M.Tech - CSE

R24
Academic Regulations
Course Structure
&
Syllabus

PRAGATI ENGINEERING COLLEGE
(An Autonomous Institution)
ADB Road, Surampalem, Kakinada District, A.P.-533 437
(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada)
(Recognized by UGC under sections 2 (f) and 12 (b) of UGC act, 1956)

M.Tech

(Effective for the students admitted from the Academic Year **2024-25** onwards)

Pragati Engineering College(Autonomous)

R24

Department of Computer Science and Engineering

ACADEMIC REGULATIONS R24 FOR M. Tech (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech (Regular) Course from the Academic Year 2024-25 onwards. The M. Tech Degree of Pragati Engineering College(Autonomous) shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree**.**

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the State Government and Affiliating University and College from time to time.

2.0 *AWARD OF M. Tech DEGREE*

2.1 A student shall be declared eligible for the award of the M. Tech Degree, if he pursues a course of study in not less than two and not more than four academic years.

2.2 ***The student shall register for all 68 credits and secure all the 68 credits.***

2.3 The minimum instruction days in each semester are 90.

3.0 A. PROGRAMMES OF STUDY

The following specializations are offered by various departments for the M. Tech Programme of study.

1. M.Tech- Power Electronics and Electrical Drives
2. M.Tech- CAD/CAM
3. M.Tech- VLSI System Design
4. M.Tech- Computer Science and Engineering

and any other course as approved by AICTE/ University from time to time.

3.0 B. Departments offering M. Tech Programmes with specializations are noted below:

EEE	M.Tech- Power Electronics and Electrical Drives
ME	M.Tech- CAD/CAM
ECE	M.Tech- VLSI System Design
CSE	M.Tech- Computer Science and Engineering

4.0 ATTENDANCE

4.1 A student shall be eligible to write End Semester Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the Committee.

4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

4.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals on the basis of Internal Evaluation and End Semester Examination.

5.1 For the **theory subjects** 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the **average** of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks. Semester End Exam Paper contains FIVE mandatory questions (one question from one unit) with internal choice, each carrying 12 marks for a total of 60 marks.

5.2 For **Practical subjects**, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded as internal marks, based on the day to day work-10 marks, Record-10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-15, Experimentation-25, Results-10 , Viva-voce-10.

5.3 For **Technical seminar**, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For Technical seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. Out of 100 marks, supervisor awards 40% marks and remaining 60% marks are awarded by the project review committee.

5.4 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.5 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End semester Examination in that subject. A candidate shall be given a chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled. For re-registration the candidates have to apply to the college by paying the requisite fees before the start of the semester in which re-registration is required.

5.6 In case the candidate secures less than the required attendance in any re registered subject (s), he shall not be permitted to write the End Examination in that subject. He shall again re-register the subject when next offered

5.7 Laboratory examination for M. Tech. programmes must be conducted with two Examiners, one of them being the Laboratory Class Teacher or teacher from the same department and the second examiner shall be appointed by the Principal from the panel of examiners submitted by the respective HoD.

5.8 Student is allowed to register for 12 week SWAYAM / NPTEL MOOC courses (recommended by BoS Chairman) and obtain required credits during II Semester itself. In any case, if a student fails in obtaining credits, he is allowed to repeat the initially opted course / change to another MOOC course or regular course and will be considered as regular candidate only. After successful completion, by the end of III Semester, he needs to submit the course certificate (through HoD) to the exam section to perform credit transfer.

5.9 In addition to credit courses, for completing the programme and obtaining degree, a student needs to complete audit courses. Audit courses will be conducted, evaluated as normal credit courses, and the assessment will be graded as Pass or Fail.

5.10 Students shall undergo mandatory summer **internship** (2 credits) for a minimum of eight weeks duration at the end of II semester of the Programme/Summer Break. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the committee. The Committee comprises of Head of the Department and two faculty. The report and the oral presentation shall carry 40% and 60% weightages respectively. For internship, there will be only internal evaluation of 100 marks in the III semester. A candidate has to secure a minimum of 50% of marks to be declared successful.

6.0 EVALUATION OF PROJECT WORK(part-1 and Part-2)

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

6.1 For Project evaluation, out of 200 marks, 80 marks shall be for Internal Evaluation(40 internal marks for Project work Part-I and remaining 40 internal marks for project work Part-II) and 120 marks for the End Examination (Viva–Voce).

6.2 Student has to secure 40% of marks in the Viva–Voce examination and a minimum aggregate of 50% of total marks in Viva–Voce examination and Internal Evaluation taken together.

6.3 A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members.

6.4 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

6.5 After satisfying 6.4, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

6.6 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.7 A candidate shall submit his status report in two stages at least with a gap of 3 months between them.

6.8 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.

6.9 The candidate may be allowed to submit the project report, if the project work is published or accepted in a reputed national or international journal or conference.

6.10 Three copies of the Project Thesis certified by the supervisor shall be submitted to the department along with plagiarism report (<40%).

6.11 The thesis shall be adjudicated by one examiner selected by the Principal. For this, the Head of the Department shall submit a panel of five examiners, eminent in that field, with the help of the guide concerned and other PRC Members.

6.12 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is still unfavorable, the thesis shall be summarily rejected. The candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Principal.

6.13 The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.

6.14 If the candidate failed in the Viva-Voce examination, the candidate shall retake the Viva-Voce examination only after three months. If he failed again the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Principal.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range (Max – 100)	Letter Grade	Level (G)	Grade Point
≥ 90	S	Excellent (S)	10
≥80 to <90	A	Very Good (A)	9
≥70 to <80	B	Good (B)	8
≥60 to <70	C	Fair (C)	7
≥50 to <60	D	Satisfactory (D)	6
<50	F	Fail (F)	0
		Absent	0

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$SGPA\ (Si) = \sum (Ci\ X\ Gi) / \sum Ci$$

Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course.

Computation of CGPA

The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

$$CGPA = \sum (Ci\ X\ Si) / \sum Ci$$

Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to TWO decimal points and reported in the transcripts.

8.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 without backlog history	**From the CGPA secured from 68 Credits.**
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	

9.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

10.0 TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for re-admission into same or equivalent subjects at a time as and when offered.

11.1 GENERAL

11.2 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

11.3 The academic regulation should be read as a whole for the purpose of any interpretation.

11.4 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

11.5 The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College.

Pragati Engineering College(Autonomous)

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Department of Computer Science and Engineering

COURSESTRUCTURE

M.Tech.(CSE)ISEMESTER						
S.No	**Category**	**Course Code**	**Course Title**	**L**	**P**	**C**
1	Program Core	24011T01	High Performance Computing	3	0	3
2	Program Core	24011T02	Machine Learning	3	0	3
3	**Program Elective – I**			3	0	3
	Program Elective	24011T03	Social Media Analytics			
		24011T04	Advanced Databases and Mining			
		24011T05	Advanced Operating Systems			
4	**ProgramElective-2**			3	0	3
	Program Elective	24011T06	Internet of Things			
		24011T07	Advanced Software Engineering			
		24011T08	Advanced Computer Networks			
5	Credit Course		Research Methodology and IPR	2	0	2
6	Laboratory	24011L01	High Performance Computing Laboratory-1	0	4	2
7	Laboratory	24011L02	Machine Learning Laboratory	0	4	2
8	Audit Course	24011A01	Audit Courses-1*	2	0	0
Total Credits						18

***Student has to choose any one Audit course listed at the end of the course structure.**

M.Tech.(CSE) IISEMESTER						
S.No	**Category**	**Course Code**	**Course Title**	**L**	**P**	**C**
1	Program Core	24012T09	MEAN Stack Technologies	3	0	3
2	Program Core	24012T10	Deep Learning	3	0	3
3	**Program Elective-III**			3	0	3
	Program Elective	24012T11	Natural Language Processing			
		24012T12	Cyber Security			
		24012T13	Big Data Analytics			
4	**Program Elective-IV**			3	0	3
	Program Elective	24012T14	Cloud Computing			
		24012T15	Information Security			
		24012T16	Software Reliability			
5	Laboratory	24012L03	MEAN Stack Technologies Laboratory	0	4	2
6	Laboratory	24012L04	Deep Learning Laboratory	0	4	2
7	Seminar	24012T01	Technical Seminar	0	4	2
8	Audit Course	24012A02	Audit Courses-2*	2	0	0
Total Credits						18

***Student has to choose any one audit course listed at the end of the course structure.**

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Department of Computer Science and Engineering

M.Tech.(CSE) IIISEMESTER						
S.No	**Category**	**Course Code**	**Course Title**	**L**	**P**	**C**
1	**Program Elective-V**			3	0	3
	Program Elective	24013T17	Mining Massive Data Sets			
		24013T18	Generative AI			
		24013T19	Software Defined Networks			
2	**Open Elective**			3	0	3
	MOOCs	24013M01	MOOCs-2 (12 week NPTEL/ SWAYAM course)			
	Open Elective		A Course offered by other departments 1. Nano Technologies (ME) 2. IOT Applications (ECE) 3. Electric Vehicles (EEE)			
3	Internship	24013I01	(During II Sem to III Sem/ Summer break in I Year- TWO months internship)	0	0	2
4	Project	24013P01	Project Work Part - I	0	20	8
Total Credits						16

***StudentsgoingforIndustrialProject/Thesiswillcompletethesecoursesthrough MOOCs**

M.Tech.(CSE)IVSEMESTER						
S.No	**Category**	**Course Code**	**Course Title**	**L**	**P**	**C**
1	Project	24014P02	Project Work Part - II	0	32	16
Total Credits						**16**

Note:

- Two months Mandatory Industrial Training / Internship during summer / semester Break.
- ***Audit Course 1**
  1. Writing for Research Paper
  2. Value Education
- *Audit **Course - 2**
  1. Pedagogy Studies
  2. Personality Development through Life Enlightenment Skills

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M.Tech	HIGH PERFORMANCE COMPUTING	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVE
The main objectives of the course is to study parallel computing hardware and programming models, performance analysis and modeling of parallel programs

COURSE OUTCOMES		
On completion of the course, student will be able to–		Cognitive Level
CO1	Describe different parallel architectures inter-connect networks, programming models	K3
CO2	Develop an efficient parallel algorithm to solve given problem	K4
CO3	Analyze and measure performance of modern parallel computing systems	K4
CO4	Build the logic to parallelize the programming task	K3
CO5	Apply basics of CUDA programming and parallel algorithms	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	2	3	3	3	3

Unit I	**Introduction:** Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Scalable design principles, Architectures: N-wide superscalar architectures, Multi-core architecture.
Unit II	**Parallel Programming :** Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU.
Unit III	**Basic Communication:** Operations- One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All- to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations. Programming shared address space platforms: threads- basics, synchronization, OpenMP programming
Unit IV	Analytical Models: Sources of overhead in Parallel Programs, Performance Metrics for Parallel Systems, and The effect of Granularity on Performance, Scalability of Parallel Systems, Minimum execution time and minimum cost, optimal execution time. Dense Matrix Algorithms: MatrixVector Multiplication, Matrix-Matrix Multiplication.

Unit V	Parallel Algorithms- Sorting and Graph : Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Parallelizing Quick sort, All-Pairs Shortest Paths, Algorithm for sparse graph, Parallel Depth-First Search, Parallel BestFirst Search. CUDA Architecture : CUDA Architecture, Using the CUDA Architecture, Applications of CUDA Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel programming in CUDA- C.

Text Books:	
1	Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2	Jason sanders, Edward Kandrot, “CUDA by Example”, Addison-Wesley, ISBN-13: 978-0-13-138768-3
Reference Books :	
1	Kai Hwang, ”Scalable Parallel Computing”, McGraw Hill 1998, ISBN:0070317984
2	Shane Cook, “CUDA Programming: A Developer's Guide to Parallel Computing with GPUs”, Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013 ISBN: 9780124159884
3	David Culler Jaswinder Pal Singh, ”Parallel Computer Architecture: A Hardware/Software Approach”, Morgan Kaufmann,1999, ISBN 978-1- 55860-343-1
4	Rod Stephens, “Essential Algorithms”, Wiley, ISBN: 978-1-118-61210-1

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M.Tech	MACHINE LEARNING	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	To Develop an application for what is involved in learning from data.
2	To Demonstrate a wide variety of learning algorithms.
3	To Demonstrate how to apply a variety of learning algorithms to data.
4	To Demonstrate how to perform evaluation of learning algorithms and model selection.

COURSE OUTCOMES		
After the completion of the course, student will be able to Learn		**Cognitive Level**
CO1	Understand Domain Knowledge for Productive use of Machine Learning and Diversity of data.	K2
CO2	Analyze Demonstrate on Supervised and Computational Learning	K3
CO3	Analyze on Statistics in learning techniques and Logistic Regression	K3
CO4	Illustrate on Support Vector Machines and Perceptron Algorithm	K4
CO5	Analyze a Multilayer Perceptron Networks and classification of decision tree	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	2	3	3	3	3

UNIT-I	**Introduction-**Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.
UNIT-II	**Supervised Learning-** Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.
UNIT-III	**Statistical Learning-** Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.
UNIT-IV	**Support Vector Machines (SVM)-**Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel

	Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines. **Learning with Neural Networks:** Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

UNIT-V	**Multilayer Perceptron** Networks and error back propagation algorithm, Radial Basis Functions Networks. **Decision Tree Learning**: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Text Books	
1	Applied Machine Learning, M.Gopal, McGraw Hill Education, 2019
2	Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,2012
Reference Books	
1	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
2	Christopher Bishop, Pattern Recognition and Machine Learning, Springer,2007

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Department of Computer Science and Engineering

M.Tech	SOCIAL MEDIA ANALYTICS	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVE
The main objectives of the course is to study social media and its analytics Course

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Understanding characteristics and types of social media	K2
CO2	Understanding layers of social media analytics	K2
CO3	Apply text analysis tools on social media data	K3
CO4	Understand the significance of action analytics	K2
CO5	Detect viral topics on social media(YouTube)	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	2	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	2	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	2	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	2	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	2	-	-	-	2	3	3	3	3

Unit I	Introduction To Social Media World Wide Web, Web 1.0, Web 2.0, Web 3.0, Social Media, Core Characteristics Of Social Media, Types Of Social Media, Social Networking Sites, Using Facebook For Business Purposes, Content Communities
Unit- II	Social Media Analytics Overview Purpose Of Social Media Analytics, Social Media Vs. Traditional Business Analytics, Seven Layers Of Social Media Analytics, Types Of Social Media Analytics, Social Media Analytics Cycle, Challenges To Social Media Analytics, Social Media Analytics Tools. Case Study: The Underground Campaign That Scored Big
Unit- III	Social Media Text Analytics Types Of Social Media Text, Purpose Of Text Analytics, Steps In Text Analytics, Social Media Text Analysis Tools. Case Study: Tapping Into Online Customer Opinions
Unit- IV	Social Media Actions Analytics Introduction To Actions Analytics, Common Social Media Actions, Actions Analytics Tools. Case Study: Cover-More Group
Unit- V	Social Media Hyperlink Analytics Types Of Hyperlinks, Hyperlink Analytics, Types Of Hyperlink Analytics, Hyperlink Analytics Tools. Case Study: Hyperlinks And Viral YouTube Videos

Text Books	
1	Seven Layers Of Social Media Analytics Mining Business Insights From Social

	Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, And Location Data By Gohar F. Khan Isbn: 1507823207, Isbn-13: 9781507823200
Reference Books	
1	Social Media Analytics: Techniques And Insights For Extracting Business Value Out Of Social Media By Matthew Ganis, Avinash Kohirkar, Pearson Education.
2	Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
3	Big Data And Analytics, Seema Acharya, Subhasinin Chellappan, Wiley Publications.

M.Tech	**ADVANCED DATABASES AND MINING**	**L**	**P**	**C**
I Semester	**Course Code:**	**3**	**0**	**3**

COURSE OBJECTIVES

- To Study multidisciplinary field of data mining, the general data features, techniques for data prepossessing, general implementation of data warehouses and OLAP, the relationship between data warehousing and other generalization methods
- To Study different methods of clustering such as k-means, k-mediods, db scan algorithm, role of data mining in web mining.

COURSE OUTCOMES

Upon completion of the course, students should be able to:		**Cognitive Level**
CO1	Apply various normal forms for designing a databaseschema.	K3
CO2	Examine appropriate techniques for controlling the consequences of concurrent data access and to restrict unauthorized access, and also able to perform Query Optimization.	K2
CO3	Perform OLAP operations and apply data preprocessingstrategies.	K3
CO4	Analyze data visualizations, and observe the patternsthat can be discovered by association rule mining.	K4
CO5	Analyze and apply the appropriate classification/clustering techniques for solving real worldproblems.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	2	3	3	3	3

Unit I	An Overview of NoSQL: Review of the Relational Model, ACID Properties, Distributed Databases: Sharding and Replication, Consistency, The CAP Theorem, NoSQL Data Models. Four Types of NoSQL Database, Value of Relational Databases, Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.
Unit- II	MongoDB: The Document Data Model, Documents and Collections, MongoDB

	Use Cases, Embedded Data Models, Normalized Data, Replication via Replica Sets, MongoDB Design, MongoDB and the CAP Theorem, The MongoDB Data Manipulation Language, Transactions, Atomicity, and Documents, Durability and Journaling, Batch Processing and Aggregation, Indexing, Auto-Sharding, Shard Keys, and Horizontal Scalability, Writing to Shards, MongoDB as a File System
Unit- III	Cassandra: The Column-Family Data Model, Databases and Tables, Columns, Types, and Keys, The Data Manipulation Language, Cassandra's Architecture, Key Spaces, Replication, and Column-Families, The CAP Theorem, Consistent Hashing, Managing Cluster Nodes
Unit- IV	Data preprocessing: cleaning, transformation, reduction, filters and discretization (demonstration with weka). Data mining algorithms: association rules, mining weather data, generating item sets and rules efficiently, correlation analysis. visualization techniques (demonstration with weka)
Unit- V	Classification & Clustering: ZeroR, OneR, Naïve Bayesian and Decision trees classification and evaluation (bootstrapping and k-fold cross validation) techniques. k-means, DBSCAN and Hierarchical clustering methods (demonstration with weka).

Text Books	
1	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition, 2019
2	Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann C.J. Date, Database Systems, Pearson, 3rd edition
Reference Books	
1	MongoDB: The Definitive Guide, 3rd Edition, by Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, 2019, O'Reilly Media, Inc.,
2	Cassandra: The Definitive Guide, 3rd Edition, by Jeff Carpenter, Eben Hewitt, 2020, O'Reilly Media, Inc.

Pragati Engineering College(Autonomous)

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Department of Computer Science and Engineering

M.Tech	ADVANCED OPERATING SYSTEMS	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVE
.To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and to cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock

COURSE OUTCOMES		
After the completion of the course, student will be able to		Cognitive Level
CO1	Illustrate on the fundamental concepts of Operating systems, its architecture and process management.	K2
CO2	Analyses on memory management concepts including page replacement algorithms.	K4
CO3	Elaborate on Process synchronisation mechanisms and deadlocks in operating systems.	K6
CO4	Make use of Distributed systems for implementing synchronisation.	K3
CO5	Apply protection and security in operating systems.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	2	3	3	3	3

Unit I	Overview of Operating systems: Introduction, Operating system services, System calls, Types of operating systems. Process Management: Process Concepts, Process states, process control block, process scheduling, Operations on processes, Scheduling Algorithms.
Unit- II	Memory management concepts: Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual memory, Demand Paging, Page-replacement Algorithms, Thrashing.
Unit- III	Process Synchronization: Critical section problem, Semaphores, Readers- Writers problem. Deadlocks: System model, Deadlocks Characterization, Methods for handling

	deadlocks, Deadlock prevention, Avoidance, Detection and Recovery from Deadlocks.
Unit- IV	Operating System Support in Distributed Systems : Introduction , Operating System layer, Role of protection processes and address space. Distributed Systems and Synchronization: Clock Synchronization, logical clocks, mutual exclusion, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols, Ricart-Agarwala Algorithm, Maekawa Algorithm.
Unit- V	File systems and protection: The concept of file, Access methods, Directory structure, File system structure, File system implementation, File sharing, Protection, Directory implementation, Allocation methods, Free space management. Case studies of Android, and iOS.

Text Books	
1	Operating System Concepts, 8th edition, Silberschatz and Galvin, john Wiley,2009.
2	Distributed Systems, 2nd edition, Andrew S. Tanenbaum, Maarten Vanteen,2007.
Reference Books	
1	Advanced Concepts in Operating Systems, Indian edition, Singhal, M and Shivaratri, N.. Tata McGraw Hill,2001.
2	Distributed computing: Principles, Algorithms, and systems,1st edition, Kskhemkalyani, A and Singhal M Cambridge university press,2008.

Pragati Engineering College(Autonomous)

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Department of Computer Science and Engineering

M.Tech	INTERNET OF THINGS	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	To Understand Smart Objects and IoT Architectures.
2	To learn about various IOT-related protocols
3	To build simple IOT Systems using Arduino and Raspberry Pi.
4	To understand data analytics and cloud in the context of IOT
5	To develop IoT infrastructure for popular applications.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Summarize on the term 'internet of things' in different contexts.	K2
CO2	Analyze various protocols for IOT.	K4
CO3	Design a PoC of an IOT system using Rasperry Pi/Arduino	K6
CO4	Apply data analytics and use cloud offerings related to IOT.	K3
CO5	Analyze applications of IOT in real time scenario	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	1	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	1	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	1	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	1	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	1	-	-	-	2	3	3	3	3

Unit I	**FUNDAMENTALS OF IoT:** Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks

	of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.
Unit- II	**IoT PROTOCOLS:** IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.
Unit- III	**DESIGN AND DEVELOPMENT:** Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.
Unit- IV	**DATA ANALYTICS AND SUPPORTING SERVICES:** Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

Unit- V	**CASE STUDIES/INDUSTRIAL APPLICATIONS:** Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Text Books	
1	IOT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, First Edition-2017
Reference Books	
1	Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, Universities Press, First Edition-2015
2	2.The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2nd Edition-2012 (for Unit 2).
3	3.“From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 1st edition 2014.
4	4.Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.

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Department of Computer Science and Engineering

M.Tech	ADVANCED SOFTWARE ENGINEERING	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVE
To study phases of Software Development, common process models including Waterfall, the Unified Process, hands-on experience with elements of the agile process, a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, and Software Design techniques

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Demonstrate software process, various models and Agile methodologies	K2
CO2	Analyze and Specify software requirements through a SRS documents	K4
CO3	Design and Plan software solutions to problems	K6
CO4	Analyze the importance of Quality assurance and design, implement, and execute test cases at the Unit level	K4
CO5	Creating test cases at Integration level and analyze the role of various metrics.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	2	2	3	3	3	3
CO2	3	3	3	3	-	-	-	-	2	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	2	2	3	3	3	3
CO4	3	3	3	3	-	-	-	-	2	2	3	3	3	3

CO5	3	3	3	3	-	-	-	-	2	2	3	3	3	3

Unit I	Software and Software Engineering: Nature of software, Software Process, Software Engineering Practice. Process Models: Generic process model, defining a framework activity, identifying task set, process assessment and improvement, perspective process models Aglity and process: Agility, Agile process, Scrum, other Agile frameworks, recommended process model\
Unit- II	Human aspects of Software Engineering: characteristics and psychology of Software Engineer, software team, team structure Principles that guide practice: core principles, principles that guide each framework activity Understanding Requirements: Requirements engineering, establishing groundwork, requirements gathering, developing use cases, building analysis model, negotiating requirements, requirements monitoring, validating requirements Requirements modeling: requirements analysis, class-based modeling, functional modeling, behavioural modeling
Unit- III	Design: Design process, design concepts, design model Architectural design: software architecture, architectural styles, architectural design, assessing alternative architectural designs User experience design: elements, golden rules, User interface analysis and design, user experience analysis, user interface design, design evaluation, usability and accessibility Design for mobility: mobile development life cycle, mobile architecture, web design pyramid, , mobility and design quality, best practices.

Unit- IV	Quality: software quality, quality dilemma, achieving software quality Reviews: review metrics, Informal reviews, Formal technical reviews Software Quality Assurance: elements, SQA process, Product characteristics, SQA tasks, goals and metrics, statistical software quality assurance, software reliability, ISO 9000 quality standards, SQA plan Software testing: strategic approach to software testing, planning and recordkeeping, test case design, white box testing, black box testing, object oriented testing
Unit- V	Software testing- integration level: Software testing fundamentals, integration testing, regression testing, integration testing in OO context, validation testing Software testing- testing for mobility: mobile testing guidelines, testing strategies, User experience testing issues, web application testing, Web testing strategies, security testing, performance testing Software metrics and analytics: software measurement, software analytics, product metrics, metrics for testing, metrics for maintenance, process and project metrics, software measurement, metrics for software quality

Text Books	
1	"Software Engineering, A practitioner's Approach", Roger S. Pressman, Bruce R. Maxim, 9th Edition, Tata McGraw-Hill.
2	"Software Engineering", Ian Sommerville, 9th edition, Pearson education
Reference Books	
1	Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2	Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

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Department of Computer Science and Engineering

M.Tech	ADVANCED COMPUTER NETWORKS	L	P	C
I Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	To study Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
2	Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routingand Addressing.
3	Provide the mathematical background of routing protocols.
4	Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Illustrate reference models with layers, protocols and interfaces.	K2
CO2	Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6.	K2
CO3	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in networkdesign and implementation.	K4
CO4	Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks	K6
CO5	Describe the emerging trends in networks-MANETS and WSN	K2

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Department of Computer Science and Engineering

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	2	3	3	3	3

Unit I	**Network layer: Network Layer design issues:** store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual – circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, **congestion control algorithms :**Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets
Unit- II	**Internetworking and IP protocols:** How networks differ, How net works can be connected, internetworking, tunneling, The network layer in the internet,IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, network address translation (NAT),IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP

Unit- III	**Transport Layer Protocols:** Introduction, Services, Port numbers, User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control.
Unit- IV	**Wireless LANS:** Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers Other Wireless Networks: WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites.
Unit- V	**Emerging trends in Computer networks:** Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security Wireless Sensor Networks: WSN functioning, P2P Networks: Characteristics of P2P Networks, Classification of P2P systems.

Text Books	
1	Data communications and networking 4th edition Behrouz A Fourzan,TMH- 2007
2	Computer networks, Mayank Dave,CENGAGE, First edition.2012
Reference Books	
1	Computer networks, A system Approach, 5thed, Larry L Peterson and Bruce S Davie, Elsevier-2012

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Department of Computer Science and Engineering

M.Tech	RESEARCH METHODOLOGY AND IPR	L	P	C
I Semester	Course Code:	2	0	2

COURSE OBJECTIVES	
1	To analyze the Effective literature studies approaches, analysis,Plagiarism, Research ethics.
2	Able understand problem, Scope and objectives of research problem.
3	To learn and understand Traditional knowledge Case Studies, IPR and IITs

COURSE OUTCOMES		
At the end of the course, student will be able to:		Cognitive Level
CO1	Demonstrate the research and its types, Reviewing literature. Identifying and defining research problem.	K3
CO2	Explaining research design methods, sampling techniques	K5
CO3	Evalating and development of measuring instruments, data collection and analysis methods	K5
CO4	Show the IPR protection provides an incentive to inventors for further research work and Investment in R & D, which leads to creation of new and better products, and in turn brings about, Economic growth and social benefits.	K2
CO5	Identify Research proposal, research report and evaluating research	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	3	-	2	3	3	3	3
CO2	3	3	3	3	-	-	-	3	-	2	3	3	3	3
CO3	3	3	3	3	-	-	-	3	-	2	3	3	3	3
CO4	3	3	3	3	-	-	-	3	-	2	3	3	3	3
CO5	3	3	3	3	-	-	-	3	-	2	3	3	3	3

Unit I	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
Unit- II	Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
Unit- III	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT
Unit- IV	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications
Unit- V	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books	
1	Research methodology: an introduction for science & engineering students,1st Edition, Stuart Melville, Wayne Goddard, 1996
Reference Books	
1	Research Methodology: A Step by Step Guide for beginners, 2nd Edition, Ranjit Kumar, 2011 Resisting Intellectual Property, 1st Edition, Halbert, Taylor & Francis Ltd., 2007

M.Tech	HIGHPERFORMANCE COMPUTING LABORATORY	L	P	C
I Semester	Course Code:	0	4	2

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Department of Computer Science and Engineering

COURSE OBJECTIVES	
The main objectives of the course is to	
1	To implement the concepts of Parallel Processing..
2	To develop Optimization techniques for serial code
3	To design Parallel Computing Paradigms.
4	To Implement Parallel Programming using OpenMP and MPI.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		**Cognitive Level**
CO1	Understand the role of HPC in science and engineering.	K2
CO2	Be familiar with popular parallel programming paradigms	K2
CO3	Understand commonly used HPC platforms with particular reference to Cluster system.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	3	-	2	3	3	3	3
CO2	3	3	3	3	3	-	-	3	-	2	3	3	3	3
CO3	3	3	3	3	3	-	-	3	-	2	3	3	3	3

List of Experiments:	
1	Get familiar with OpenMP environment
2	Executing simple programs with OpenMp (vector addition, dot product)
3	Design and implement parallel Breadth First Search and Depth First search based on existing algorithms using OpenMP. Use a Tree or an undirected graph for BFS and DFS.
4	Write a program to implement parallel Bubble sort and Merge sort using OpenMP. Use existing algorithms and measure the performance of sequential and parallel algorithms.
5	Implement Min, Max, Sum and Average operations using Parallel Reduction
6	Write a CUDA Program for -Addition of two large vectors, -Matrix multiplication using CUDA C
7	Mini Project: Evaluate performance enhancement of parallel Quick sort Algorithm using MPI

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Department of Computer Science and Engineering

I Semester	Course Code:	0	4	2

COURSE OBJECTIVE
This course will enable students to learn and understand different Data sets inimplementingthe machine learning algorithms.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design and Develop Python programs for various Learning algorithms	K2
CO2	Apply appropriate data sets to the Machine Learning algorithms	K3
CO3	Develop Machine Learning algorithms to solve real world problems	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

List of Experiments	
1	Implement and demonstrate the FIND-S algorithm for finding the most specifichypothesis based on agiven set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of theset of all hypotheses consistent withthe training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use anappropriate data set for building the decision tree andapply this knowledge to classify a new sample.
4	Exercises to solve the real-world problems using the following machine learning methods: a) LinearRegression b) Logistic Regression c) Binary Classifier
5	Develop a program for Bias, Variance, Remove duplicates , Cross Validation
6	Write a program to implement Categorical Encoding, One-hot Encoding
7	Build an Artificial Neural Network by implementing the Back propagationalgorithm and test thesame using appropriate data sets.
8	Write a program to implement k-Nearest Neighbor algorithm to classify theiris data set. Print bothcorrect and wrong predictions.
9	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
11	Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data setfor clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/PythonML library classes/API in the program.
12	Exploratory Data Analysis for Classification using Pandas or Matplotlib.
13	Write a Python program to construct a Bayesian network considering medicaldata. Use this model todemonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
14	Write a program to Implement Support Vector Machines and PrincipleComponent Analysis.
15	Write a program to Implement Principle Component Analysis.

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Department of Computer Science and Engineering

M.Tech	WRITING FOR RESEARCH PAPER	L	P	C
I Semester	Course Code:	2	0	0

COURSE OBJECTIVES	
1	To improve your writing skills and level of Readability
2	Learn about what to write in each section
3	Understand the skills needed when writing a Title

COURSE OUTCOMES		
At the end of the course, student will be able to		Cognitive Level
CO1	Understand writing skills and level of readability	K2
CO2	Analyzing about what to write in each section	K4
CO3	Applying the skills needed when writing a Title	K3
CO4	Analyzing the skills needed for writing	K4
CO5	Evalating skills needed to write the results	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	-	3	2	2	3	3	3	3
CO2	3	3	3	3	2	2	-	3	2	2	3	3	3	3
CO3	3	3	3	3	2	2	-	3	2	2	3	3	3	3
CO4	3	3	3	3	3	2	2	-	3	2	2	3	3	3
CO5	3	3	3	3	3	2	2	-	3	2	2	3	3	3

Unit I	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
Unit- II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts Introduction
Unit- III	Review of the Literature, Methods, Results, Discussion, Conclusions,The Final Check.
Unit- IV	Key skills are needed when writing a Title, key skills are needed whenwriting an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature
Unit- V	Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the ConclusionsUseful phrases, how to ensure paper is as good as it could possibly bethe first- time submission.

Text Books	
1	Writing for Science, 0th Edition, Yale University Press, Goldbort R 2006
2	How to Write and Publish a Scientific Paper,7th Edition, Cambridge UniversityPress, Day R 2006
3	Handbook of Writing for the Mathematical Sciences,2nd Edition, SIAM, Highman's book, Highman N 1998

Pragati Engineering College(Autonomous)

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Department of Computer Science and Engineering

M.Tech	VALUE EDUCATION	L	P	C
I Semester	Course Code:	2	0	0

COURSE OBJECTIVES	
1	Understand value of education and self- development
2	Imbibe good values in students
3	Let the should know about the importance of character

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Infer the knowledge of self-development	K2
CO2	Describe the importance of Human values	K2
CO3	Developing the overall personality	K6
CO4	Understanding human behaviour and habits	K2
CO5	Analyzing overall character	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	3	2	3	2	2	3	3	3	3
CO2	3	3	2	2	2	3	2	3	2	2	3	3	3	3
CO3	3	3	2	2	2	3	2	3	2	2	3	3	3	3
CO4	3	3	2	2	2	3	2	3	2	2	3	3	3	3
CO5	3	3	2	2	2	3	2	3	2	2	3	3	3	3

Unit I	**Values and self-development-** Social values and individualattitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation, Standards and principles, Value judgments
Unit- II	**Importance of cultivation of values-** Sense of duty, Devotion, Self reliance, Confidence, Concentration. Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism. Love for nature, Discipline.
Unit- III	**Personality and Behaviour Development**-Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking.
Unit- IV	**Free from anger, Dignity of labour**- Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.
Unit- V	**Character and Competence-** Holy books vs Blind faith, Self- management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self- control, Honesty, Studying effectively.

Text Books	
1	Values and Ethics for organizations Theory and practice, Latest Edition, Chakroborty, S.K., Oxford University Press, New Delhi

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Department of Computer Science and Engineering

M.Tech	MEAN STACK TECHNOLOGIES	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
2	Writing optimized front end code HTML and JavaScript.
3	Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
4	Design and implementation of Robust and Scalable Front End Applications

COURSE OUTCOMES		
On completion of the course, student will be able to–		**Cognitive Level**
CO1	Identify the Basic Concepts of Web & Markup Languages.	K3
CO2	Develop web Applications using Scripting Languages &Frameworks.	K3
CO3	Make use of Express JS and Node JS frameworks	K3
CO4	Illustrate the uses of web services concepts like restful, react js.	K2
CO5	Adapt to Deployment Techniques & Working with cloudplatform.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO2	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	2	3	3	3	3

Unit I	**Introduction to Web:** Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. **Html5** concepts, **CSS3**, Anatomy of a web page. **XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches
Unit- II	**JavaScript: The** Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. **Angular Java Script** Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS
Unit- III	**Node.js:** Introduction, Advantages, Node.js Process Model, Node JS Modules. **Express.js:** Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.
Unit- IV	**RESTful Web Services:** Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. **React Js:** Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM

	Rendering, Factories
Unit- V	**Mongo DB**: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books	
1	Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson-2013
2	Web Technologies, Uttam K Roy, Oxford-2010
Reference Books	
1	Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly,1st edition-2006
2	Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly,2012
3	Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech 1st edition-2013

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Department of Computer Science and Engineering

M.Tech	DEEP LEARNING	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVE
To study the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short term memory cells and convolution neural networks.

COURSE OUTCOMES		
After completion of course, students would be able to:		Cognitive Level
CO1	Explore feed forward networks and Deep Neural networks	K2
CO2	Mathematically understand the deep learning approaches and paradigms	K2
CO3	Apply the deep learning techniques for various applications	K3
CO4	Understand the concepts of CNN and RNN	K2
CO5	Implement Interactive Applications of Deep Learning	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO3	2	1	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	1	1	-	-	-	-	-	-	2	3	3

Unit I	**Basics-** Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.
Unit- II	**Feedforward Networks**-Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, utoencoders. **Deep Neural Networks:** Difficulty of training deep neural networks, Greedylayer wise training.
Unit- III	**Better Training of Neural Networks**- Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).
Unit- IV	**Recurrent Neural Networks**- Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs. **Convolutional Neural Networks**: LeNet, AlexNet. Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.
Unit- V	**Recent trends**- Variational Autoencoders **Applications:** Computer Vision,Natural Language Processing, Speech Processing

Text Books	
1	Deep Learning, Ian Good fellow and YoshuaBengio and Aaron Courville,MIT Press, 2016.
Reference Books	
1	Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2	Pattern Recognition and Machine Learning, Christopher Bishop,2007
3	Deep Learning with Python, François Chollet, Manning Publications, 2017

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Department of Computer Science and Engineering

M.Tech	NATURAL LANGUAGE PROCESSING	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	Understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
2	Examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
3	To describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

COURSE OUTCOMES		
After completion of this course		Cognitive Level
CO1	Understanding a given text with basic Language features	K2
CO2	Creating an innovative application using NLP components	K6
CO3	Evaluating a rule based system to tackle morphology/syntax of a language	K5
CO4	Analyzing a tag set to be used for statistical processing for real-time applications	K4
CO5	Evaluate, Compare and contrast the use of different statistical approaches for different types of NLP applications.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**INTRODUCTION:** Origins and challenges of NLP Language Modeling: Grammar-based LM, Statistical LM –Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules,Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.
Unit- II	**WORD LEVEL ANALYSIS:** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-

	Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.
Unit- III	SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

Unit- IV	**SEMANTICS AND PRAGMATICS:** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.
Unit- V	**DISCOURSE ANALYSIS AND LEXICAL RESOURCES:** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)

Text Books	
1	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.
2	Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.
Reference Books	
1	Language Processing with Java and Ling Pipe Cookbook, 1st Edition, BreckBaldwin, Atlantic Publisher, 2015.
2	Natural Language Processing with Java, 2nd Edition, Richard M Reese,OReilly Media,2015.
3	Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition

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Department of Computer Science and Engineering

COURSE OBJECTIVE
To create a strong foundation and detailed technical knowledge in security, privacy, and cryptography applied to computer systems networks and web applications.

M.Tech	**CYBER SECURITY**	**L**	**P**	**C**
II Semester	**Course Code:**	**3**	**0**	**3**

COURSE OUTCOMES		
On completion of the course, student will be able to–		**Cognitive Level**
CO1	Understand key terms and concepts in security, intellectual property and cyber crimes, trademarks and domain theft.	**K4**
CO2	Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition	**K3**
CO3	Secure both clean and corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage.	**K4**
CO4	Incorporate approaches for incident analysis and response	**K6**

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**Introduction to Cyber security-** Cyber security objectives**,** Cyber security roles**,** Differences between Information Security & Cyber security. **Cyber security Principles-**Confidentiality, integrity & availability Authentication & non repudiation.
Unit- II	**Information Security (IS) within Lifecycle Management-**Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts. **Risks & Vulnerabilities-** Basics of risk management**,** Operational threat environments**,** Classes of attacks.
Unit- III	**Incident Response-** Incident categories**,** Incident response Incident recovery. **Operational security protection**: Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.
Unit- IV	**Threat Detection and Evaluation (DE):** Monitoring- Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances**. Analysis-** Network traffic Analysis, packet capture and analysis
Unit- V	**Introduction to backdoor System and security-**Introduction to metasploit, Backdoor, demilitarized zone(DMZ),Digital Signature, Brief study on Harding of operating system

Text Books	
1	Security Analyst Student Hand Book , NASSCOM: Dec 2015
2	Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton ,Published by BCS, June 2013
Reference Books	
1	CSX- cyber security fundamentals 2nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security

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Department of Computer Science and Engineering

M.Tech	BIG DATA ANALYTICS	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
This course is aimed at enabling the students to	
1	Provide an overview of an exciting growing field of big data analytics.
2	Introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
3	Teach the fundamental techniques and principles in achieving big dataanalytics with scalability and streaming capability.
4	Optimize business decisions and create competitive advantage with BigData analytics

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COURSE OUTCOMES		
After the completion of the course, student will be able to		Cognitive Level
CO1	Illustrate big data and its use cases from selected business domains.	K4
CO2	Interpret the applicability of NoSQL databases using Cassandra	K3
CO3	Analyze the big data using Hadoop, MapReduce, Hive and Apache Spark	K4
CO4	Implement real time processing with Spark Streaming for data intensiveapplications.	K4
CO5	Analyse the data analytics process with a case study	K3

Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO2	3	1	1	2	2	-	-	-	-	-	-	1	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	3	3	3	2	2	-	-	-	-	-		1	3	3

Unit- I	What is big data, why big data, convergence of key trends, unstructured data, indus examples of big data, web analytics, big data and marketing, fraud and big data, r and big data, credit risk management, big data and algorithmic trading, big data a healthcare, big data in medicine, advertising and big data, big data technologi introduction to Hadoop, open source technologies, cloud and big data, mobile busin intelligence, Crowd sourcing analytics, inter and trans firewall analytics.
Unit- II	Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra ,Table creation, loading and reading data.
Unit- III	Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoo distributed file system (HDFS), fault tolerance ,with data replication, Hig availability, Data locality , Map Reduce Architecture, Process flow, Java interface

	data flow, Hadoop I/O, data integrity, compression, serialization. Introduction to Hive data types and file formats, HiveQL data definition, HiveQL data manipulation Logical joins, Window functions, Optimization, Table partitioning, Bucketing Indexing, Join strategies.
Unit- IV	Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide Actions, Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data Working with Complex Types, Working with JSON, Grouping, Window Functions Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN , Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid
Unit- V	Spark-Performance Tuning, Stream Processing Fundamentals, Event- Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books	
1	Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, andAmbiga Dhiraj, 1st edition ,2013
2	SPARK: The Definitive Guide, Bill Chambers &MateiZaharia, O'Reilley, 2018-first Edition.
Reference Books	
1	"Hadoop Operations", O'Reilley, Eric Sammer, First Edition -2012.
2	"Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen,2012.
3	"Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt,2010
4	NPTEL MOOC - Big Data Computing https://archive.nptel.ac.in/courses/106/104/106104189/

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Department of Computer Science and Engineering

M.Tech	CLOUD COMPUTING	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	To implement Virtualization
2	To implement Task Scheduling algorithms.
3	Apply Map-Reduce concept to applications.
4	To build Private Cloud.
5	To educate and know the impact of engineering on legal and societalissues involved.

COURSE OUTCOMES		
On completion of the course, student will be able to–		Cognitive Level
CO1	Interpret the key dimensions of the challenge of Cloud Computing	K2
CO2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization.	K4
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications	K5
CO4	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas.	K5
CO5	Illustrate Virtualization for Data-Center Automation.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO2	3	1	1	2	2	-	-	-	-	-	-	1	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	3	3	3	2	2	-	-	-	-	-		1	3	3

Unit I	**Introduction:** Network centric computing, Network centric content,peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems:** Introduction, architecture distributed systems, communication protocols, logical clocks,message delivery rules, concurrency, model concurrency with Petri Nets.
Unit- II	**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity,

	Intercloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, **Cloud Computing :** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

Unit- III	**Cloud Resource virtualization:** Virtualization, layering andvirtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, **Cloud Resource Management and Scheduling**: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.
Unit- IV	**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), **Cloud Security:** Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks
Unit- V	**Introduction:** Network centric computing, Network centric content,peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems:** Introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

TEXT BOOKS	
1.	Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier,2014
REFERENCE BOOKS	
1.	Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier,First Edition,2013
2.	Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press,2014
3.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2009
4.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs20/preview

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Department of Computer Science and Engineering

M.Tech	INFORMATION SECURITY	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVE
To learn different encryption techniques along with hash functions, MAC, digital signatures and their use in various protocols for network security and system security.

COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		Cognitive Level
CO1	Identify the basic concepts of cryptography.	K3
CO2	Classify the symmetric encryption techniques.	K3
CO3	Apply various public key cryptography techniques, implement Hashingand Digital Signature.	K4
CO4	Design authentication applications and analyze network securityprotocols	K2
CO5	Apply security mechanisms to detect and prevent various attacks.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**Introduction:** Security Attacks, Security Services, Security Mechanisms, and a Model for Network Security. Non-Cryptographic Protocol Vulnerabilities - DoS, DDoS, Session Hijacking and Spoofing, Software Vulnerabilities - Phishing, Buffer Overflow, Format String Attacks, SQL Injection. Basics of Cryptography Steganography,Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Other Cipher Properties - Confusion, Diffusion, Block and Stream Ciphers
Unit- II	**Secret Key Cryptography:** S-DES, Data Encryption Standard (DES), Strength of DES, Block Cipher Design Principles and Modes of Operations, Triple DES, AES **Number Theory:** Divisibility and the Division Algorithm, Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and

	Euler's Theorems, the Chinese Remainder Theorem, Discrete Logarithms.
Unit- III	**Public Key Cryptography:** Principles of Public Key Cryptosystems, RSA Algorithm, Diffie-Hellman Key Exchange, Introduction to Elliptic Curve Cryptography. **Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions, Secure Hash Algorithm, Message Authentication Codes – Message Authentication Requirements and Functions, HMAC, Digital signatures, Digital Signature Standards. **Authentication Applications:** Kerberos, Key Management and Distribution, X.509 Directory Authentication service, Public Key Infrastructure, Electronic Mail Security: Pretty Good Privacy.

Unit- IV	**IP Security**: Overview, Architecture, Authentication Header,Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange **WebSecurity:** Web Security Considerations,Secure Sockets Layer and Transport Layer Security, Electronic Payment.
Unit- V	**System Security:** Malicious Software–Types,Viruses,Virus Countermeasures, Worms. **Firewalls:** Characteristics, Types of Firewalls, Placement of Firewalls, FirewallConfiguration, Trusted Systems.

Text Books	
1	William Stallings, Cryptography and Network Security, 4th Edition, PearsonEducation.
2	Atul Kahate, Cryptography and Network Security, 2nd Edition, McGraw Hill.
3	
Reference Books	
1	Mark Stamp, Information Security - Principles and Practice, Wiley India.
2	Forouzan Mukhopadhyay, Cryptography and Network Security, 2nd Edition,McGraw Hill.
3	C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security: 1st Edition, Wiley India.

Pragati Engineering College(Autonomous)

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Department of Computer Science and Engineering

M.Tech	SOFTWARE RELIABILITY	L	P	C
II Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
The main objectives of the course is to	
1	Understand the concepts and metrics related to software reliability.
2	Learn techniques for measuring, predicting, and improving softwarereliability.
3	Explore various models used in the analysis of software reliability.
4	Develop skills in designing reliable software systems.
5	Investigate practical applications and challenges in software reliability.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Explain the concepts and importance of software reliability.	K3
CO2	Apply statistical techniques for reliability measurement and prediction.	K3
CO3	Implement software reliability models and analyze their outputs.	K4
CO4	Design and implement strategies for improving software reliability.	K2
CO5	Evaluate the impact of software reliability on overall system performance.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**Introduction to Software Reliability Definition and I**mportance of Software Reliability, Factors Influencing Software Reliability, Software Failure and Fault Analysis, Role of Reliability in Software Engineering

Unit- II	**Software Reliability Metrics and Measurement** Reliability Metrics: MTTF, MTTR, Availability, Software Reliability Growth Models, Fault Detection and Correction, Reliability Measurement Techniques
Unit- III	**Software Reliability** Models Exponential Model, Weibull Model, Log-Logistic Model, Non-HomogeneousPoisson Process (NHPP) Model
Unit- IV	**Techniques for Improving Software** Reliability Fault Tolerance and Redundancy, Error Detection and Recovery, Code Reviews and Inspections, Testing Strategies for Reliability
Unit- V	**Practical Applications and Emerging Trends** Reliability in Cloud Computing, Reliability in Distributed Systems, Reliability in Safety-Critical Systems, Machine Learning for Predicting Software Reliability

Text Books	
1	"Software Reliability Engineering" by John D. Musa, Anthony Iannino,and K. Nagel, McGraw-Hill Inc.,US
2	"Quantitative Software Engineering" by Lawrence Bernstein, Wiley-IEEE Computer Society Pr; 1st edition (11 November 2005)
Reference Books	
1	"Software Engineering: A Practitioner's Approach" by Roger S. Pressma, McGraw Hill Education; 7th edition (1 April 2009)

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Department of Computer Science and Engineering

M.Tech	MEAN STACK TECHNOLOGIES LABORATORY	L	P	C
II Semester	Course Code:	0	4	2

COURSE OBJECTIVES	
1	Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
2	Writing optimized front end code HTML and JavaScript
3	Design and implementation of Robust and Scalable Front End Applications.

COURSE OUTCOMES		
On completion of this course, the student will be able to		Cognitive Level
CO1	Implement the Basic Concepts of Web & Markup Languages.	K4
CO2	Develop web Applications using Scripting Languages & Framework	K3
CO3	Build applications using Express JS and Node JS frameworks	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	1	1	-	-	-	-	2	-	3	3
CO2	3	3	3	1	1	-	-	-	-	2	-	3	3
CO3	3	3	3	1	1	-	-	-	-	2	-	3	3

List of Experiments:	
Experiment-1	Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist of the following pages. Home page Registration and user Login, User profile page, Books catalog Shopping cart, Payment by credit card Order Conformation
Experiment-2	Write an HTML page including any required JavaScript that takes a

	numberfrom text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
Experiment-3	Develop and demonstrate JavaScript with POP-UP boxes and functions for thefollowing problems: a)Input: Click on Display Date button using on click ( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alertInput: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert
Experiment-4	Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

Experiment-5	Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
Experiment-6	Develop and demonstrate PHP Script for the following problems: a)Write a PHP Script to find out the Sum of the Individual Digits. b)Write a PHP Script to check whether the given number is Palindrome or not
Experiment-7	Implement the following in CSS a) Implementation of 'get' and 'post' methods. b) Implementation in colors, boarder padding. c) Implementation button frames tables, navigation bars.
Experiment-8	Implement the web applications with Database using a) PHP, b) Servlets and c) JSP.
Experiment-9	Write a program to design a simple calculator using a) JavaScript b) PHP c) Servlet and d) JSP.
Experiment-10	Create registration and login forms with validations using Jscript query.
Experiment-11	Jscript to retrieve student information from student database using databaseconnectivity.
Experiment-12	Implement the following in React JS a) Using React Js creating constructs data elements. b) Using React Js implementations DoM.
Experiment-13	Implement the following in Angular JS a) Angular Js data binding. b) Angular JS directives and Events. c) Using angular Js fetching data from MySQL.
Experiment-14	Develop and demonstrate Invoking data using Jscript from Mongo DB
Experiment-15	Create an Online fee payment form using JSCript and MangoDB.

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Department of Computer Science and Engineering

M.Tech	DEEP LEARNING LABORATORY	L	P	C
II Semester	Course Code:	0	4	2

COURSE OBJECTIVE
Understand the context of neural networks and deep learning

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Implement deep neural networks to solve real world problems	K3
CO2	Choose appropriate pre-trained model to solve real time problem	K3
CO3	Interpret the results of two different deep learning models	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO2	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO3	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3

Software Packages required: 1) Keras 2) Tensorflow 3) PyTorch	
List of Experiments:	
Experiment-1	Implement multilayer perceptron algorithm for MNIST Hand written DigitClassification.
Experiment-2	Design a neural network for classifying movie reviews (Binary Classification)using IMDB dataset
Experiment-3	Design a neural Network for classifying news wires (Multi class

	classification)using Reuters dataset.
Experiment-4	Build a Convolution Neural Network for MNIST Hand written Digit Classification.
Experiment-5	Build a Convolution Neural Network for simple image (dogs and Cats)Classification
Experiment-6	Use a pre-trained convolution neural network (VGG16) for image classification
Experiment-7	Implement one hot encoding of words or characters.
Experiment-8	Implement word embeddings for IMDB dataset.
Experiment-9	Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books	
1	Reza Zadeh and BharathRamsundar, "Tensorflow for Deep Learning",O'Reilly publishers, 2018
Reference Books	
1	https://github.com/fchollet/deep-learning-with-python-notebooks

M.Tech	**PEDAGOGY STUDIES**	**L**	**P**	**C**
II Semester	**Course Code:**	**2**	**0**	**0**

COURSE OBJECTIVES	
1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2	Identify critical evidence gaps to guide the development.

COURSE OUTCOMES		
At the end of the course, student will be able to		**Cognitive Level**
CO1	Remembering pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?	K1
CO2	Unserstanding is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?	K2
CO3	Applying teacher education (curriculum and practicum) andthe school curriculum and guidance materials best support effective pedagogy?	K3
CO4	Analyzing student abilities are developed as a professional	K4
CO5	Analyzing teacher educate towards research activities	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3

CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**Introduction and Methodology:** Aims and rationale, Polic background, Conceptual framework and terminology, Theories of learning Curriculum, Teacher education, Conceptual framework, Researc questions**,** Overview of methodology and Searching
Unit- II	**Thematic overview:** Pedagogical practices are being used by teachersin formal and informal classrooms in developing countries, Curriculum, Teachereducation.
Unit- III	**Evidence on the effectiveness of pedagogical practices:** Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy, Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.
Unit- IV	**Professional development:** Alignment with classroom practices and follow up support, Peer support, Support from the head teacher and the community Curriculum and assessment, Barriers to learning: limited resources and larg class sizes
Unit- V	**Research gaps and future directions:** Research design, Contexts Pedagogy, Teacher education, Curriculum and assessment, Disseminatio and research impact

Text Books	
1	Classroom interaction in Kenyan primary schools, Ackers J, HardmanF, Compare, 31 (2): 245-261, 2001
2	Curricular reform in schools: The importance of evaluation, Agrawal M, Journal of Curriculum Studies, 36 (3): 361-379, 2004
Reference Books	
1	Teacher training in Ghana: does it count? Multi-site teacher education research project (MUSTER) country report 1, Akyeampong K, London: DFID, 2003

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Department of Computer Science and Engineering

M.Tech	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	P	C
II Semester	Course Code:	2	0	0

COURSE OBJECTIVES	
1	To learn to achieve the highest goal happily
2	To become a person with stable mind, pleasing personality and determination
3	To awaken wisdom in students

COURSE OUTCOMES		
At the end of the course, student will be able to		Cognitive Level
CO1	Understanding of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life	K2
CO2	Analyzing the person who has studied Geeta will lead the nation and mankind to peace and prosperity	K4
CO3	Undersatandingof Neetishatakam will help in developing versatilepersonality of students.	K2
CO4	Understanding Shrimad-Bhagwad-Geeta besic knowledge	K2
CO5	Analyzing personality in Shrimad-Bhagwad-Geeta	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Unit I	Neetisatakam-Holistic development of personality, Verses- 19,20,21,22 (wisdom), Verses- 29, 31, 32 (pride & heroism), Verses- 26,28,63,65 (virtue), Verses- 52, 53, 59 (don'ts), Verses- 71,73,75,78 (do's)

Unit- II	Approach to day to day work and duties. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47, 48
Unit- III	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5, 13, 17, 23,35, Chapter 18- Verses 45, 46, 48
Unit- IV	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16, 17, 18
Unit- V	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36, 37, 42, Chapter 4-Verses 18, 38, 39,Chapter18 – Verses 37, 38, 63

Text Books	
1	Shrimad-Bhagwad-Geeta, His Divine Grace A.C. Bhaktivedanta Swami Prabhupada, **Publisher** Bhaktivedanta Book **Edition** Latest **Publication Date** 1 January 2019
2	Bhartrihari's Three Satakam (Niti-sringar-vairagya), P.Gopinath
Reference Books	
1	Rashtriya Sanskrit Sansthanam, New Delhi.

M.Tech	**MINING MASSIVE DATA SETS**	**L**	**P**	**C**
III Semester	**Course Code:**	**3**	**0**	**3**

COURSE OBJECTIVE
Analyze the concepts involved in Mining from massive datasets

COURSE OUTCOMES		
Upon Successful completion of course, the student will be able to		**Cognitive Level**
CO1	Remembering fundamentals of data mining	K1
CO2	Apply the concept of Map reduce and data streams for storing andprocessing of massive data sets	K3
CO3	Analyze the issues underlying the effective applications of massive datasets	K4
CO4	Analyze Association rules for mining algorithms	K4
CO5	Evaluate different clustering algorithms and analyze various decomposition techniques	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3

CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	Data Mining: Introduction, Statistical Modeling, Machine Learning, Computational Approaches to Modeling, Feature Extraction, Statistical Limits on Data Mining, Hash Functions, Indexes, Natural Logarithms, Power Laws. (CO 1)
Unit- II	Map Reduce and the New Software Stack: Distributed File Systems, Map Reduce, Algorithms Using MapReduce, Extensions to MapReduce, Complexity Theory for MapReduce (CO 2)
Unit- III	Mining Data Streams: The Stream Data Model, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Counting Ones in a Window, Decaying Windows. (CO 1, CO 2)
Unit- IV	Frequent Item sets: The Market-Basket Model, Market Baskets and the A-Priori Algorithm, Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream. (CO 1, CO 3)
Unit- V	Clustering: Introduction to Clustering Techniques, Hierarchical Clustering, K-means Algorithms, The CURE Algorithm, Clustering in Non-Euclidean Spaces, and Clustering for Streams and Parallelism. Dimensionality Reduction: Eigen values and Eigenvectors of Symmetric Matrices, Principal-Component Analysis, Singular-Value Decomposition, CUR Decomposition (CO 1, CO 4).

Text Books	
1	Mining of Massive Datasets - Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, Publisher Dreamtech Press Edition Second Publication Date 1 January 2016

M.Tech	**GENERATIVE AI**	**L**	**P**	**C**
III Semester	**Course Code:**	**3**	**0**	**3**

COURSE OBJECTIVES	
1	Understand the principles and concepts underlying Generative AI.
2	Explore various types of generative models and their applications.
3	Develop practical skills in implementing and training generative models.
4	Evaluate the performance and limitations of different generative AI techniques.
5	Analyze ethical considerations and emerging trends in Generative AI.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		**Cognitive Level**
CO1	Understanding the fundamental concepts of Generative AI and its applications.	K2
CO2	Implement and train different types of generative models, including GANsand sequence generation models.	K4
CO3	Analyzing assess the strengths and weaknesses of generative models invarious domains.	K4
CO4	Apply generative AI techniques to real-world problems and datasets.	K3

CO5	Evaluating awareness of ethical considerations in Generative AI andpropose responsible solutions.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	Introduction to Generative Al: “Drawing" Data from Models Applications of AI , The rules of probability, Why use generative models, Style transfer and image transformation
Unit- II	Building Blocks of Deep Neural Networks Perceptrons — a brain in a function, Multi-layer perceptrons and backpropagation, Varieties of networks: Convolution and recursive, Networks for seeing: Convolutional architectures, Networks for sequence data RNNs and LSTMs
Unit- III	Image Generation with GANs, The taxonomy of generative models Generative adversarial networks, Vanilla GAN, Improved GANs, Progeressive GAN
Unit- IV	Deepfakes with GANs, Deepfakes overview, Modes of operation, Key feature set, High-level workflow, Replacement using autoencoders, Re-enactment using pix2pix
Unit- V	Composing Music with Generative Models Getting started with music generation, Music generation using LSTMs, Music generation using GANs, MuseGAN — polyphonic music generation, Emerging applications in generative AI

Text Books	
1	Generative AI with Python and TensorF,low 2, Joseph Babcock, Raghav Bali, Publisher Packt Publishing,Edition 1 Publication Date 30 April 2021
2	Hands-On Generative Adversarial Networks with Keras, Rafael Valle, Packt Publishing

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Department of Computer Science and Engineering

M.Tech	SOFTWARE DEFINED NETWORKS	L	P	C
III Semester	Course Code:	3	0	3

COURSE OBJECTIVES	
1	Understand the principles and concepts of Software Defined Networking.
2	Learn about the architecture and components of SDN.
3	Explore SDN programming and network virtualization.
4	Gain hands-on experience in deploying SDN solutions.
5	Analyze the impact of SDN on network management and security.

COURSE OUTCOMES		
Upon completion of the course, students should be able to:		Cognitive Level
CO1	Understanding the principles and advantages of Software Defined Networking.	K2
CO2	Analyzing the architecture and components of an SDN.	K4

CO3	Applying SDN applications using programming languages.	K3
CO4	Evaluate the performance and scalability of SDN solutions.	K2
CO5	Analyzing the impact of SDN on network management and security.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution Of Course Outcomes Towards Achievement Of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3

Unit I	**Introduction to SDN**Evolution of Networking Paradigms, Challenges in Traditional Network Architectures, Principles of Software Defined Networking, SDN Use Cases and Applications
Unit- II	**SDN Architecture and Components** SDN Controller: Functions and Types Southbound APIs (e.g., OpenFlow), Northbound APIs for SDN Applications Data Plane and Control Plane Separation
Unit- III	**SDN Programming** Programming SDN Applications, SDN Language and Tools (e.g., P4, ONOS), Network Function Virtualization (NFV), SDN Orchestration and Automation
Unit- IV	**Deployment of SDN Solutions** SDN in Data Centers, SDN in Wide Area Networks (WAN), SDN in InternetService Providers (ISPs), Case Studies of SDN Deployments
Unit- V	**SDN Management and Security** Network Management in SDN, Security Challenges in SDN, SDN Security Mechanisms, Future Trends in SDN

Text Books	
1	Software Defined Networks: A Comprehensive Approach, Paul Goransson, Chuck Black, **Publisher:** Morgan Kaufmann, 30 June 2014
2	"SDN: Software Defined Networks" by Thomas D. Nadeau and Ken Gray, August 2013, Publisher(s): O'Reilly Media, Inc.

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