1st Edition, Thomson, 2009.
List and Links of e-learning resources:
Modes of Evaluation and Rubric
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	CS & IT

Dr. Kanak Saxena
Chairperson

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Department of Computer Science and Engineering IT
Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4thYear 7thSemester
Subject Category	Engineering Science Course (OEC)
SubjectCode:**AI-2074(B)**	Subject Name: Recommendation System

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10			100	3	-	-	3

Prerequisites:

Knowledge about the machine learning algorithms. Familiarity with linear algebra (inner product, matrix-vector product).

Course Objective:

1. Describe the purpose of recommendation systems.
2. Understand the components of data mining method for recommendation system including candidate generation, scoring, and re-ranking.
3. Understanding for basics of Content-based Recommender Systems.
4. Understanding for basics of Neighborhood-based Recommendation Methods.
5. Develop a deeper technical understanding of Collaborative Filtering.

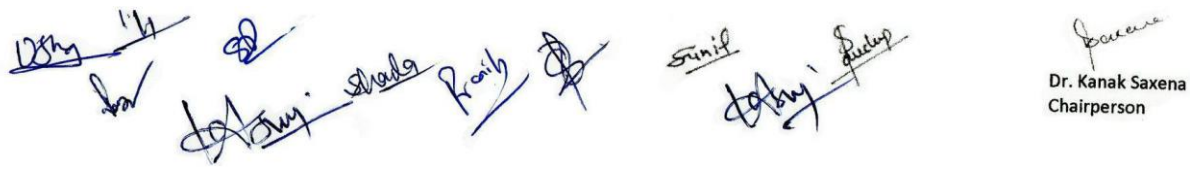
Course Outcomes: After completion of this course students will be able to

UNITs	Descriptions	Hrs.	CO's
I	Introduction to Recommender Systems: Recommender Systems Function, Data and Knowledge Sources, Recommendation Techniques, Application and Evaluation, Recommender Systems and Human Computer Interaction (Trust, Explanations and Persuasiveness, Conversational Systems, Visualization), Recommender Systems as a Multi-Disciplinary Field,	8	1
II	Data Mining Methods for Recommender Systems: Data Preprocessing (Similarity Measures , Sampling, Reducing, Denoising), Classification (Nearest Neighbors, Decision Trees, Ruled-based Classifiers, Bayesian Classifiers, Artificial Neural Networks, Support Vector Machines, Ensembles of Classifiers, Evaluating Classifiers, Cluster Analysis(k-Means, Alternatives to k-means), Association Rule Mining.	8	2
III	Basics of Content-based Recommender Systems: A High Level Architecture of Content-based Systems, Advantages and Drawbacks of Content-based Filtering, State of the Art of Content-based Recommender Systems , Item Representation, Methods for Learning User Profiles ,Trends and Future Research , The Role of User Generated Content in the Recommendation Process, Beyond Over-specializion,	8	3

IV	Neighborhood-based Recommendation Methods: Formal Definition of the Problem, Overview of Recommendation Approaches, Advantages of Neighborhood Approaches, Neighborhood-based (User-based Rating Prediction, User-based Classification, Regression VS Classification, Item-based Recommendation, User-based VS Item-based Recommendation).	8	4
V	Advances in Collaborative Filtering: Baseline predictors, Implicit feedback, Matrix factorization models ,SVD , SVD++ , Time-aware factor model ,Comparison Components of Neighborhood Methods (Rating Normalization, Similarity Weight Computation, Neighborhood Selection), Neighborhood models (Similarity measures, Similarity-based interpolation, Jointly derived interpolation weights), A global neighbourhood, A factorized neighborhood model, Temporal dynamics at neighborhood models .	8	5
Guest Lectures (if any)			
Total Hours			

Suggestive list of experiments:
NO Lab
Text Book- 1. Ricci, Francesco, Lior Rokach, and Bracha Shapira. "Introduction to recommender systems handbook." *Recommender systems handbook*. Boston, MA: springer US, 2010. 1-35. 2. Lops, Pasquale, Marco De Gemmis, and Giovanni Semeraro. "Content-based recommender systems: State of the art and trends." *Recommender systems handbook* (2011): 73-105. 3. Desrosiers, Christian, and George Karypis. "A comprehensive survey of neighborhood-based recommendation methods." *Recommender systems handbook* (2010): 107-144.
Reference Books- 1. Ricci, Francesco, Lior Rokach, and Bracha Shapira. "Introduction to recommender systems handbook." *Recommender systems handbook*. Boston, MA: springer US, 2010. 1-35.
List and Links of e-learning resources: 1.https://www.coursera.org/specializations/recommender-systems?action=enroll
Modes of Evaluation and Rubric
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Dr. Abhay Upadhyay



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Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
Subject Category	Open Elective Course (OEC)
SubjectCode:**AI-2074**	Subject Name: Application Development

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	-	-	100	3	1	-	4

Prerequisites:

Course Objective:

1 To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

Course Outcomes: After completion of this course students will be able to

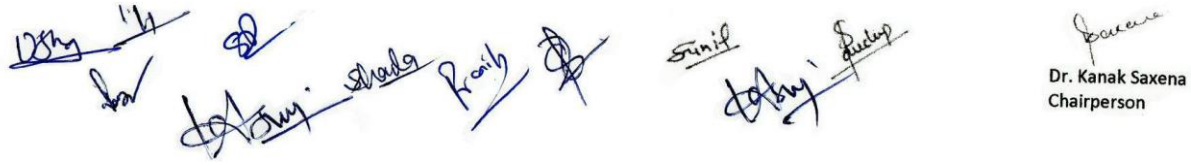
1. Identify various concepts of mobile programming that make it unique from programming for other platforms
2. Critique mobile applications on their design pros and cons
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features, and
5. Deploy applications to the Android marketplace for distribution.

UNITs	Descriptions	Hrs.	CO's
I	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.		
II	Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.		
III	Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.		
IV	Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.		
V	Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.		

Guest Lectures (if any)			
Total Hours			

Suggestive list of experiments:
NO Lab
Text Book- 1. T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
Reference Books- 2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd 3. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd 4. Android Application Development All in one for Dummies by Barry Burd, Edition: I
List and Links of e-learning resources: 1.
Modes of Evaluation and Rubric
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	



Dr. Kanak Saxena
Chairperson

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Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4thYear 7thSemester
Subject Category	Professional Elective Course (PEC)
SubjectCode:**AI-2075**	Subject Name: **Modern Tools for Data Science**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	-	-	100	3	-	-	3

Prerequisites:

Data Science, Machine Learning

Course Objective:

1

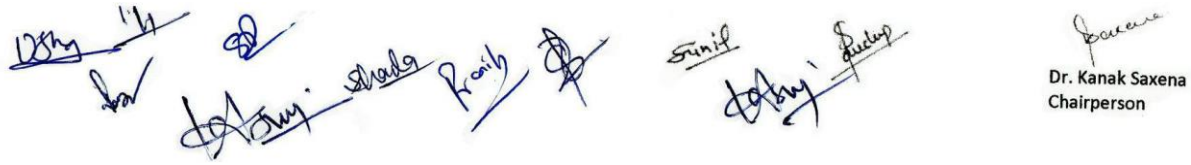
Course Outcomes: After completion of this course students will be able to

UNITs	Descriptions	Hrs.	CO's
I	**Statistical Analysis System(SAS)**: Collection of Data, Sample Measurement and Scaling Techniques, Statistical Derivatives and Measures of Central Tendency, Measures of Variation and Skewness, Correlation and Simple Regression, Time Series Analysis, Index Numbers, Probability and Probability Rules Probability Distributions, Tests of Hypothesis–I, Tests of Hypothesis – II, Chi-Square Test		
II	Apache Spark: Introduction, Features, Spark built on Hadoop,Components of Spark: Apache Spark Core, Spark SQL, Spark Streaming, MLlib (Machine Learning Library), GraphX **BigML**: Web Interface, Command Line Interface, API, Creating a deep learning model with BigML		
III	**Data-Driven Documents (D3.js)**: Introduction, Web Standards: HyperText Markup Language (HTML), Document Object Model (DOM), Cascading Style Sheets (CSS), Scalable Vector Graphics (SVG), JavaScript. **MatLab**: Matlab Environment Setup, Syntax, Variables, Commands, M-files, Datatypes and Operators.		
IV	**Natural Language Toolkit (NLTK)**:Tokenizing Text, Training Tokenizer & Filtering Stopwords, Looking up words in Wordnet Stemming & Lemmatization, Natural Language Toolkit - Word Replacement, Synonym & Antonym Replacement.		

	TensorFlow: Convolutional Neural Networks, TensorBoard Visualization, TensorFlow - Word Embedding, TensorFlow - Linear Regression		
V	**Tableau**: Design Flow, File Types, Data Types, Data Terminology, Data source, worksheet and calculations. **Scikit-learn**: Introduction, Modelling Process, Data Representation, Estimator API, Conventions, Linear Modeling.		
Guest Lectures (if any)			
Total Hours			

Suggestive list of experiments:
NO Lab
Text Book- 4.
Reference Books- 5.
List and Links of e-learning resources: 1.
Modes of Evaluation and Rubric
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ajay Kumar Goyal



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Computer Science and Engineering IT
Syllabus applicable to July 2020 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4thYear 7thSemester
Subject Category	Departmental Elective-3 (PEC-3)
SubjectCode:**AI-2075 PEC(3)**	Subject Name: **Distributed Systems**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	-	-	100	3	-	-	3

Prerequisites: Knowledge of Computer networks and Operating system.

Course Objective:

The work of Operating System is different in the distributed environment.
Students should understand Message passing, RPC, Synchronization, LoadBalancing.
Migration of processes, Deadlock management etc in distributed environment.

Course Outcomes: After completion of this course students will be able to

CO -1: Understand distributed architecture, characteristics and models for distributed processing.

CO-2: identify deadlock and mechanism to avoid, prevent and resolve deadlocks.

CO-3: Explain and Analyze system models, agreement protocols and distributed file systems.

CO-4: Evaluates the performance and characteristics of Failure recovery in a particular distributed system.

CO-5:AnalyzeTransactionand Concurrency Control in distributed systems.

UNITs	Descriptions	Hrs.	CO's
I	**Characterization of Distributed Systems:** Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Message Ordering, Causal ordering of messages, global state, termination detection.	8	CO1
II	**Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized deadlock detection, distributed deadlock detection, path pushing algorithms, edge chasing algorithms.	8	CO2
III	**Agreement Protocols:** Introduction, System models, classification of Agreement Problem, Byzantine agreement	8	CO3

	problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems.		
IV	Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory. Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.	8	CO4
V	**Transactions and Concurrency Control**: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault Tolerance.	8	CO5
Guest Lectures (if any)		-	-
Total Hours		40Hrs	

Suggestive list of experiments
NO La

Text Book-

1. Tenanuan baum,Steen,"Distributed Systems",PHI
2. Gerald Tel,"Distributed Algorithms",Cambridge University Press

Reference Books-

3. Singhal & Shivaratri,"Advanced Concept in Operating Systems",Mc GrawHill
4. Pradeep K.Sinha,Distributed Operating Systems,PHI,2005.
5. Coulouris,Dollimore,Kindberg,"Distributed System: Concepts and Design",Pearson Education

List and Links of e-learning resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Sheena Kumar

Dr. Kanak Saxena
Chairperson