BOARD OF STUDIES MEETING – 2021-22

K.S.R.M COLLEGE OF ENGINEERING

AUTONOMOUS

Minutes of the Meeting

Date	**22.09.2021**	**Day**	**Wednesday**
Time	**11.30AM**	**Venue**	**Virtual meeting: http://meet.google.com/hbe-hcep-ofv**
Dept./SS	**CSE**	**Convener**	**Dr. M. Sreenivasulu**

Members Present:12 **MembersAbsent: 01**

S.No	Name	Designation	Signature	S.No	Name	Designation
1.	Dr. M. Sreenivasulu	Prof., & HOD CSE, KSRMCE		1	Dr. D. Janakiram	Prof., Dept. of CSE, IITM, Chennai
2.	Dr. RBV Subramanyam	Prof., & HOD CSE, NITW				
3.	Dr. C. ShobaBindu	Prof., in CSE, JNTUA				
4.	Dr. G. Varaprasad	Alumni, Prof., BMS College of Engg., Bangalore				
5.	Dr. B.V. Ramana Reddy	Prof., KSRMCE				
6.	Dr. V. Lokeswara Reddy	Prof., KSRMCE				
7.	Dr. N. Ramanjaneya Reddy	Associate Prof., KSRMCE				
8.	Dr. M.V. Rathnamma	Associate Prof., KSRMCE				
9.	Smt. B. Manorama Devi	Assistant Prof., KSRMCE				
10.	Sri. G. NagendraBabu	Assistant Prof.,				

		KSRMCE			
11.	Sri. S. Khaja Khizar	Assistant Prof., KSRMCE	S.Khizar		
12.	Sri. CH. Sreedhar	Industry			

Dr. M. Sreenivasulu, welcomed all the members to the meeting and presented the agenda of the meeting.

The resolutions are:

	Todo item	**Discussion**	**Resolution**	**Coordinator/in-charge**
1	To finalize the curriculum and syllabus for VII sem & VIII sem B.Tech (CSE) under R18 Regulations.	The Head of the Department has presented the curriculum and the syllabus designed by the faculty after taking the feedback from all stakeholders and comparing with premier institute syllabus.	The committee has approved curriculum and syllabus for VII sem and VIII sem B.Tech CSE under R-18 Regulations which also includes New Courses, Open Electives and Professional Electives. The approved course structure is enclosed in Annexure – 1.	Dr. M. Sreenivasulu
2	To finalize the curriculum and syllabus for III sem and IV sem B.Tech (CSE) under R20 Regulations.	The Head of the Department has presented the curriculum and the syllabus designed by the faculty after taking the feedback from all stakeholders and comparing with premier institute syllabus	The committee has approved curriculum and syllabus for III sem & IV sem B.Tech CSE under R20 regulations which also includes new courses. The approved course structure is enclosed in Annexure -2.	Dr. B. V. Ramana Reddy
3	To finalize the curriculum and syllabus for I sem and II sem B.Tech (AI &ML) under R20 Regulations.	The Head of the Department has presented the syllabus designed by the faculty after taking the feedback from all stakeholders and	The committee has approved the course structure with and syllabus with certain modifications for I Sem & II Sem B. Tech (AI & ML) (R20). (i)The committee suggested to change the "Problem solving with algorithm thinking lab" to "Problem solving using C lab" in I Sem. (ii)The committee suggested to change the theory subject	Dr. V. Lokeswara Reddy

		institute syllabus	syllabus should contain the topics related to "Data Structures" in II Sem. The syllabus was modified accordingly. The Committee approved the curriculum and syllabus of I Sem & II Sem B.Tech AI & ML (R20 regulations). The approved course structure is enclosed in Annexure-3.	
4	To finalize the curriculum and syllabus for I sem to IV sem M.Tech (AI & DS) under R18 Regulations.	The Head of the Department has presented the syllabus designed by the faculty after taking the feedback from all stakeholders and comparing with premier institute syllabus	The committee has approved the course structure with certain modifications and syllabus for I Sem to IV Sem of M. Tech (AI & DS) (R18). (i)The committee suggested to offer the subject "Machine Learning" in place of "Data Science" as Professional Core- 1 subject in I Sem. (ii) The committee suggested to offer "AI & Machine Leaning lab" in place of "Artificial Intelligence Lab" in I Sem. (iii) The committee suggested to offer "Software Lab-1" covering the experiments from Professional Elective-1 & Elective -2 in I Semester in place of "Data Science Lab". (iv) The committee suggested to offer the subject "Big Data Analysis" in place of to "Soft computing" subject in Professional Elective-1 and also "Advanced Data Mining" subject in place of "Data warehouse and data mining" in Professional Elective-2 in I Sem. (v) The committee suggested to offer the subject "Data science" in place of "Big Data Analysis" in Professional Core-3 in II Sem. (v) The committee suggested to offer "Software lab-2" covering experiments from Professional Electives 3 & 4 in place of "Big Data Analysis lab" in II Sem.	Dr. N. Ramanjaneya Reddy
5.	To finalize and approve the syllabus for Certificate Courses/Skill Courses/Employability Courses/Entrepreneursh	The Head of the Department has presented the syllabus for certification courses and skill courses, designed by	The committee appreciated the certification courses to be offered by department and approved the content for offering Certificate Courses/Skill Courses/Employability Courses/Entrepreneurship.	Dr. M. V. Rathnamma

	ip.	the faculty after taking the feedback from all stakeholders.		
6.	Feedback/suggestions from stake holders and action taken report.	The Head of the Department presented Feedback and suggestions from stakeholders and also action taken report by the department.	The committee approved action taken report on suggestions and feedback given by stakeholders. The suggestions/feedback from stakeholders and action taken report is enclosed in Annexure-4.	Smt. B. Manorama Devi
7.	Department Review Committee Report.	The head of the department presented Department Review Committee report.	The committee taken into the consideration of Department Review Committee report presented by the Head of Department while approving the curriculum and syllabus.	Sri. S. Khaja Khizar

The Head of the Department have proposed the Vote of thanks and concluded the meeting.

Convener

Dr. M. Sreenivasulu,
M. E., Ph. D.
Professor & HOD CSE
K.S.R.M. College of Engineering
K.A.D. 516 003

CSE 305

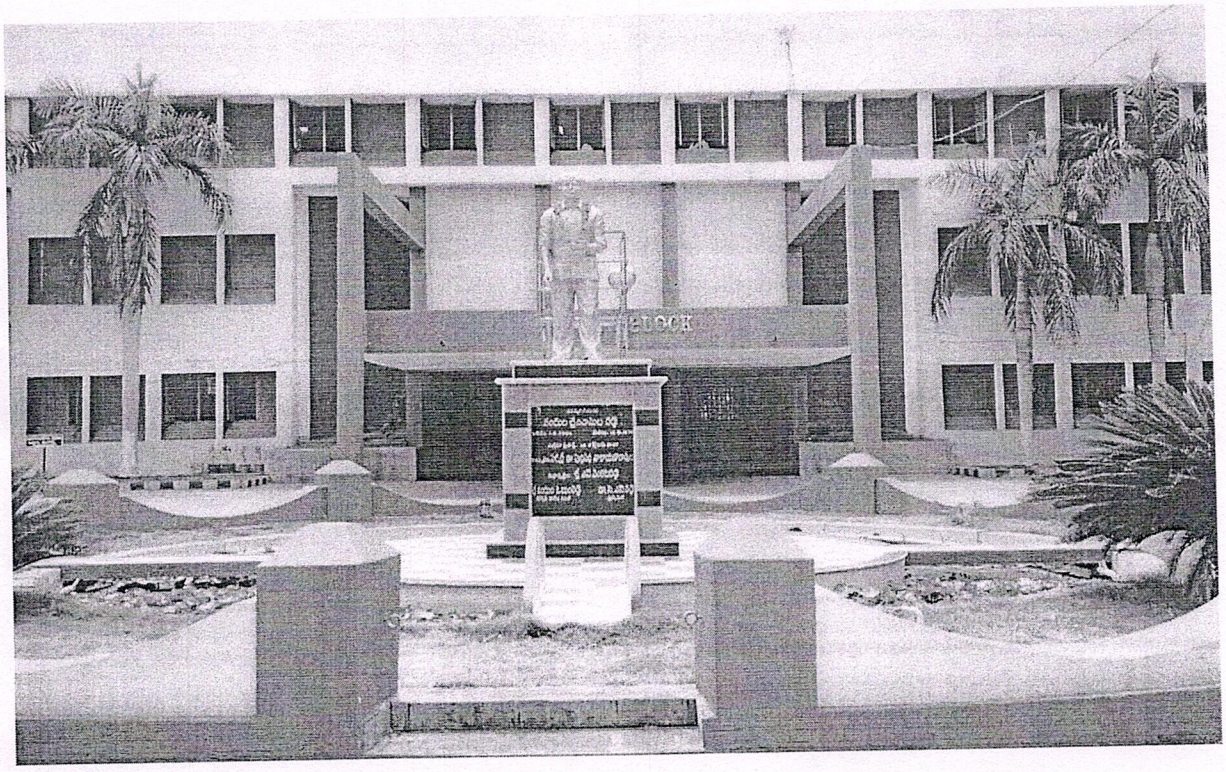
DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE AND SYLLABUS

FOR

B.Tech CSE (I Sem - VIII Sem) (R18 Regulations)

(Effective from 2018-19 for Regular students and from 2019-20 for Later Entry students)



KANDULA SREENIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING (AUTONOMOUS)

KADAPA - 516005, AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

VI SEMESTER

Subject Code	Subject Category	Course Name	L	T	P	IM	EM	CR
1805601	PCC	Internet of Things	3	0	0	30	70	3
1805602	PCC	Data Mining	3	0	0	30	70	3
1805603 1805604 1805605	PEC	**Professional Elective-2** 1. Artificial Intelligence 2. Software Testing 3. Mobile Adhoc Networks	3	0	0	30	70	3
18OE501 18OE502	OEC	**Open Elective-1** 1. Data Structures 2. Database Management Systems	3	0	0	30	70	3
1825609	HSC	Management Science	3	0	0	30	70	3
1805608	PCC	Mobile Application Development	3	0	0	30	70	3
1805609	PCC	Internet of Things Lab	0	0	2	50	50	1
1805610	PCC	Mobile Application Development Lab	0	0	2	50	50	1
1805611	Project	Internship	--	--	--	100	--	2
		TOTAL	**18**	**0**	**04**	**380**	**520**	**22**

VII SEMESTER

Subject Code	Subject Category	Course Name	L	T	P	IM	EM	CR
1805701	PCC	Machine Learning	3	0	0	30	70	3
1805702	PCC	Big Data Technologies	3	0	0	30	70	3
1805703 1805704 1805705	PEC	**Professional Elective-3** 1. Computer Graphics 2. Design Patterns 3. Cloud Computing	3	0	0	30	70	3
18OE503 18OE504	OEC	**Open Elective-2** 1. Python Programming 2. Computer Networks	3	0	0	30	70	3
18OE505 18OE506	OEC	**Open Elective-3** 1. Web Technologies 2. Operating Systems	3	0	0	30	70	3
1805710	PCC	Big Data Technologies Lab	0	0	2	50	50	1
1805711	PCC	Machine Learning Lab	0	0	2	50	50	1
1805712	Project	Technical Seminar	0	0	2	100	--	1
1805713	Project	Project-I	0	0	8	100	--	4
		TOTAL	**15**	**0**	**14**	**450**	**450**	**22**

Dr. V. LOKESWARA REDDY
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Professor & HOD CSE
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VIII SEMESTER

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1805801 1805802 1805803	PEC	**Professional Elective-4** 1. Cyber Security 2. Object Oriented Analysis & Design 3. Deep Learning	3	0	0	30	70	3
18OE507 18OE508	OEC	**Open Elective-4** 1. Software Engineering 2. Cloud Computing	3	0	0	30	70	3
1805806	Project	Project-II	0	0	12	50	50	6
		TOTAL	**6**	**0**	**12**	**110**	**190**	**12**

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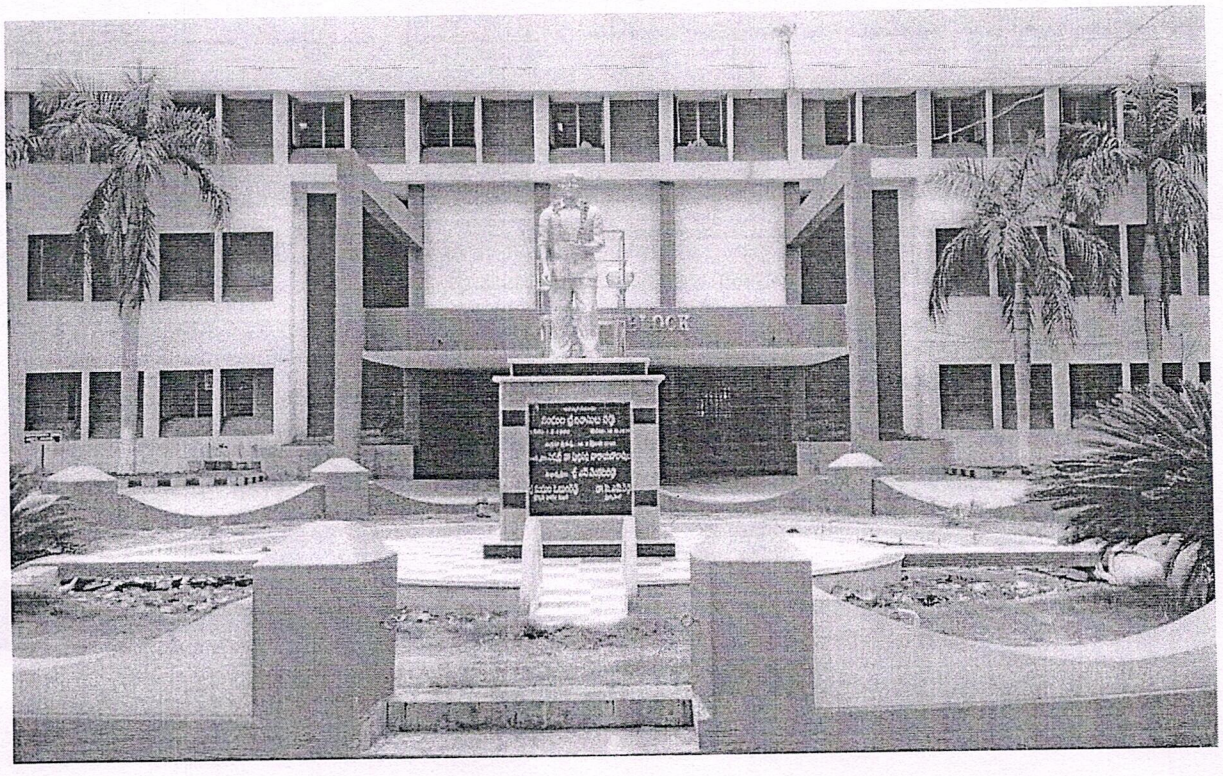
UG Programs in Engineering (R20UG)
Curriculum and Syllabus for

I - VIII Sem B.Tech

Department of Computer Science and Engineering



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II Semester (Theory-05,Lab-05)

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2021201	Differential Equations & Vector Calculus	BSC	3	0	0	40	60	3
2	20AP202	Applied Physics	BSC	3	0	0	40	60	3
3	2024203	Communicative English	HSMC	3	0	0	40	60	3
4	2005204	Python Programming	ESC	3	0	0	40	60	3
5	2003205	Engineering Drawing	ESC	1	0	2	40	60	2
6	2003206	Engineering Drawing Lab	ESC	0	0	2	40	60	1
7	20AP207	Applied Physics Lab	BSC	0	0	3	40	60	1.5
8	2024208	Communicative English Lab	HSMC	0	0	3	40	60	1.5
9	2005209	Python Programming Lab	ESC	0	0	3	40	60	1.5
10	20MC210	Environmental Science	MC	3	0	0	40	00	0.0
Total				16	00	13	390	540	19.5

III Semester (Theory-05,Lab-03)

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2024301	Business Economics and Accounting for Engineers	HSMC	3	0	0	40	60	3
2	2005302	Advanced Data Structures	PCC	3	0	0	40	60	3
3	2005303	Formal Languages & Automata Theory	PCC	3	0	0	40	60	3
4	2005304	Object Oriented Programming through JAVA	PCC	3	0	0	40	60	3
5	2005305	Data Base Management Systems	PCC	3	0	0	40	60	3
6	2005306	Advanced Data Structures Lab	PCC	0	0	3	40	60	1.5
7	2005307	JAVA Lab	PCC	0	0	3	40	60	1.5
8	2005308	Data Base Management Systems Lab	PCC	0	0	3	40	60	1.5
9	2005309	Skill Oriented Course Exploring Data Analysis with R	SC	0	0	4	40	60	2.0
Total				15	00	13	400	540	21.5

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IV Semester (Theory-05,Lab-03)

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2004401	Microprocessors & Microcontrollers	ESC	3	0	0	40	60	3
2	2005402	Computer Organization	PCC	3	0	0	40	60	3
3	2005403	Principles of Operating Systems	PCC	3	0	0	40	60	3
4	2005404	Digital Logic Circuits & Design	PCC	3	0	0	40	60	3
5	2021405	Probability Theory & Statistical Methods	BSC	3	0	0	40	60	3
6	2004406	Microprocessors & Microcontrollers Lab	ESC	0	0	3	40	60	1.5
7	2005407	Principles of Operating Systems Lab	PCC	0	0	3	40	60	1.5
8	2005408	Digital Logic Design Lab	PCC	0	0	3	40	60	1.5
9	2005409	Skill Oriented Course Advanced Python Programming	SC	0	0	4	40	60	2.0
10	2024410	Universal Human Values	MC	3	0	0	40	60	3.0
Total				18	00	13	400	600	24.5

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CSE/BOS Mtg

Department of Artificial Intelligence & Machine Learning

COURSE STRUCTURE AND SYLLABUS

FOR

B.Tech AI & ML (I Sem & II Sem) (R20 Regulations)

Kandula Srinivasa Reddy Memorial College of Engineering
(Autonomous)
Kadapa 516005, AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

Artificial Intelligence & Machine Learning
Course Structure

Semester - 1								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2021101	BS	Linear Algebra & Calculus	3	-	-	40	60	3
2023102	BS	Environmental Chemistry	3	-	-	40	60	3
2006103	ES	Problem Solving with Algorithmic thinking	2	-	-	40	60	2
2024104	HS	Professional Communication	2	-	-	40	60	2
2006105	ES	Python Programming	3	-	-	40	60	3
20AG106	BS	Agriculture for Engineers & Field Activity	-	-	3	40	60	1.5
2003107	ES	Introduction to Digital Manufacturing	2	-	-	40	60	2
2006108	ES	Problem Solving using C Lab	-	-	3	40	60	1.5
2006109	ES	Python Programming Lab	-	-	3	40	60	1.5
20MC110	MC	Indian Traditional Knowledge	3	-	-	40	-	---
								19.5

Semester - 2								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2006201	ES	Introduction to machine learning	1	-	-	40	--	0
20BE202	BS	Biology for Engineers	2	-	-	40	60	2
2006203	ES	Data Structures	3	-	-	40	60	3
2021204	BS	Mathematics for Intelligent Systems	2	-	-	40	60	2
2006205	ES	Object Oriented Programming through Java	3	-	-	40	60	3
20AP206	BS	Applied Physics	2	-	-	40	60	2
2004207	ES	Principles of Measurements & Sensors	3	-	-	40	60	3
2006208	ES	Data Structures Lab	-	-	3	40	60	1.5
2024209	HS	Communication Skills lab	-	-	3	40	60	1.5
2006210	ES	Java Programming Lab	-	-	3	40	60	1.5
20MC211	MC	Community work / NSS	2	-	-	40	-	---
		Total						**19.5**

*** To get the first year result they should get a social intern with government or NGO.**

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ACADEMIC REGULATIONS (R18)
COURSE STRUCTURE AND DETAILED SYLLABUS

MASTER OF TECHNOLOGY
IN
ARTIFICIAL INTELLIGENCE & DATA SCIENCE

For

M.Tech.- Regular Two Year Post Graduate Degree Programe
(Applicable for the batches admitted from 2022-23)

KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING
(UGC-Autonomous)
Kadapa 516005, A.P

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 14001:2004 & 9001: 2015 Certified Institution)

E-mail: principal@ksrmce.ac.in **Website:** www.ksrmce.ac.in

M.Tech. (Artificial Intelligence & Data Science)-R18 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

M.Tech SEM-I

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1898101	*Professional Core-1* Machine Learning	3	0	0	40	60	3
2	1898102	*Professional Core-2* Artificial Intelligence	3	0	0	40	60	3
3	1898103 1898104 1898105	*Professional Elective-1* 1. Big data Analytics 2. Information Retrieval 3. Privacy Preserving Data Publishing	3	0	0	40	60	3
4	1898106 1898107 1898108	*Professional Elective-2* 1. Data Visualization Techniques 2. Advanced Data Mining 3. Cloud Data Management	3	0	0	40	60	3
5	1898109	Research Methodology & IPR	3	0	0	40	60	2
6	1898110	Audit Course-1	2	0	0	40	--	0
7	1898111	AI & Machine Learning Lab	0	0	4	50	50	2
8	1898112	Software Lab-1 (for electives)	0	0	4	50	50	2
		Total:	**17**	**0**	**08**	**340**	**400**	**18**

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M.Tech SEM-II

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1898201	*Professional Core-3* Data Science	3	0	0	40	60	3
2	1898202	*Professional Core-4* Deep Learning	3	0	0	40	60	3
3	1898203 1898204 1898205	*Professional Elective-3* 1. Natural Language Processing 2. Exploratory Data Analysis using R 3. Knowledge Engineering and Data Science	3	0	0	40	60	3
4	1898206 1898207 1898208	*Professional Elective-4* 1. Text Mining 2. Social network Analysis 3. Artificial Intelligence in Cyber Security	3	0	0	40	60	3
5	1898209	Audit Course-2	2	0	0	40	--	0
6	1898210	Deep Learning Lab	0	0	4	50	50	2
7	1898211	Software Lab-2 (for Electives)	0	0	4	50	50	2
8	1898212	Mini Project with Seminar	2	0	0	100	--	2
		Total	**16**	**0**	**08**	**400**	**340**	**18**

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M.Tech SEM-III

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1898301 1898302 1898303	*Professional Elective-5* 1. Genetic Algorithms 2. Machine Learning Models and Storage Management 3. Scalable Systems for Data Science	3	0	0	40	60	3
2	1898304 1898305 1898306 1898307 1898308 1898309	*Open Elective* 1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	3	0	0	40	60	3
3	1898310	*Major Project* Phase-I Dissertation	0	0	20	100	--	10
		Total:	**6**	**0**	**20**	**180**	**120**	**16**

M.Tech SEM-IV

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1898401	*Major Project* Phase-II Dissertation	0	0	32	40	60	16
		Total:	**0**	**0**	**32**	**40**	**60**	**16**

Dr. M. LOKESWARA REDDY
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Course Title	MACHINE LEARNING				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805701	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To study the various probability-based and generalized learning techniques.
- To understand ensemble models of machine learning algorithms.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the machine learning concepts that are suitable for developing real time applications
CO 2	Understand the concept of decision tree classifier and develop a model for a given problem.
CO 3	Apply instant based learning to solve a real time problem.
CO 4	Understand the concepts of probability and Bayes's machine learning algorithms.
CO 5	Evaluate different clustering algorithms.

UNIT – I

Introduction: Introduction to Machine Learning: Introduction, Different types of learning, Applications of Machine Learning, Parametric and Nonparametric Machine Learning Algorithms, Training and test sets, cross validation. Linear Regression: Introduction, Linear Models for Regression.

UNIT – II

Decision Tree Learning: Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis spacesearch in decision tree learning, inductive bias in decision tree learning, issues indecision tree learning, Avoiding Over fitting the Data.

UNIT – III

Instance Based Learning: K nearest neighbor, the Curse of Dimensionality, Over fitting and Under fitting, Feature Selection: forward search, backward search, univariate, multivariate feature selection approach, Dimensionality Reduction, Linear Discriminant Analysis, Principal Component Analysis.

UNIT – IV

Probability and Bayes Learning: Brute-Force Bayes Concept Learning, Maximum Likelihood Hypothesis, Naïve Bayes Classifier, Logistic Regression, Support Vector Machine:Introduction, the Dual formulation, Maximum margin with noise, nonlinear SVM and Kernelfunction, Beyond Binary Classification.

UNIT – V

Evaluating Machine Learning algorithms and Model Selection, Ensemble Learning: Introduction, Bagging and boosting, Random forest. Clustering: Introduction, K-mean clustering, K-medoids clustering, Hierarchical clustering - Agglomerative clustering –Divisive clustering-Choosing the number of clusters.

Text Books:

1. Machine Learning, Tom M.Mitchell, McGraw-Hill
2. Machine Learning: A Probabilistic Perspective,KevinMurphy,MITPress,2012
3. Pattern Recognition and Machine Learning, Christopher Bishop,Springer,2007.
4. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor &Francis

Reference Books:

1. Machine Learning: The Art and Science of Algorithms That Make Sense of Data, Peter Flash, Cambridge, University Press
2. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshi rani, Jerome Friedman, Springer, 2009.
3. Machine Learning: Pocket Reference, Matt Harrison, O'Reilly Media.
4. Introduction Machine Learning, Ethem Alpaydin, 3rd Edition, The MIT Press.

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Course Title	BIG DATA TECHNOLOGIES				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805702	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To study the big data characteristics and its history
- To provide students with knowledge in HDFS concepts and interfaces
- To acquire conceptual understanding of MapReduce Framework and its classes
- To make learners aware about MapReduce job runs
- To provide overview of Hadoop Database applications

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the Bigdata characteristics.
CO 2	Make use of HDFS interfaces to read and write files.
CO 3	Analyze the data with MapReduce classes.
CO 4	Build the development environment of Hadoop to run the job on local job runner and on a cluster.
CO 5	Summarize the database applications of Hadoop and Pig.

UNIT - I

Introduction to Big Data, Why is Big Data, Why Big Data is important, Meet Hadoop, Data, Data Storage and Analysis, Comparison with other systems, Grid Computing, A briefhistory of Hadoop, Apache Hadoop and the Hadoop EchoSystem, Linux refresher; VMWare Installation of Hadoop.

UNIT - II

The Design of HDFS, HDFS Concepts, Command Line interface to HDFS, Hadoop File Systems, Interfaces, Java Interface to Hadoop, Anatomy of a file read, Anatomy of a file write, Replica placement and Coherency Model, Parallel copying with distcp, Keeping an HDFS cluster balanced.

UNIT - III

Introduction, Analyzing data with unix tools, Analyzing data with Hadoop, Java MapReduce classes(new API), Data flow, combiner functions, Running a distributed MapReduce job, Configuration API, Setting up the developing environment, Managing configuration, Writing a unit test with MRUnit, Running ajob in local job runner, Running on a cluster, Launching a job, The MapReduce WebUI.

UNIT - IV

Classic MapReduce, Job submission, Job initialization, Task Assignment, Taskexecution, Progress and status updates, Job Completion, Shuffle and sort on Map and Reducer side, Configuration tuning, Map Reduce types, Input formats, Sorting, Map side and Reduce side joins.

UNIT - V

Hive: The Hive Shell, Hive services, Hive clients, The meta store, comparison withtraditional databases, Hive QI, Hbasics, Concepts, implementation, Java and Map reduce clients, Loading Data, Web queries.

Pig: Introduction to Pig, Pig Latin.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide" , 3rd Edition, O'Reilly Publications,2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Undetstanding Big Data Analytics for Enterprise class Hadoop and StreamingData", 1st Edition, TMH, 2012.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to DataScience and its Applications, Wiley Publications, 2014.
4. Big Data Technologies and Applications, Borko Furht, Flavio Villanustre, Springer.

Reference Books:

1. Hand Book of Big Data Technologies, Albert Y. Zomaya, Sherif Sakr, Springer.
2. Big Data Analytics: Tools and Technology for Effective Planning, Arun K. Somani, Ganesh Chandra Deka, CRC Press.
3. Big Data, Big Analytics, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley and Sons.

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Course Title	COMPUTER GRAPHICS (Professional Elective-3)				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805703	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To apply the rules and algorithms in generating graphical outputs.
- To develop multi-dimensional objects using suitable transformations.
- To Develop real-time rendering graphics.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Classify CRT, Color CRT, DVST, Flat Panel display devices and Graphical Input Devices.
CO 2	Understand DDA, Bresenhams line drawing algorithms and Midpoint circle generating algorithms, clipping of polygons.
CO 3	Exemplify 2D & 3Dtranslation, rotation, reflection, scaling and shearing.
CO 4	Compare RGB, CMY,YIQ, CMYK Color models.
CO 5	Summarize types of animation, Animation sequence and morphing technique.

UNIT - I

Introduction: Usage of Graphics and their applications, Presentation Graphics- Computer Aided Design- Computer Art- Entertainment- Education and Training- Visualization- Image Processing Graphical User Interfaces.

Overview of Graphics systems: Video Display Devices- Raster Scan systems-random scan systems Graphics monitors and workstations-Input devices-hard copy devices- Graphics software.

UNIT - II

Scan Converting Lines – Basic Incremental algorithm, Midpoint algorithm and additional issues; Scan converting Circles, Scan Converting Ellipses, Solid Filling, Pattern Filling, Thick Primitives, Cohen – Sutherland line clipping algorithm, Parametric line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm, Generating characters.

UNIT - III

Geometrical transformations – 2D transformations, Homogeneous coordinates, Matrix representation of 2D transformations, Composition of 2D transformations, Window to view- port transformation, Matrix representation of 3D transformations, Composition of 3Dtransformations.

Representing Curves and Surfaces – Polygon meshes, Parametric cubic curves, Parametric bicubic surfaces and Quadratic surfaces.

UNIT - IV

Viewing in 3D – Projections, Specifying an arbitrary 3D view.

Solid Modeling – Representing Solids, Regularized Boolean set operations, Primitive instancing, Sweep Representation, Boundary Representations, Spatial-Partitioning Representations.

Achromatic and Colored Light – Achromatic light, Chromatic color, Color models for raster graphics, Reproducing color, Using color in computer graphics.

UNIT - V

Illumination Models – Ambient light, Diffuse reflection, Atmospheric attenuation.

Shading Models – Constant shading, Interpolated shading, Polygon mesh shading, Gouraudshading, Phong shading.

Animation – Conventional and Computer–Assisted animation, Animation languages,Methods of controlling animation, Basic rules of animation, Problems peculiar to animation.

Text Books:

1. Foley, Van Dam, Feiner and Hughes, Computer Graphics – Principles and Practice, 2nd Edition in C, Pearson Education, 2004
2. Donald Hearn and M. Pauline Baker, Computer graphics, C version, Prentice – Hall.
3. William M. Newman, Robert F. Sproull, Principles of interactive computer graphics, 12thEdition, McGraw – Hill, 1986.
4. David F. Rogers, Rae A. Earnshaw, Computer Graphics Techniques : Theory and Practice,Springer-Verlag, 1990.

Reference Books:

1. Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.
2. Fundamentals of Computer Graphics, Steve Marschner, Peter Shirley, 4th Edition, CRC Press.
3. Introduction to Computer Graphics:A Practical Learning Approach, Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto, CRC Press.
4. Computer Gaphics, Amarendra N. Sinha, Arun D Uadi, Tata McGraw Hill.

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Course Title	DESIGN PATTERNS (Professional Elective-3)				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805704	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To understand design patterns and their underlying object oriented concepts
- To understand implementation of design patterns and providing solutions to realworld software design problems.
- To understand patterns with each other and understanding the consequences ofcombining patterns on the overall quality of a system

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Know the underlying object oriented principles of design patterns.
CO 2	Understand the context in which the pattern can be applied.
CO 3	Understand how the application of a pattern affects the system quality and its tradeoffs.

UNIT - I

Introduction to Design Patterns: Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, Use of Design Patterns.

UNIT - II

Designing A Document Editor: A Case Study: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation. Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - III

Structural Patterns-1: Adapter, Bridge, Composite. Structural Patterns-2: Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT - IV

Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns-2: Mediator, Memento, Observer.

UNIT - V

Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, and Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community, An Invitation, A Parting Thought.

Text Books:

1. Design Patterns by Erich Gamma, Pearson Education.
2. Pattern's in JAVA Vol-I By Mark Grand, Wiley DreamTech.
3. Pattern's in JAVA Vol-II By Mark Grand, Wiley DreamTech.
4. JAVA Enterprise Design Patterns Vol-III By Mark Grand, Wiley DreamTech

Reference Books:

1. Head First Design Patterns By Eric Freeman-Oreilly-spd
2. Design Patterns Explained By Alan Shalloway, Pearson Education.
3. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.

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Course Title	CLOUD COMPUTING (Professional Elective-3)				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1805705	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs			

Course Objectives:

- To explain the cloud paradigms.
- To introduce the various levels of services that can be achieved by cloud.
- To know about service providers of cloud.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Recall different computing paradigms.
CO 2	Understand the evolution of cloud computing paradigm and its architecture.
CO 3	Explain and characterize different cloud deployment models and service models.
CO 4	Understand programming models and API's in Cloud Computing.
CO 5	Identify the Data Center environment and service providers in cloud computing.

UNIT - I

Computing Paradigms:

High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Cloud Computing Fundamentals:

Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Computing Is a Service, Cloud Computing Is a Platform. Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

UNIT - II

Cloud Computing Architecture and Management: Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT - III

Cloud Deployment Models: Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

Virtualization: introduction, Virtualization opportunities, Approaches to virtualization, Hypervisors, From virtualization to cloud computing.

UNIT - IV

Programming Models in Cloud: Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka.

Software Development in Cloud : Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology.

UNIT - V

Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers.

Cloud Service Providers: Introduction, EMC, Google, Amazon Web Services, Microsoft, IBM, Salesforce, Rackspace.

Text Books:

1. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
3. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing:Principles and Paradigms, Wiley, 2011.
4. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems andApplications, Springer, 2012.

Reference Books:

1. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill.
2. Cloud Computing Theory and Practice: Dan C. Marinescu, Elsevier.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing.
4. Cloud Computing and Virutualization, Dac-Nhuong Le, Raghavendra Kumar, Gia Nhu Nguyen, Jyir Moy Chatterjee, Wiley.

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Course Title	BIG DATA TECHNOLOGIES LAB				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805710	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	2	1	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Optimize business decisions and create competitive advantage with Bigdata analytics.
- Practice java concepts required for developing mapreduce programs.
- Impart the architectural concepts of Hadoop and introducing mapreduce paradigm.
- Practice programming tools PIG and HIVE in Hadoop ecosystem.
- Implement best practices for Hadoop development.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the installation of VMW are and PIG.
CO 2	Understand and apply the setting up and Installing Hadoop in its three operating modes.
CO 3	Implement the file management tasks in Hadoop.
CO 4	Understand MapReduce Paradigm.
CO 5	Understand Pig Latin scripts sort, group, join, project, and filter your data.

LIST OF EXPERIMENTS

1. Installation of VMW is to setup the Hadoop environment and its ecosystems.

2. **A**. Perform setting up and Installing Hadoop in its three operating modes.
   I. Standalone.
   II. Pseudo distributed.
   III. Fully distributed.
   B. Use web based tools to monitor your Hadoop setup.

3. Implementing the basic commands of LINUX Operating System File/Directory creation, deletion, and update operations.

4. Implement the following file management tasks in Hadoop:
   I. Adding files and directories
   II. Retrieving files
   III. Deleting files
   Hint: A typical Hadoop work flow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

5. Run a basic word count MapReduce program to understand MapReduce Paradigm.

6. Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

7. Implement matrix multiplication with Hadoop MapReduce.

8. Installation of PIG.

9. Write Pig Latin scripts sort, group, join, project, and filter your data.

10. A. Run the Pig Latin Scripts to find Word Count.
    B. Run the Pig Latin Scripts to find a max temp for each and every year.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide" , 3rd Edition, O'Reilly Publications,2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Undetstanding Big Data Analytics for Enterprise class Hadoop and StreamingData", 1st Edition, TMH, 2012.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to DataScience and its Applications, Wiley Publications, 2014.
4. Big Data Technologies and Applications, Borko Furht, Flavio Villanustre, Springer.

Reference Books:

1. Hand Book of Big Data Technologies, Albert Y. Zomaya, Sherif Sakr, Springer.
2. Big Data Analytics: Tools and Technology for Effective Planning, Arun K. Somani, Ganesh Chandra Deka, CRC Press.
3. Big Data, Big Analytics, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley and Sons.

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Course Title	MACHINE LEARNING LAB				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805711	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	2	1	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To get an overview of the various machine learning techniques and able to demonstrate them using python.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand complexity of Machine Learning algorithms and their limitations.
CO 2	Understand modern notions in data analysis-oriented computing.
CO 3	Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
CO 4	Be capable of performing experiments in Machine Learning using real-world data.

LIST OF EXPERIMENTS

1. Download, Install Anaconda on Windows and understand environment.
2. Data Pre-processing
    a. Importing the Data set
    b. Missing Data
    c. Splitting the dataset into the Training set and Test set
    d. Feature Scaling
3. Implement Simple Linear Regression using python.
4. Implement decision tree algorithm using python.
5. Implement k-nearest neighbor's classification using python.
6. Implement Principal Component Analysis (PCA) using python.
7. Implement Naive Bayes using python.
8. Implement Support Vector Machine (SVM) using python.
9. Implement K-Means Clustering using Python.
10. Implement Hierarchical Clustering using Python.

Text Books:

1. Machine Learning, Tom M.Mitchell, McGraw-Hill
2. Machine Learning: A Probabilistic Perspective,KevinMurphy,MITPress,2012
3. Pattern Recognition and Machine Learning, Christopher Bishop,Springer,2007.
4. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor &Francis

Reference Books:

1. Machine Learning: The Art and Science of Algorithms That Make Sense of Data, Peter Flash, Cambridge, University Press
2. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshi rani, Jerome Friedman, Springer, 2009.
3. Machine Learning: Pocket Reference, Matt Harrison, O'Reilly Media.
4. Introduction Machine Learning, Ethem Alpaydin, 3rd Edition, The MIT Press.

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Course Title	TECHNICAL SEMINAR				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805712	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	2	1	100	--	100
Internal Assessment								

Course Objectives:

- Identify and compare technical and practical issues related to the area of course specialization.
- Outline annotated bibliography of research demonstrating scholarly skills.
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO 2	Organize a detailed literature survey and build a document with respect to technical publications.
CO 3	Analysis and comprehension of proof-of-concept and related data.
CO 4	Effective presentation and improve soft skills.
CO 5	Make use of new and recent technology for creating technical reports.

GUIDELINES FOR TECHNICAL SEMINAR

Seminar is an important component of learning in an Engineering College, where the student getsacquainted with preparing a report & presentation on a topic.

PARAMETERS OF EVALUATION:

1. The seminar shall have topic approved by the faculty.
2. The seminar is evaluated for 100 marks for internal.
3. The students shall be required to submit the rough drafts of the seminar.
4. Faculty shall make suggestions for modification in the rough draft. The final draft shall be presented by the student.
5. Presentation schedules will be prepared by Department in line with the academic calendar.

The Seminars shall be evaluated as follows:

Rough Draft:

In this stage, the student should collect the information from various sources on the topic and collate themin a systematic manner. He/ She may take the help of the concerned faculty.
The report should be typed in "MS-Word" file with "Times New Roman" font, with font size of 16 for main heading, 14 for sub-headings and 12 for the body text. The seminar report contains relevant diagrams,pictures and illustrations. It should normally contain 10 to 15 pages.

1.	Topic, name of the student & faculty	1 Page
2.	List of contents	1 Page
3.	Introduction	1 Page
4.	Descriptions of the topic (point-wise)	5 – 10 Pages
5.	Conclusion	1 Page
6.	References/Bibliography	1 Page

The soft copy of the rough draft of the seminar presentation in MS Power Point format along with the draftreport should be submitted to the concerned faculty, within stipulated time.

The evaluation of the technical seminar report shall generally be based upon the following:
Within one week of the submission of the rough draft, the students are to submit the final draftincorporating the suggestions made by the faculty.

Presentation:

After finalization of the final draft, the students shall be allotted dates for presentation (in the designatedseminar classes) and they shall then present it in presence of students, Faculty & Technical Seminar In- charge.

The student shall submit 3 copies of the Report neatly bound. The students shall also distribute the title andabstract of the seminar in hard copy to the Technical Seminar In-charge. The final presentation has to be delivered with 18-25 slides. The time duration for presentation is 15 to 20 minutes.

The evaluation of the Presentation shall generally be based upon the following.

1.	Punctuality in submission of Seminar Report	20 Marks
2.	Reports and Contents of Presentation	20 Marks
3.	Depth of the students' knowledge in the subject	20 Marks
4.	Relevance and interest the topic creates	15 Marks
5.	Ability to involve the spectators	15 Marks
6.	Question answer session	10 Marks
	Total	**100 Marks**

WHO WILL EVALUATE?

The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar in-charge and a senior faculty of the department.

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Course Title	PROJECT-I				B.Tech VII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805713	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	8	4	100	--	100
Internal Assessment								

Course Objectives:

- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate a technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution.
CO 3	Design engineering solutions to complex problems utilizing a systems approach.
CO 4	Communicate with engineers and the community at large in written an oral form.
CO 5	Demonstrate the knowledge, skills and attitudes of a professional engineer.

GUIDELINES FOR PROJECT

The prime objective of the project work is to imbibe students with technical, analytical and innovative ideas. The students will able to learn theoretical and practical approaches pertaining to software applications development. A team of 4-5 students formed as a group and work under the supervision of a departmental faculty. Associating the students to solve real world problems identified within the department. The project work normally includes:

1. Literature survey on existing problem/ topic from viable sources.
2. Eliciting the problem-solving approach/methodologies and making the feasibility study.
3. The team should perform an extensive software requirements analysis.
4. Preparing an abstract on the selected topic and present before Departmental Review Committee (DRC).
5. Preparing a roadmap to design, analyze, implement, evaluate/test considering functional, non-functional aspects and finally, deploy the application/product/software service.
6. Detailed Analysis/Design /Simulation as needed.
7. Final development of product/process conducting testing and specifying the results, conclusions and future scope.
8. Preparing a project report in the standard format for being evaluated by the Department Review Committee (DRC).
9. Final Project presentation / execution before Departmental Review Committee (DRC)

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Semester 7: (Open Elective-2 & 3)

S.No	Subject Code	Subjects	L	T	P	C R
1	18OE503 18OE504	**Open Elective-2:** 1. Python Programming 2. Computer Networks	3	0	0	3
2	18OE505 18OE506	**Open Elective-2:** 1. Web Technologies 2. Operating Systems	3	0	0	3
	Total		**6**	**0**	**0**	**6**

Course Title	PYTHON PROGRAMMING (Open Elective-2)					B.Tech VII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
18OE503	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- Understand programming skills using basics of Python language
- To introduce the object-oriented programming concepts.
- Acquire basics of how to translate problem into object-oriented form
- To understand object-oriented programming concepts, and apply them in solving problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate and acquire knowledge on usage of Data types, operators, input and output statements in python programming.
CO 2	Analyze the given problem and develop python program to solve the problem.
CO 3	Able to use proper iterative statements in problem solving.
CO 4	Entity the right sequence to solve the real-world problems.
CO 5	Apply object-oriented features to solve real time applications.

UNIT - I

Features of python, Execution of a python program, comments, identifiers and variables, classification of data types, keywords, constants, Naming conventions in python, Operators and expressions, operator precedence and associativity, input and output statements.

UNIT - II

Control statements: simple if, if..else, nested if, if..elif..else statement. **Loops:** while loop, for loop, nested loops, break , continue , pass and assert statements, Arrays in python, Strings and their operations.

UNIT - III

Functions: define and calling a function, return statement, formal and actual arguments, local and global variables, passing arguments to function, anonymous functions, example programs on functions, recursion.

UNIT - IV

Sequences: Lists, Tuples, Sets, Dictionaries, Operations and methods on Tuples, Lists, Dictionaries. **Files:** Types of files, opening file, closing a file, write data into a file, read data from a file.

UNIT - V

Introduction to Oops:, Introduction to class and objects, self-variable in python, constructor,types of variables and methods, Inheritance and polymorphism, abstract class.

Text Books:

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
4. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018

Reference Books:

1. Python: The complete reference by Martin C Brown, McGraw-Hill Publication, 2018.
2. Programming Python, Mark Lutz,4th Edition, O'Reilly publications.
3. Dive into Python, Mark Pilgrim, APress Media, LLC.

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Course Title	COMPUTER NETWORKS (Open Elective-2)				B.Tech VII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE504	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Study the evolution of computer networks and future direction.
- Study the concepts of computer networks from layered.
- Perspective study the issues open for research in computer networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the terminology and concepts of the OSI reference model and TCP-IP.
CO 2	Describe the functions of Data link layer and its protocols.
CO 3	Classifying the different routing algorithms and IP addressing with network layer
CO 4	Understand connection establishment and services provides by TCP and UDP.
CO 5	Explain the working of DNS and World Wide Web

UNIT - I

Introduction: Uses of Computer Networks, Network Hardware, Reference Models: OSI, TCP/IP, Comparison of OSI & TCP/IP reference models.

Introduction to physical layer: Data and Signals, Transmission impairment.

Transmission media: Introduction, Guided Media, Unguided Media

UNIT - II

The Data Link Layer: Data Link Layer design issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols.

The Medium Access Control sublayer : Multiple Access protocols, Ethernet.

UNIT - III

The Network Layer: Network layer design issues, Routing algorithms : The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing. Quality of service, IP Addresses, IPv4,IPv6,Tunneling, Fragmentation.

UNIT - IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP: Introduction to TCP,Introduction to UDP.

UNIT - V

The Application layer: Domain Name System (DNS), World Wide Web (WWW), E-mail.

Text Books:

1. "Computer Networks", Andrew S. Tanenbaum, David J.Wetherall, Pearson, 5th edition, 2010.
2. "Data communications and networking", Behrouz A. Forouzan, TMH, 5th edition, 2012.
3. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1,Douglas E. Comer, 5 th edition, PHI
4. "Computer Networks", 5E, Peterson, Davie, Elsevier.

Reference Books:

1. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
2. "Computer Networks and Internets with Internet Applications", Comer.
3. Computer Networks, A Top-Down Approach, James F. Kurose, Keith W. Ross, 3rd Edition, Pearson.
4. Computer Networks, A Top-Down Approach, Behrouz A. Forouzan, Firoz Mosharraf, Special Indian Edition, McGraw Hill.

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Course Title	WEB TECHNOLOGIES (Open Elective-3)				B.Tech VII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
180E505	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
MidExamDuration:2Hrs					EndExamDuration:3Hrs		

Course Objectives:

- To learn the basic concepts of HTML.
- To introduce client side scripting with Java Script.
- To introduce the concepts of Java Applets, AWT and Swings.
- To introduce server side programming with Servlets and Database connectivity

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Understand the basic concepts of HTML scripting language.
CO2	Understand the CSS, java Script and create static web pages.
CO3	Understand the concepts of AWT and Swings.
CO4	Define web server and installation of web server.
CO5	Develop server side programs using JSP and accessing database through JSP.

UNIT - I

HTML Common tags- Introduction, HTML Basics: Text, Colors, Links, Images, Forms: Text Area, Check Box, Radio Button, Button, Menus, Frames, List, Tables

UNIT - II

Java Script: Introduction , Basics of Java Script, Control Structures, Pop up Boxes, Functions, Arrays Events, Objects, Dynamic HTML: Introduction, Cascading Style Sheets (CSS).

UNIT - III

Review of Applets, Class, Event Handling, AWT Programming, Introduction to Swings: JApplet Handling Swing Controls like icons, Labels, Buttons, Text Boxes, Combo Boxes

UNIT - IV

Web Servers and Servlets: Tomcat Server Installation &Testing, Introduction to Servlets, Deployment of servlet, Life cycle of a servelet, HTTP-GET and POST Requests, Session Tracking, Cookies.

UNIT - V

JDBC: Database Access, JDBC Architecture, Introduction to JSP: Introduction, Advantages of JSP, The problem with servlet, The anatomy of JSP page, JSP Processing.

Text Books:

1. HTML & CSS: The Complete Reference, Thomas A. Powell, 5the Edition, McGraw Hill.
2. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education.
3. Java The Complete Reference, Herbert Schildt, TMH.
4. Web Technologies, A.S. Puntambekar, Technical Publications.

Reference Books:

1. Web Programming, building internet applications, Chris Bates 3rd edition, WILEYDreamtech
2. Web Technology, N.P. Gopalan, J. Akilandeswari, PHI.
3. Foundations of Web Technlogy, Ramesh R Sarukkai, Springer.

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Course Title	OPERATING SYSTEMS (Open Elective-3)				B.Tech VII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
180E506	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid ExamDuration:2Hours					EndExamDuration:3Hrs			

Course Objectives:

- Have an overview of functions of operating systems.
- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks.
- Learn the concepts of files, protection and security.

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Understand the basic concepts related to the operating systems.
CO2	Analyze the various process scheduling algorithms and process synchronization mechanisms.
CO3	Analyze the various memory management schemes.
CO4	Understand the ways to deal the deadlocks and the basic concepts related to files inthe system.
CO5	Analyze the protection and security mechanisms

UNIT - I

Operating Systems Basics: Operating systems functions, Overview of computer operating systems, distributed systems, operating system services and systems calls, system programs, operating system structure.

UNIT - II

Process Management: Process concepts, scheduling-criteria, algorithms, their evaluation.

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, semaphores, monitors.

UNIT-III

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms.

UNIT-IV

Deadlocks: system model, deadlock characterization, deadlock prevention, detection andavoidance, recovery form deadlock.

Files: The concept of a file, Access Methods, Directory structure, File system mounting.

UNIT-V

Protection: Protection, Goals of Protection, Principles of Protection, Domain of protection Access Matrix, Implementation of Access Matrix.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", SixthEdition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

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Course Title	CYBER SECURITY (Professional Elective-4)				B.Tech VIII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805801	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To learn about cybercrimes and how they are planned
- To learn the vulnerabilities of mobile and wireless devices
- The learner will gain knowledge about securing both clean and corrupted systems, protectpersonal data, and secure computer networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding the basic cyber security concepts.
CO 2	Classifying the international laws and cyber forensics.
CO 3	Remembering to cyber-crime.
CO 4	Recognizing cybercrime and cyber terrorism.
CO 5	Understanding the privacy issues.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
4. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC PressT&F Group.

Reference Books:

1. Cyber Security Engineering: A Practical Approach for Systems and Software Assurance, Nancy R. Meade, Carol C. Woody, Addison Wesley.
2. The Cyber Security: Self help Guide, Arun Soni, CRC Press.
3. Cyber Security: Analytics, Technology & Automation, Martti Lehto, Pekka Neittaanmaki, Springer.
4. Cyber Security: Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, SYBEX.

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Course Title	OBJECT ORIENTED ANALYSIS & DESIGN (Professional Elective-4)				B.Tech VIII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805802	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To understand the Object-oriented life cycle.
- To know how to identify objects, relationships, Services and attributes through UML.
- To understand different UML diagrams.
- To know object-oriented design process, software quality and usability.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design software applications and document them using UML class diagrams
CO 2	Analyze, design, document the requirements through use case driven approach.
CO 3	Identify analyses, and model structural and behavioral concepts of the system.
CO 4	Apply the concepts of architectural design for deploying the code for software.
CO 5	Develop; explore the conceptual model into various scenarios and applications.

UNIT - I

Introduction to UML: Importance of Modeling, Principles of Modeling, Object OrientedModeling, Conceptual Model of the UML, Architecture.

UNIT - II

Basic Structural Modeling : Classes, Relationships, Common Mechanisms, andDiagrams Interfaces, Types and Roles, Packages.

Class and Object Diagrams : Terms, Concepts, Modeling Techniques for Class andObject Diagrams.

UNIT - III

Basic Behavioral Modeling-I : Interactions, Interaction Diagrams.

Basic Behavioral Modeling-II : Use Cases, Use Case Diagrams, Activity Diagrams.

UNIT - IV

Advanced Behavioral Modeling : Events and Signals, State Machines, Processes andThreads, Time and Space, State Chart Diagrams.

UNIT - V

Architectural Modeling: Component, Deployment, Component Diagrams and Deployment Diagrams, Systems and Models.

Case Stud : The Unified Library Application.

Text Books:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh,Ivar Jacobson, Pearson Education.
2. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
3. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Pearson Education.
4. Modeling Software Systems Using UML2, Pascal Roques, Wiley- Dreamtech India Pvt.Ltd.

Reference Books:

1. Object Oriented Analysis and Design, Atul Kahate, The McGraw- Hill Companies.
2. Object-Oriented Analysis and Design with the Unified Process, John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.
3. Learning UML 2.0, Russ Miles and Kim Hamilton, O'Reilly, SPD.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
5. UML and C++, R.C.Lee and W.M.Tepfenhart, PHI.
6. Object Oriented Analysis, Design and Implementation, B.Dathan and S.Ramnath, Universities Press.
7. OO Design with UML and Java, K.Barclay, J.Savage, Elsevier.
8. Mark Priestley: Practical Object-Oriented Design with UML, TMH.

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Course Title	DEEP LEARNING (Professional Elective-4)				B.Tech VIII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1805803	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Study the neural networks and convolutions networks and their architecture.
- Gain knowledge about recurrent neural networks and deep supervised learning methods.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the neural networks to solve the real time problems.
CO 2	Understand convolutional neural networks and their architectures.
CO 3	Understand recurrent neural networks and recursive NNs.
CO 4	Understand Deep supervised learning methods.
CO 5	Implement the Deep Learning models in various Applications.

UNIT - I

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, vanishing gradient problem, ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

UNIT - II

Convolutional Neural Networks : Architectures, convolution / pooling layers

UNIT - III

Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures Recursive neural network (RNN).

UNIT - IV

Deep Unsupervised Learning: Auto encoders (standard, sparse, denoising, contractive, etc), Variational Auto encoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks.

UNIT - V

Applications of Deep Learning to NLP/Computer Vision: Introduction to NLP and Vector Space Model of Semantics, Word Vector representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Named Entity Recognition, Opinion Mining using Recurrent Neural Networks, Sentence Classification using Convolutional Neural Networks. Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, Video to text with LSTM models. Attention models for computer vision tasks.

Text Books:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book. (2015).
2. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner's Approach, OReilly, 2017.
3. Jeff Heaton, Deep Learning and Neural Networks, Heaton Research Inc, 2015.
4. Mindy L Hall, Deep Learning, VDM Verlag, 2011.

Reference Books:

1. Introduction to Deep Learning, Eugene Charniak, The MIT Press.
2. Deep Learning, D. Kelleher, The MIT Press.
3. Dive into Deep Learning, Joanne Quinn, Joanne McEachen, Michael Fullan, Mag Gardner, Max Drummy, Corwin.

Course Title	PROJECT-II				B.Tech VIII Sem (R18) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1805806	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	12	6	50	50	100
Internal Assessment:50					External Assessment:50			

Course Objectives:

- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate a sound technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution
CO 3	Design engineering solutions to complex problems utilizing a systems approach.
CO 4	Communicate with engineers and the community at large in written an oral form
CO 5	Demonstrate the knowledge, skills and attitudes of a professional engineer

GUIDELINES FOR PROJECT

The prime objective of the project work is to imbibe students with technical, analytical and innovative ideas. The students will able to learn theoretical and practical approaches pertaining to software applications development. A team of 4-5 students formed as a group and work under the supervision of a departmental faculty. Associating the students to solve real world problems identified within the department. The project work normally includes:

1. Literature survey on existing problem/ topic from viable sources.
2. Eliciting the problem-solving approach/methodologies and making the feasibility study.
3. The team should perform an extensive software requirements analysis.
4. Preparing an abstract on the selected topic and present before Departmental ReviewCommittee (DRC).
5. Preparing a roadmap to design, analyze, implement, evaluate/test considering functional, non- functional aspects and finally, deploy the application/product/software service.
6. Detailed Analysis/Design /Simulation as needed.
7. Final development of product/process conducting testing and specifying the results, conclusions and future scope.
8. Preparing a project report in the standard format for being evaluated by the Department Review Committee (DRC).
9. Final Project presentation / execution before Departmental Review Committee (DRC)

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Semester 8: (Open Elective-4)

S.No	Subject Code	Subjects	L	T	P	C R
1	18OE507 18OE508	**Open Elective-4:** 1. Software Engineering 2. Cloud Computing	3	0	0	3
		Total	**3**	**0**	**0**	**3**

Course Title	SOFTWARE ENGINEERING (Open Elective-4)				B.Tech VIII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE507	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Knowledge of basic Software engineering methods and practices, and their appropriate application also the software engineering layered technology and Process frame work.
- A general understanding of software process models such as the waterfall and evolutionary models.
- Understanding of the role of project management including planning, scheduling, risk management, etc.
- Understanding of data models, object models, context models and behavioural models also different software architectural styles.
- Understanding of software testing approaches such as unit testing and integration testing other testing strategies and Risk management.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Ability to apply software engineering principles and techniques.
CO 2	Ability to develop, maintain and evaluate large-scale software systems.
CO 3	To produce efficient, reliable, robust and cost-effective software solutions.
CO 4	To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

UNIT –I

Software and Software Engineering: The Nature of Software, Software Engineering, Software Process Software Myths. Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models.

UNIT - II

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling: Requirements Analysis, Scenario-Based Modeling, Data Modeling Concepts, Class-Based Modeling.

UNIT – III

Design Concepts: Design within the Context of Software Engineering, Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design.

UNIT - IV

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Coding and Testing: Testing, Testing in the Large versus Testing in the Small, Unit Testing, Integration Testing, Black-Box Testing, White-Box Testing, Debugging, System Testing.

UNIT - V

Software Project Management: Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO-A Heuristic Estimation Technique, Halstead's Software Science-An Analytical Technique, Risk Management.

Text Books:

1. Software Engineering: A practitioner's Approach, Roger S. Pressman, Seventh Edition, 2010, McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, 4th Edition, 2014, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education.
4. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford UniversityPress.
3. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
4. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition , 2006.
5. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.

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Course Title	CLOUD COMPUTING (Open Elective-4)				B.Tech VIII Sem (R18)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE508	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To explain the cloud paradigms.
- To introduce the various levels of services that can be achieved by cloud.
- To know about service providers of cloud.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Recall different computing paradigms
CO 2	Understand the evolution of cloud computing paradigm and its architecture, and Characterizing different cloud deployment models.
CO 3	Explain service models and Virtualization.
CO 4	Understand programming models and Software Development in Cloud Computing.
CO 5	Identify the Data Center environment and service providers in cloud computing.

UNIT - I

Computing Paradigms:

High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Cloud Computing Fundamentals:

Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Computing Is a Service, Cloud Computing Is a Platform. Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

UNIT - II

Cloud Computing Architecture and Management: Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

Cloud Deployment Models: Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud.

UNIT - III

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

Virtualization: introduction, Virtualization opportunities, Approaches to virtualization, Hypervisors, From virtualization to cloud computing,

UNIT - IV

Programming Models in Cloud: Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka.

Software Development in Cloud: Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology

UNIT - V

Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers.

Cloud Service Providers: Introduction, EMC, Google, Amazon Web Services, Microsoft, IBM, Salesforce, Rackspace

Text Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
2. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.
3. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015.
4. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing:Principles and Paradigms, Wiley, 2011

Reference Books:

1. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill.
2. Cloud Computing Theory and Practice: Dan C. Marinescu, Elsevier.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing.
4. Cloud Computing and Virutualization, Dac-Nhuong Le, Raghavendra Kumar, Gia Nhu Nguyen, Jyir Moy Chatterjee, Wiley.

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UG Programs in Engineering (R20UG)
Curriculum and Syllabus for

III - IV Sem B.Tech

Department of Computer Science and Engineering

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Kadapa 516003 AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)(An ISO 9001-2008 Certified Institution)

COMPUTER SCIENCE AND ENGINEERING

Approved Course Structure

Semester - 3								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2024301	HS	Business Economics and Accounting for Engineers	3	0	0	40	60	3
2005302	PC	Advanced Data Structures	3	0	0	40	60	3
2005303	PC	Formal Languages and Automata Theory	3	0	0	40	60	3
2005304	PC	Object Oriented Programming through JAVA	3	0	0	40	60	3
2005305	PC	Database Management Systems	3	0	0	40	60	3
2005306	PC (LAB)	Advanced Data Structures Lab	0	0	3	40	60	1.5
2005307	PC (LAB)	Java Lab	0	0	3	40	60	1.5
2005308	PC (LAB)	Database Management Systems Lab	0	0	3	40	60	1.5
2005309	Skill Oriented Course	Exploring Data Analysis with R	0	1	2	40	60	2
2024310	Mandatory Course (AICTE Suggested)	Environmental Science	2	0	0	40	--	0
		Total						**21.5**

Semester - 4								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2004401	ES	Microprocessors & Microcontrollers	3	0	0	40	60	3
2005402	PC	Computer Organization	3	0	0	40	60	3
2005403	PC	Principles of Operating Systems	3	0	0	40	60	3
2005404	PC	Digital Logic Circuits & Design	3	0	0	40	60	3
2021405	BS	Probability Theory And Statistical Methods	3	0	0	40	60	3
2004406	ES Lab	Microprocessors & Microcontrollers Lab	0	0	3	40	60	1.5
2005407	PC (LAB)	Principles of Operating Systems Lab	0	0	3	40	60	1.5
2005408	PC (LAB)	Digital Logic Design Lab	0	0	3	40	60	1.5
2005409	Skill Oriented Course	Advanced Python Programming	0	1	2	40	60	2
		Total						**21.5**

B.Tech III SEM CSE (R20)

Course Title	BUSINESS ECONOMICS AND ACCOUNTING FOR ENGINEERS				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024301	HS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To equip the budding engineering student with an understanding of concepts andtools of economic analysis.
- To provide knowledge of Business economics through differential economics concepts and theories.
- To make aware of accounting concepts to analyze and solve complex problems relating financial related matters in industries.
- To understand professional and ethical responsibility and ability to communicate effectively.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concept of Business Economics and able to apply.
CO 2	Understand the Production functions and application of Business Economics and Accounts for making business decisions.
CO 3	To Analyze the markets conditions and determine price-output relations.
CO 4	To understand the concepts of Accounting and able to prepare the financialstatement of a business firm.
CO 5	To evaluate, analyze and interpret the financial performance of business.

UNIT – I: INTRODUCTION TO BUSINESS ECONOMICS

Meaning, Definition, Nature and scope of Business Economics, Demand Analysis: Concept of Demand, Determinants of demand, Law of Demand and its exceptions, Elasticity of Demand – Types, Measurement of Elasticity of Demand, Demand Forecasting – Techniques of Demand Forecasting.

UNIT – II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III : CLASSIFICATION OF MARKETS AND PRICING METHODS

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.

Methods of Pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV: INTRODUCTION TO FINANCIAL ACCOUNTING

Definition to Accounting, objective and need for Accounting, Double Entry Book keeping – Accounting process, Journal Ledger, Trial Balance, and Final Accounts – Trading Account, Profit and Loss Account and Balance sheet with problems.

UNIT – V: FINANCIAL ANALYSIS THROUGH RATIOS

Concept of Financial Ratios , Types of Ratios – Liquidity Ratios, Turnover Ratios, Capital Structure Ratios, Profitability Ratios with problems.

Text Books:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K K Dewett - Managerial Economics, S. Chand Publishers.
3. Varshney & Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
4. Prasad and K.V.Rao: Financial Accounting, Jai Bharath Publishers, Vijayawada.
5. A.R. Aryasri: Managerial Economics and Financial Analysis, TATA McGraw-Hill Publishing Co. Ltd.

Reference Books:

1. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
2. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.
3. Paul A Samuleson and William nordhaus : Economics, Oxford University Publications.
4. M L Jhingan : Micro Economics & Macro Economics, Vrinda Publacations (P) Ltd.

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Course Title	ADVANCED DATA STRUCTURES				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005302	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To develop skills and analyze linear and non linear data structures.
- To understand basic concepts of stacks and queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting, dictionaries and hashing.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the variety of abstract data types and data structures.
CO 2	Analyze data structures such as linked list, Stacks and Queues.
CO 3	Apply and analyze tree traversal algorithms.
CO 4	Analyze graph traversal algorithms and organize data using various sortingalgorithms.
CO 5	Ability to understand the concept of hashing, B-Trees and B+-Trees.

UNIT-I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & NonLinear data structures, **Linear Lists:** Definition, **Arrays:** Definition,
Stacks: Definition,Array&Linkedrepresentations,Operations,Applications

UNIT-II

Queues: Definition, Array & Linked representations, Operations, Circular Queues & Dequeues.

Trees: Basic terminology, Binary Trees- Definition, Properties, Representation,Complete and Full Binary Tree.

UNIT-III

Tree Traversal Algorithm: Inorder, Preorder and Post order.

Priority Queues: Definition, Heaps, Leftist Trees.

Binary Search Tree (BST): Definition, Operations & Implementations, BST with Duplicates, Indexed BST. **Balanced Search Trees:** AVL, Red-Black & Splay Trees.

UNIT-IV

Graphs: Terminology, Representations **Graph Traversal:** Depth First Search (DFS), Breadth First Search (BFS), Minimum Spanning Tree. **Sorting:** Quick, Merge, Heap.

UNIT-V

Dictionaries, Linear List Representation, Skip List Representation

Hashing: Introduction, Hash Table representation, Hash Functions.

Collisions: Introduction, Separate Chaining, Open Addressing, B-Trees, OperationsonB-Trees,B+-Trees.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universitiespress.
3. Data Structures using C++,Varsha H.Patil, Oxford University Press.
4. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) PrivateLimited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepoguand Radhik Raju Palagiri, Pearson Education.

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Course Title	FORMAL LANGUAGES AND AUTOMATATHEORY				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005303	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To be able to construct finite state machines and the equivalent regular expressions and prove the equivalence of languages described by finite state machines and regular expressions.
- To be able to construct push down automata and the equivalent context free grammars, Turing machines and Post machines.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand of the notion of a regular set and its representation by DFA's, NFA'sand regular expressions.
CO 2	Understand of the notion of a context-free language and its representation by
CO 3	Identify the applications of regular expressions and context-free grammars.
CO 4	Understand the concept of Push Down Automata.
CO 5	Solve to the problems using Turing machines.

UNIT-I

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with ϵ transitions-Significance, acceptance of languages. Conversions and Equivalence : Equivalence between NFA with and without ϵ transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

UNIT-II

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

UNIT-III

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and left most derivation of strings.

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL(proofs omitted).

UNIT-IV

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

UNIT-V

Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, Types of Turing machines (proofs not required).

Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0)grammar, decidability of problems, Universal Turing Machine, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Books:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation - Sipser 2nd edition Thomson.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
4. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Reference Books:

1. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
2. Theory of Computer Science and Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI. 5. Theory of Computation, By K.V.N. Sunitha and N.Kalyani

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Course Title	OBJECT ORIENTED PROGRAMMING THROUGHJAVA					B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005304	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes						End Exam Duration: 3Hrs		

Course Objectives:

- To give the students a firm foundation on Java concepts like Primitive data types, Java control flow, Methods, Object-oriented programming, Core Java classes, packages and interfaces, multithreading.
- To provide the students with an understanding of Java applets, Abstract Window, Toolkit and exception handling.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Solve problems using object oriented approach and implement them using Java
CO 2	Apply the concept of inheritance, polymorphism and Packages, Interfaces
CO 3	Implement Exception handling and able to develop multithreaded applications with synchronization.
CO 4	Able to develop applets for web applications.
CO 5	Able to design GUI based applications.

UNIT-I

Object Oriented Programming basics: Need for OOP paradigm, Principles of OOP concepts.

Java Basics: History of Java, Java buzzwords, Simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control, **this** keyword, overloading methods and constructors.

UNIT-II

Inheritance: Inheritance basics, Types of Inheritance, benefits of inheritance, **super** uses, using **final** with inheritance, polymorphism- method overriding, abstract classes. **Packages and Interfaces:** Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface,implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-III

Exception handling and multithreading: Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT-IV

Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling Mouse and Keyboard events, Adapter classes, The AWT class hierarchy, user interface components- Labels, Button, Scrollbars, Text Components, Check box, Choices, Graphics, Layout manager types – Flow, Border, Grid, Card and Gridbag.

UNIT-V

Applets: Concepts of Applets, differences between applets and applications, life cycle ofan Applet, creating applets, passing parameters to applets.

Swings: Introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, and Tables.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented application development, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

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Course Title	DATABASE MANAGEMENT SYSTEMS				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005305	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To study the physical and logical database designs, database modeling, relatio hierarchical, and network models.
- To understand and use data manipulation language to query, update, and manag database.
- To develop an understanding of essential DBMS concepts such as: database secur integrity and concurrency. .

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To understand the basic concepts and the application of Database systems.
CO 2	To understand the basics of SQL and construct queries using SQL.
CO 3	To understand the Relational Database design principles.
CO 4	To apply various Normalization techniques for database design improvement.
CO 5	To apply concurrency control and recovery techniques during transactionexecution.

UNIT-I

Introduction - Database-System Applications, View of Data, Database languages, Database architecture, Database Users and Administrators.
E-R Model - The Entity Relationship Model, Constraints, Entity Relationship Diagrams, and Extended E-R features.

UNIT-II

Relational Model - Structure of Relational Databases, Database Schema, Keys, Query Languages, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Modification of Database.

UNIT-III

Introduction to SQL - Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Complex queries, views, Modification of the Database.

Advanced SQL -Integrity Constraints, Dynamic SQL, Functions and Procedures. **Other Relational Query Languages -** Tuple Relational Calculus, Domain Relational calculus.

UNIT-IV

Normal Forms – Atomic domain and First Normal Form, Keys and Functional Dependencies, Second Normal Form, BCNF, BCNF and Dependency Preservation, Third Normal Form, Lossless Decomposition, Dependency- preserving, Multi valued Dependencies, Fourth Normal Form, Join Dependencies, Fifth Normal Form, and Inclusiondependencies.

UNIT-V

Transactions -Transaction Concept, Transaction State, Implementation of Transaction Atomicity and Durability, Concurrent Executions, Serializability.
Concurrency Control -Lock-Based Protocols, Timestamp-Based Protocols.
Recovery System - Failure Classification, Storage, Recovery and Atomicity, Log based recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database system Concepts", 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems.3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Reference Links:

1. https://nptel.ac.in/courses/106/105/106105175/ (IIT KHARAGPUR)
2. https://nptel.ac.in/courses/106/106/106106095/ (IIT MADRAS)

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Course Title	ADVANCED DATA STRUCTURES LAB				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005306	PC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

1. To implement linear and non-linear Data Structures.
2. To be able to understand the concept of Stacks and Queues.
3. To be able to understand the concept of trees and tree traversing methods.
4. To be able to understand graph traversal methods and various Sorting algorithms.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Implement the operations of various linear data structures.
CO 2	Implement the ADTof Stack and Queue.
CO 3	Implement the concept Inorder, Preorder and Postorder tree traversingtechniques.
CO 4	Analyze and implement the Graph traversing methods and Sorting algorithms.

List of Experiments:

Exercise-1:

a. Write a program to implement Transpose of a given matrix.
b. Write a program to implement Matrix multiplication.

Exercise-2:

a. Write a program to implement Stack operations using arrays.
b. Write a program to convert Infix expression into Postfix expression.

Exercise- 3:

a. Write a program to implement Queue operations using arrays.
b. Write a program to implement Circular Queue operations using arrays

Exercise-4:

Write a programto implement the tree traversal methods.

Exercise-5:

Write a program for Binary Search Tree to implement the following operations.
i) Insertion ii) Deletion

Exercise-6:

a) Write a programto implement Breadth First Search.
b) Write a programto implement Depth First Search.

Exercise-7:

Write a program to implement Linear and Binary search using switch case.

Exercise-8:

a. Write a program to implement Bubble Sort.
b. Write a program to implement Insertion sort.

Exercise-9:

a. Write a program to implement Quick Sort
b. Write a program to implement Merge sort.

Exercise-10:

Write a program to implement Heap sort.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed,
3. Universitiespress.
4. Data Structures using C++,Varsha H.Patil, Oxford University Press.
5. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) PrivateLimited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepoguand Radhik Raju Palagiri, Pearson Education.

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Course Title	JAVA LAB				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005307	PC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA. To familiarize Java environment to create, debug and run simple Java programs.
- To be able to understand Primitive data types, Java control flow, Methods, classes, packages, multithreading and exception handling
- To be able to understand and implement Java applications and applets

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Create, compile, and run Java programs
CO 2	Apply the concept of inheritance and polymorphism
CO 3	Implement Packages, Interfaces and Exception handling
CO 4	Develop windows applications both for standalone and Applets programs by usingawt and swings.

List of Experiments:

Exercise 1: (Basics)

a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

b) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)

Exercise 2: (Basics)

a) Write a Java program to multiply two given matrices.

b) Write a Java Program that reads a line of integers, and then displays each integer,and the sum of all the integers (Use String Tokenizer class of java.util)

c) Write a Java program that checks whether a given string is a palindrome or not.Ex: MADAM is a palindrome.

Exercise 3:(Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methodsand invoke them inside main method.

Exercise 4: (Methods)

a). Write a JAVA program to implement constructor overloading. b). Write a JAVA program implement method overloading.

Exercise 5: (Inheritance)

a). Write a JAVA program to implement Single Inheritance
b). Write a JAVA program to implement multi level Inheritance
c). Write a java program for abstract class to find areas of different shapes

Exercise 6: (Inheritance - Continued)

a). Write a JAVA program give example for "super" keyword.
b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise 7:(Threads & Packages)

c) . Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
d) Write a Java program to implement packages.

Exercise 8: (Exception Handling)

a).Write a JAVA program that describes exception handling mechanism b). Write a JAVA program that implements Runtime polymorphism

Exercise 9: (Applet)

a) Write a JAVA program to display analog clock using Applet.
b) Write a JAVA program to create different shapes and fill colors using Applet.
c) Write a Java program to develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

Exercise 10: (Event Handling)

a) Write a Java program for handling mouse events.
b) Write a Java program for handling keyboard events.

Exercise 11: (Swings)

a) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. (Real Time)

b) Write a JAVA program that to create a single ball bouncing inside a JPanel.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell,eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell,eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino andF.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented applicationdevelopment, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

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Course Title	DATABASE MANAGEMENT SYSTEMS LAB				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005308	PC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To give an introduction to systematic database design approaches covering conceptual.
- Design, logical design and an overview of physical design.
- To give a good formal foundation on the relational model of data.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To understand and develop an Entity-Relationship model based on user requirements and Convert to Relational Schema.
CO 2	Populate and query a database using SQL DML/DDL commands.
CO 3	Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
CO 4	Programming PL/SQL including stored procedures, stored functions.

DBMS LAB EXPERIMENTS

1. Draw E-R diagram and convert entities and relationships to relation table for agiven scenario.

   COLLEGE DATABASE:
   STUDENT (Rno, SName, Address, Phone, Gender)
   COURSE(CName)
   BRANCH(Code,BName)
   SEMSEC (Sem, Sec)
   SUBJECT (Subcode, Title, Sem, Credits)
   IAMARKS (Rno, Subcode, Test1, Test2, Test3, Avg,Rank)

2. Consider University Database and Perform the following:
   a. Viewing all databases
   b. Creating a Database
   c. Viewing all Tables in a Database
   d. Creating Tables (With and Without Constraints)
   e. Inserting/Updating/Deleting Records in a Table
   f. Saving (Commit) and Undoing (rollback)

3. Consider Depttable (DEPTNO, DNAME, LOC) Perform the following:
   a. Rename the table dept as department
   b. Add a new column PINCODE with not null constraints to the existing table DEPT
   c. All constraints and views that reference the column are dropped automatically,along with the column.
   d. Rename the column DNAME to DEPT_NAME in dept table
   e. Change the data type of column loc as CHAR with size 10
   f. Delete table

4. Fo/r a given set of relation schemes, create tables and perform the following: Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With INclause, With EXISTS clause.

5. For a given set of relation tables perform the following:
a. Creating Views (with and without check option), Dropping views, Selecting from a view.

6. Write a Pl/SQL program to print integers from 1 to 10 by using PL/SQL FORloop.

7. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write acursor to select the five highest paid employees from the table.

8. Write PL/SQL code for finding specific Employee salary in given table.

9. Illustrate how you can embed PL/SQL in a high-level host language such asC/Java and demonstrates how a banking debit transaction might be done.

10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into agiven relation.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database systemConcepts", 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems.3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Web Links:

SQL and PL/SQL tutorial: 1. https://www.w3schools.com/sql/,
2. http://www.plsqltutorial.com/

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Course Title	EXPLORING DATA ANALYSIS WITH R				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005309	Skill Oriented Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	1	2	2	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- The course enables the students to apply exploring data analysis with R on real time applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding the basic concepts of R programming.
CO 2	Apply critical R programming concepts to handle the data.
CO 3	Apply statistical concepts on real data.
CO 4	Use linear regression on given data set.
CO 5	Apply data visualization using R packages.

List of Experiments:

1. Download, install R and RStudio on windows.
2. Study of basic syntaxes in R.
   a. Write a R program to create a sequence of numbers from 20 to 50, find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
   b. Write a R program to get the first 10 Fibonacci numbers.
3. Implementation of different types of R operators.
4. Study and implementation of various control structures in R.
   a. Write a R program to check weather given is even or odd.
   b. Write a R program to find the sum of n natural numbers [1+2+3+…….+n].
   c. Write a R program to get all prime numbers up to a given number.
5. Write a R program to find factorial of a given number using recursive function.
6. Programs using vectors, matrix, factor and list in R.
   a. Write a R program to create a vector of a specified type and length. Create vector of numeric, complex, logical and character type of length 6.
   b. Write a R program to create a matrix taking a given vector of numbers as input and define the column and row names. Display the matrix.
   c. Write a R program to find the levels of factor of a given vector.
   d. Write a R program to create a list containing strings, numbers, vectors and a logical values.
7. Programs using statics (apply all statistical concepts using R)
8. Programs using linear regression.
   Consider the "cars" dataset. Assume "cars$dist" as the response variable and "cars$speed" as the predictor variable. Create a model using the lm() function.
9. Write a R program to create dataframe and extract specific rows and columns.
10. Study and implementation of data visualization using R packages.

Text Books:

1. ROBERT I. KABACOFF "R in Action Data analysis and graphics with R" Manning Publications Co 2011.
2. Aczel–Sounderpandian: "*Complete Business Statistics*" 7th Edition Complete Business Statistics, Seventh Edition McGraw–Hill Primis.
3. Pierre Lafaye de Micheaux, Remy Drouilhet and Benoit Liquet – " The R Software Fundamentals of Programming and Statistical Analysis", Springer.

Reference Books:

1. Seema Acharya - *"Data Analytics Using R"* ,Jan 01, 2018, Seema Acharya-MC GRAW HILL INDIA (2018)

Swayam/Nptel/Moocs:

1. https://onlinecourses.nptel.ac.in/noc21_ma35/preview
2. https://www.coursera.org/learn/data-analysis-r

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B.Tech IV SEM CSE (R20)

Course Title	MICRO PROCESSORS & MICRO CONTROLLERS				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004401	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To become familiar with 8086 Microprocessor and 8051 Microcontroller Architecture, Instructions, Operating Modes and Programming.
- To use 8086 microprocessor and 8051 microcontroller for various applications.
- To study various peripherals for microprocessor based systems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define various components and list out various features of microproces microcontroller and peripherals.
CO 2	Describe the internal block diagram of microprocessor, microcontroller and peripherals, addressing modes, instruction set and data transfer schemes.
CO 3	Develop algorithm and assembly language programs to solve problems.
CO 4	Apply an appropriate algorithm, program and peripheral for the application.
CO 5	Design the microprocessor or microcontroller based system to solve real time problems. (Prepare a case study model to get a first prototype).

UNIT-I

The 8086 Microprocessor–Introduction to microprocessors, 8086 microprocessor Architecture, Instruction set, Addressing modes, Interrupt system. Pin diagram, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT- II

Assembly Language Programming: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, look-up tables, string manipulations, Macros and Delay subroutines.

Data transfer schemes and Memory Interfacing: Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Address decoding techniques, Interfacing Static RAM and ROM chips.

UNIT-III

Peripheral Interfacing: 8255 PPI and its interfacing, Programmable Communication Interface (8251 USART) and its interfacing, Programmable Interval Timer (8254) and its interfacing, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, ADC and DAC Interfacing.

UNIT-IV

The 8051 microcontroller: Architecture, pin diagram, memory organization, external memory interfacing, stack, addressing modes, instruction set, Assembler directives, Assembly Language programs and Time delay Calculations, 8051 interrupt structure, 8051 counters and Timers, programming 8051 timers.

UNIT-V

Introduction to ARM: ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table, Instruction Set- Data Processing Instructions, Branch, Load-Store, Software interrupt, PSR instructions, Conditional instructions, Thumb instruction Set: Register Usage, Other Branch instructions, Data processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and its applications with 8085", Penram International Publications, 4thEdition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals",TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, "The 8051Microcontroller and Embedded Systems", 2nd Edition, Pearson Education, 2008.
4. Kenneth J Ayala, "The 8051 microcontroller: Architecture, Programming & Applications", Penram publications, 2nd edition.
5. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware",2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming and Interfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design", 2nd Edition, PHI.
4. Raj Kamal,"Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
5. Steve Furbur, "ARM System on-chip Architecture",2nd Edition, Addison Wesley, 2000.

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Course Title	COMPUTER ORGANIZATION				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005402	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To make the students understand the structure of computers and internalorganization of different units like memory, I/O devices, registers.
- To study in detail about the microoperationsand implementation of fixed andfloating point addition, subtraction, multiplication and division operations.
- To study in detail about pipelining, Memory, I/O organization and multiprocessors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the Basic concepts of computers and Data representation.
CO 2	Understand the concept of Register Transfer and various Micro operations.
CO 3	Understand the concept of basic computer organization and design, Micro programmed control and Computer Arithmetic.
CO 4	Understand the concept of Pipelining and Memory.
CO 5	Understand concept of I/O organization and Multiprocessors.

UNIT-I

Basic Concepts of Computers: Computer Types, Functional units, Basic operational concepts, Bus Structures, Performance. **Data Representation-** Fixed Point Representation, Floating Point Representation.

UNIT-II

Register Transfer and Microoperations: Register Transfer, Bus and memory transfers. Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT-III

Basic Computer Organization and Design: Instruction codes, Computer instructions, Memory Reference Instructions, Input – Output and Interrupt, Addressing modes. **Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Hard wired control, Micro programmed control. **Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms.

UNIT-IV

Pipeline: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISCPipeline.
Memory: Basic concepts, Memory Hierarchy, Cache memory, Performance considerations, Virtual memory.

UNIT-V

Input-Output Organization: Peripheral Devices, Input- Output Interface, Asynchronousdata transfer, Modes of Transfer, Priority Interrupt, Direct memory Access (DMA).
Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures.

Text Books:

1. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.
3. Computer Organization and Architecture – William Stallings Sixth Edition,Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Reference Books:

1. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi, SpringerInt. Edition.
2. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

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Course Title	PRINCIPLES OF OPERATING SYSTEMS				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005403	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- Have an overview of functions of operating systems.
- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks.
- Learn the concepts of files, protection and security

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic concepts related to the operating systems.
CO 2	Analyze the various process scheduling algorithms and processsynchronization mechanisms
CO 3	Analyze the various memory management schemes.
CO 4	Understand the ways to deal the deadlocks and the basic concepts related to filesin the system.
CO 5	Analyze the protection and security mechanism.

UNIT-I

Operating Systems Basics: Operating systems functions, Overview of computer operating systems, distributed systems, operating system services and systems calls, system programs, operating system structure.

UNIT-II

Process Management: Process concepts, scheduling-criteria, CPU scheduling algorithms, Evaluation of Scheduling Algorithms.

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, semaphores, Classic problems of Synchronization, monitors.

UNIT-III

Memory Management: Introduction, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, Allocation of frames.

UNIT-IV

Deadlocks: system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock.
Files: The concept of a file, Access Methods, File Allocation Methods, Directorystructure, File system mounting, File sharing and Protection.

UNIT-V
Protection: Protection, Goals of Protection, Principles of Protection, Domain ofprotection Access Matrix, Implementation of Access Matrix.
Security: The security problem, Program threats, User authentication.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts",Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

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Course Title	DIGITAL LOGIC CIRCUITS & DESIGN				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005404	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To study the basic philosophy underlying the various number systems, Complements and binary codes.
- To study the theory of Boolean algebra and acquire the skills to manipulate andexamine Boolean algebraic expressions.
- To study the design principles of combinational and sequential circuits.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Recall Binary Number systems.
CO 2	Understand Boolean algebra and apply to the Boolean functions.
CO 3	Apply different optimization techniques to construct effective logic circuit.
CO 4	Develop digital systems using combinational and sequential logic to solve engineering problems.
CO 5	Illustrating different registers, counters, Memory Concepts.

UNIT-I

BINARY SYSTEMS: Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Error detection and Correction, Binary codes.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic Gates.

UNIT-II

GATE-LEVEL MINIMIZATION: The map method, Four-variable map, Five-variable map, Product of sums(POS) simplification , Don't-Care conditions, NAND and NOR implementation, Other Two-level implementations, Exclusive –OR function.

UNIT-III

COMBINATIONAL LOGIC: Combinational Circuits, Analysis of Combinational circuits, Design procedure, Code -converters, Binary adder-subtractor, Decimal Adder, Binary multiplier, Magnitude -comparator, Decoders, Encoders, Multiplexers.

UNIT-IV

SEQUENTIAL LOGIC: Sequential circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design of Synchronous sequential circuits.

UNIT-V

REGISTERS AND COUNTERS: Registers, Shift Registers, Ripple counters, synchronous counters, Ring counter and Johnson counter.

MEMORY AND PROGRAMMABLE LOGIC: Random-Access memory, Read-Only memory, Programmable Logic Array, Programmable Array Logic.

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6thedition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M.Rafiquzzaman John Wiley.

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Course Title	PROBABILITY THEORY AND STATISTICALMETHODS				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
2021405	BS	3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To help the students in getting a thorough understanding of the fundamentals of probabilities.
- To help the students in getting a thorough understanding and usage of statistical techniques like testing of hypothesis and statistical control.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concepts of Probability and random variables.
CO 2	Interpret the properties of probability distributions and their applications.
CO 3	Analyze the problems of engineering and industry using the techniques of testingof hypothesis for large samples.
CO 4	Analyze the problems of engineering and industry using the techniques of testingof hypothesis for small samples.
CO 5	Apply statistical quality control and draw appropriate inferences for engineering problems.

UNIT-I

Random variables: Discrete random variables – Continuous random variables – Probability distribution function – Discrete and continuous probability distribution – Mathematical Expectation, Variance and standard deviation of probability distribution.

UNIT-II

Discrete distributions: Binomial and Poisson distributions with related properties.
Continuous distributions: Uniform and Normal distributions with related properties.

UNIT-III

Testing of Hypothesis: Formulation of null hypothesis, critical regions, level of significance. Large sample tests. Tests based on normal distribution – z -test for means and proportions.

UNIT-IV

Small samples: t-test for one sample, two samples problems and paired t-test. F-test –Chi-square test (testing of goodness of fit and independence).

UNIT-V

Statistical Quality Control: Concept of quality of a manufactured product – defect and defectives – Causes of variation – Random and assignable causes – The principle of Shewhart control chart – Charts for attributes and variable quality characteristics – Construction and operation of X-bar chart and R-chart, p-chart and c-chart.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna Publishers-44 edition.
2. Probability and Statistics for Engineers and Scientists, Walpole and Myers, Seventh edition, Pearson Education Asia, 2002
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013.
4. An Introduction to Probability theory and its applications, William Feller

Reference Books:

1. Probability and Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publishers.
2. Statistical Methods by S.P.Gupta, S Chand Publications, 44th revised edition 2014.
3. Probability and Statistics for Engineers, Johnson, Fifth edition, Prentice Hall of India.
4. Probability & Statistics, Mendenhall Beaver, Beaver.

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Course Title	MICROPROCESSORS & MICROCONTROLLERS LAB				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004406	ES Lab	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To write 8086microprocessor and 8051 microcontroller programs for various operations
- Learning interfacing of processor with various Peripherals

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop algorithm and assembly language programs to solve problems.
CO 2	Analyze abstract problems and apply a combination of hardware and software toaddress the problem.
CO 3	Choosing an appropriate algorithm, program and peripheral for the application.
CO 4	Design the microprocessor based system to solve real time problems.

General Programs

1. Addition and Subtraction of two 8- bit/16 bit numbers, Multiplication of two 8-bit& two 16-bit numbers, Division of 16-bit by 8-bit and 32-bitby 16-bit number
2. Addition and Subtraction of 6 data bytes with 6-data bytes of another location.
3. Check the given Number is even or odd, Counting of 0's and 1's in a given data, Check the given number is logical palindrome or not.
4. Finding the maximum and minimum numbers in a given string of data.
5. Sorting the given numbers in ascending and descending order.
6. Finding the Factorial and Generating Fibonacci Series.
7. Conversion of BCD to hexadecimal number, Multiplication of two 3x3 matrices.
8. Addition, Subtraction, Multiplication, Division using Microcontroller.

Interfacing

1. Dual DAC interface (waveform generation).
2. Stepper motor control.
3. Display of flags using logic controller.
4. Traffic light controller.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and itsapplications with 8085", Penram International Publications, 4thEdition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals",TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, "The 8051Microcontroller and Embedded Systems", 2nd Edition, Pearson Education, 2008.
4. Kenneth J Ayala, "The 8051 microcontroller: Architecture, Programming & Applications", Penram publications, 2nd edition.
5. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware",2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming andInterfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 FamilyArchitecture, Programming and Design", 2nd Edition, PHI.
4. Raj Kamal,"Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
5. Steve Furbur, "ARM System on-chip Architecture",2nd Edition, Addison Wesley, 2000.

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Course Title	PRINCIPLES OF OPERATING SYSTEMS LAB				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005407	PC Lab	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks
- Have a thorough knowledge on paging and segmentation concepts

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design, implement and analyze the various process scheduling algorithms andprocess synchronization mechanisms
CO 2	Understand, implement and analyze the various memory management schemes.
CO 3	Design, implement and analyze the ways to deal the deadlocks in the system.
CO 4	Understand and analyze the paging and segmentation schemes.
CO 5	Understand and analyze the File Allocation Techniques.

List of Sample Experiments:

1. Write a C/C++ program to simulate the following CPU scheduling algorithmsto find the average turnaround time and average waiting time of process.
   (a) First Come First Serve
   (b) Shortest Job First
   (c) Priority
   (d) Round Robin Scheduling

2. Write a C/C++ Program to simulate Producer Consumer Problem.

3. Write a C program to simulate the concept of Dining-Philosophers problem.

4. Write a C/C++ program to simulate the following contiguous memory allocation techniques
   a) First Fit b) Best Fit c) Worst Fit

5. Write a C/C++ program to simulate the following page replacement algorithmsto find the total number of page faults for given page reference string.
   (a) First in First out
   (b) Least Recently Used
   (c) Optimal

6. Write a C/C++ program to simulate the paging and segmentation concepts.

7. Write a C program to simulate the following
a) Deadlock avoidance b) Deadlock detection

8. Write a C/C++program to simulate the following file allocation
a) Sequential b)Indexed c)Linked

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts",Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.\
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

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Course Title	DIGITAL LOGIC DESIGN LAB				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005408	PC Lab	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To study the theory of Boolean algebra and acquire the skills to manipulate andexamine Boolean algebraic expressions.
- To study the design principles of combinational and sequential circuits.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply knowledge of binary systems, logic gates and Boolean functions to minimizeand implement digital logic circuit.
CO 2	Design digital logic circuit using combinational and sequential logic to solve engineering problems.

List of Experiments:

1. Implementation of basic gates with NAND and NOR gates.
2. Implementation of logic circuit for given Boolean Expression.
3. 4-bit Binary adder cum subtractor.
4. BCD to Excess-3 code conversion.
5. Design 3x8 Decoder.
6. Design the following encoders

   A) 8x3 Encoder.

   B)Priority Encoder.
7. Design 16x1 multiplexer using 4x1 multiplexer.
8. Design 4-bit Binary comparator.
9. Design BCD adder.
10. Design 4-bit shift register.
11. Design asynchronous UP/DOWN counter
12. Design

    A) Synchronous UP counter using D-flipflop

    B) Modulo 6 counter

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6thedition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M.Rafiquzzaman John Wiley.

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Course Title	ADVANCED PYTHON PROGRAMMING				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005409	Skill Oriented Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	1	2	2	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Python is a very powerful programming language used for many different applications. Over time, the huge community around this open source language has created quite a few tools to efficiently work with Python. The course enables the students to learn various python libraries starting from Numpy arrays, Pandas Data Frames, Matplotlib. Along the way, they'll learn about data cleaning, feature extraction and object oriented concepts using python.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding the basic concepts on Numpy arrays and performs calculations on given data.
CO 2	Apply critical pandas concepts to handle the data frames.
CO 3	Apply data visualization using matplotlib packages.
CO 4	Analyze object oriented concepts for data reusability.
CO 5	Use data cleaning methods and feature extraction for data science applications.

List of Experiments:

Week-1: Study and implementation of various Basic Slicing and Advanced Indexing operations of NumPy arrays using Python over example data series?

Week-2: Implement the program using python Aggregations like Min, Max, and etc.?
Example: Consider the heights of all US presidents and find the Average Height of prime ministers of America? This data is available in the file "*president_heights.csv*".

Week-3: Write a python Program using Numpy Comparisons, Masks, and Boolean Logic? Example: Consider the series of data that represents the amount of precipitation each day for a year in a given city and count the Rainy Days.

Week-4: Write a python Program using Numpy Fancy Indexing in single and multiple dimensions by selecting Random Points?

Week-5: Study and implementation of various Pandas operations on

i) Data sets ii) Data Frames iii) Crosstab iv) Group by

v) Filter vi) Missing values

Week-6: Implement the python program using pandas

i) Program to Combining Datasets using Merge.

ii) Program to Combining Datasets using joins.

Week-7: Implement the python program using pandas

i) Program using Pandas on Pivot Tables.

ii) Program using Pandas to Vectorized String Operations.

Week-8: Program using Pandas to Working with Time Series
Example: Visualizing Seattle Bicycle Counts data set.

Week-9: Implement the python program for the following matplotlib features

i) Color bars.
ii) Annotation
iii) Matplotlib to Text.
iv) Histograms
v) Scatter Plots
vi) Box plot

Week 10: Write the python program to implement various sub packages of Scipy.

Week11: Write a Python program to create a parent class and child class along with their own methods. Access parent class members in child class to implement the following sceneries.

a) Constructors & destructors
b) Polymorphism

Example:

Create a class ATM and define ATM operations to create account, deposit, check_balance, withdraw and delete account. Use constructor to initialize members.

Week-12: Implement the various data cleaning steps of example data sets using python nympy and pandas

Week13: Implement the feature selection of data set using appropriate sklearn libraries.

Text Books:

1. Robert Johansson, "Numerical Python: A Practical Techniques Approach for Industry" published by Apress.
2. Daniel Y. Chen, "Pandas for Everyone: Python Data Analysis", First Edition by Addison-Wesley Professional
3. Alvaro Fuentes, "Become a Python Data Analyst" by Packt publishing
4. Paul Barry, "Head First Python a Brain Friendly Guide", O'Reilly, 2nd Edition, 2016.

Reference Books:

1. Advanced Python Programming By Dr. Gabriele Lanaro, Quan Nguyen, SakisKasampalis by Packt publishing
2. Advanced Python Development: Using Powerful Language Features in Real World Applications By Matthew Wilkes ApressJuly 2020
3. Expert Python Programming - Fourth Edition By Michal Jaworski and Tarek ZiadePackt PublishingMay 2021
4. Modern Python Cookbook - Second Edition By Steven F. Lott Packt PublishingJuly 2020.

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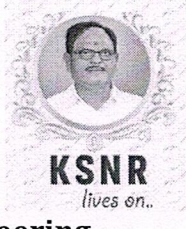
Department of Artificial Intelligence & Machine Learning

COURSE STRUCTURE AND SYLLABUS

FOR

B.Tech AI & ML (I Sem & II Sem) (R20 Regulations)



Kandula Srinivasa Reddy Memorial College of Engineering
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(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

Artificial Intelligence & Machine Learning
Course Structure

Semester - 1								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2021101	BS	Linear Algebra & Calculus	3	-	-	40	60	3
2023102	BS	Environmental Chemistry	3	-	-	40	60	3
2006103	ES	Problem Solving with Algorithmic thinking	2	-	-	40	60	2
2024104	HS	Professional Communication	2	-	-	40	60	2
2006105	ES	Python Programming	3	-	-	40	60	3
20AG106	BS	Agriculture for Engineers & Field Activity	-	-	3	40	60	1.5
2003107	ES	Introduction to Digital Manufacturing	2	-	-	40	60	2
2006108	ES	Problem Solving using C Lab	-	-	3	40	60	1.5
2006109	ES	Python Programming Lab	-	-	3	40	60	1.5
20MC110	MC	Indian Traditional Knowledge	3	-	-	40	-	---
								19.5

Semester - 2								
Subject Code	**Subject Category**	**Course Name**	**L**	**T**	**P**	**IM**	**EM**	**CR**
2006201	ES	Introduction to machine learning	1	-	-	40	--	0
20BE202	BS	Biology for Engineers	2	-	-	40	60	2
2006203	ES	Data Structures	3	-	-	40	60	3
2021204	BS	Mathematics for Intelligent Systems	2	-	-	40	60	2
2006205	ES	Object Oriented Programming through Java	3	-	-	40	60	3
20AP206	BS	Applied Physics	2	-	-	40	60	2
2004207	ES	Principles of Measurements & Sensors	3	-	-	40	60	3
2006208	ES	Data Structures Lab	-	-	3	40	60	1.5
2024209	HS	Communication Skills lab	-	-	3	40	60	1.5
2006210	ES	Java Programming Lab	-	-	3	40	60	1.5
20MC211	MC	Community work / NSS	2	-	-	40	-	---
		Total						**19.5**

*** To get the first year result they should get a social intern with government or NGO.**

B.Tech I SEM AI & ML (R20)

Course Title	LINEAR ALGEBRA & CALCULUS				B.Tech AI&ML IISem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2021101	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO 2	Utilize mean value theorems to real life problems
CO 3	Classifythe functions of several variables which are useful in optimization techniques.
CO 4	Evaluate multiple integrals.
CO 5	Define Beta and Gamma functions.

UNIT -I

Rank of a matrix by Echelon form, Normal form. Solving system of homogeneous and non- homogeneous linear equations. Eigen values and Eigen vectors for real matrices – Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley–Hamilton theorem. Diagonalisation by orthogonal transformation.

UNIT -II

Mean Value Theorems: (08 Hours)

Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), related problems.

UNIT -III

Multivariable Calculus: (10 Hours)

Partial derivatives, total derivative, chain rule, change of variables, Jacobians, Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT -IV

Multiple Integrals: (10 Hours)

Evaluation of double integrals in Cartesian coordinates and polar coordinates – Change of variables in double integrals – Change the order of integration in double integrals – Evaluation of triple integrals in Cartesian and polar coordinates – Change of variables between Cartesian, cylindrical and spherical polar coordinates.

UNIT -V

Beta and Gamma functions: (08 Hours)

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of definite integrals using Beta and Gamma functions.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-44 edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 10th edition- 2021.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. Linear Algebra: A Modern Introduction, D Poole, 2nd Edition, Brooks/Cole, 2005. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.

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Course Title	Professional Communication				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024104	HS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- Enhance language skills and vocabulary forprofessional success.
- Help the students thorough with presentation skills to become effective participants in various discussions.
- Develop confidence and become effective communicator.
- Make them write and speak grammatically correct sentences.
- Analyze interview techniques to get success at interviews.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop language skills and vocabulary forprofessional success
CO 2	Make the students thorough with presentation skills and become successful
CO 3	Enhanceconfidence and become effective communicator
CO 4	Speak and write grammatically correct sentences
CO 5	Analyze interview techniques and get success at interviews

UNIT -I

Importance of communication - Role of language in communication - Technical vocabulary - Verbal analogies - Synonyms and Antonyms.

Grammar: Parts of speech - Discussion and Identification - Question tags.

UNIT-II

Reading Comprehension - Guidelines for effective understanding of the given text - Passage for comprehension - SQ3R method - PQRST method.

Grammar: Subject - Verb agreement - Embedded sentences - Conditional clauses.

UNIT-III

Oral Presentation - Preparation - Guidelines for effective presentation - Kinesics

Grammar: Transformation - Affirmative and Negative -Active and Passive - Direct and Indirect - Degrees of Comparison - Simple, Compound and Complex.

UNIT-IV

Group Discussion - Introduction - Dos and Don'ts - strategies of GD.

Grammar: Dialogue writing - Proverbial expansion –

UNIT-V

Interview skills - Preparation - Before, During and After the interview - Dos and Don'ts of interview - FAQs at interviews - Resume building.

Grammar: Common errors in everyday use and their correction

Reference Books

1. English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Black swan 2010.

2. Meenakshi Raman and SangeethaSharma,"Technical Communication: Principles and Practice", 2nd Edition, Oxford University Press, 2011

3. AnandGanguly, "Success in Interview", RPH, 5th Edition, 2016

4. English Grammar and Composition : Wren & Martin, S. Chand and Company Ltd, New Edition 2020

5. English Grammar and In Use: Reymond Murphy, Cambridge University Press - 5th Edition.

6. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015

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Course Title	ENVIRONMENTAL CHEMISTRY				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2023102	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To provide the fundamental knowledge concerning the chemical-physical characteristics of air, water and soil.
- Able to understand the main environmental pollutants present & control measures

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the interconnections between different sectors of the environment like soil, water and atmosphere.
CO 2	Explain basic chemical composition of water & factors that influence the quality of water
CO 3	Describe waste water treatment processes and the practical approach for testing water quality involved.
CO 4	Analyze the different types of pollutions such as Soil & Radioactive pollution which influence the environment
CO 5	Better realization about the causes of Industrial pollution &sustainable development by applying Green Chemistry.

UNIT-I: Introduction to Environment & Atmosphere Chemistry:

Introduction to environment, Atmosphere, environmental segments, Components of environment, earth's radiation balance, particulates, ions, radicals and their formation. Air pollution: Introduction, Sources-oxides of C, N, S, their effects& control measures. Climatic changes- acidrain, Photo chemical smog formation, Green-house effect, global warming and ozone depletion

UNIT-II: Hydrosphere:

Water; Sources of water & its distribution in environment, Chemical composition of water bodies-lakes, streams, rivers, sea, estuaries etc., hydrological cycle.Water pollution-inorganic, organic pesticides, industrial and radioactive materials, oil spills and oil pollutants, eutrophication, Biomagnification, Water borne diseases.

UNIT-III: Water Quality parameters and its Analysis:

Various water quality parameters- drinking & industrial water. Experimental methods for measuring Hardness of water by EDTA method, DO by Winkler's method, Chlorides, Alkalinity, & TDS. Waste water treatment; domestic waste water-aerobic and anaerobic treatment, and industrial waste water treatment- Open Pond system.

UNIT-IV: Soil Pollution

Soil pollution - agricultural pollution - use of chemical fertilizers - Organic chemicals and environment-Agrochemicals-Pesticides, insecticides and herbicides,effects of various pesticides in agriculture on excessive use.

UNIT-V: Environmental Pollution and Control

Effects of Air pollution, Water pollution, Soil pollution&Radioactivepollutionand their control measures. Solid waste disposal - methods - solid waste from mining and metal production and its disposal - electro-coagulation and flocculation.

Textbooks:

1. Perspectives in Environmental Studies – AnubhaKaushik, C. P. Kaushik, New Age International Publishers.
2. Fundamental Concepts of Environmental Chemistry- Sodhi G S – Oxford University
3. Environmental Chemistry- Anil Kumar De-Willey Publications

Reference Books:

1. Textbook of Environmental Sciences by A.K. Agrawal -Student Editions
2. Air pollution-M.N. Rao, HVN Rao- McGraw Hill publications
3. Environment Impact Assessment- Larry W. Canter- McGraw Hill publications

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Course Title	Problem Solving with Algorithmic Thinking				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006103	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To provide the foundations of Computational Problem Solving.
- It aims to train the student to the basic concepts of the C programming language

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply algorithmic thinking to understand, define and solve problems
CO 2	Apply the basic programming constructs for problem solving.
CO 3	Implement different Operations on arrays, Pointers.
CO 4	Use functions to solve the given problem.
CO 5	Understand structures and unions.

UNIT-I

Introduction to Computers: - Introduction, computer hardware and software.

Problem Solving and Algorithmic Thinking Overview – problem definition, logical reasoning; Algorithm – definition, practical examples, properties, representation, algorithms ,Flow chart-Definition ,Practical Examples, creating and running programs, software development life cycle.

UNIT-II

Introduction to C programming: - Overview of C, structure of a C program, variables, constants, data types, identifiers, keywords, Input/output statements in C, programming examples.

Operators and Expressions:- Operators, expressions, precedence and associativity, evaluating expressions, type conversion, type def, enumerations.

Decision making statements: if statement, if-else statement, nested if-else statement, switch statement.

UNIT-III

Loops in C: while loop, for loop, do-while loop, nested for loops, **Jumping statements**: break, continue and goto statements.

Arrays: Introduction, Declaration and initialization of 1D and 2D arrays. **Strings**: - Definition, declaration and initialization of strings, string I/O functions, string handling functions, array of strings (table of strings).

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self referential structures, usage of self referential structures in linked list

UNIT -IV

Functions: Designing structured programs, Declaring a function, Types of functions, Parameters and return type of a function, passing parameters to functions, call by value, Call by Reference, Passing arrays to functions.

Recursion Problem Solving Techniques: Factoring and Recursion Techniques, Dynamic memory allocation: Allocating and freeing memory.

UNIT –V

Structures and union: Introduction, defining a structure, declaring structure variable, structure initialization, accessing members of structure, copying and comparing structure variables, structures within structures, array of structures, and introduction of union.

TEXT BOOKS

1. Riley DD, Hunt KA. Computational Thinking for the Modern Problem Solver.CRC press; 2014 Mar 27.

2. E. Balagurusamy, Programming in ANSI C, Fifth Edition, McGraw Hill.

3. Rema Theraja, Programming in C, second edition, Oxford.

Reference text books:

1. R. G. Dromey, "How to solve it by Computer", PHI, 2008

2.YashavantKanetkar, Let us C, 15th edition, BPBPublications.

3 .Dr.P.ChennaReddy, Computer Fundamentals and C Programming, SecondEdition.

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Course Title	Python Programming				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2006105	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- Explain variables, strings and functions
- Use of mathematical operators and functions
- Explain different statements like if, for etc. ,Explain the python libraries
- Explain Details of the Pandas library o Series and Data Frames
- Define regression with Use case study, Define exploratory data analysis
- Define churn analysis with Use case, Define advance Machine learning Algorithms

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Installing and get start with python and using basic variables and stings in python
CO 2	How to input data in Python ,Use Boolean with python ,Using If and Looping Statements in Python
CO 3	Installing Pandas ,Work with series and data frames.
CO 4	Work with regular expression , Work with Pattern matching ,Parse data
CO 5	Apply advanced Machine learning algorithms ,Work on Support vector machines, Define Random forest

UNIT-I

Introduction to PYTHON

What is Python, its advantages and disadvantages, how to run python scripts, how to use variables, string operator and functions.

UNIT - II

Deep dive into PYTHON

Working of Python like inputting the data, working with Boolean and other statements

UNIT- III

Python Libraries

The use of pandas library for data analysis

Error Handling

Dealing with different type of errors that one can encounter while working with Python.

Other Topics

How to deal with miscellaneous things in python

UNIT- IV
Regression (Use case study)
Regression analysis with the help of a use case.

Other Regression related topics

Topics which are important from the point of view of data analytics

UNIT –V
Advance
Some advance data analytics techniques.

Text Books:

1. Numerical Python : A Practical Techniques Approach for Industry By Robert Johansson published by Apress.
2. Pandas for Everyone: Python Data Analysis, First EditionBy Daniel Y. Chen **PUBLISHEDBY:**Addison-Wesley Professional
3. Become a Python Data Analyst by Alvaro Fuentes by Packt publishing

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Course Title	Agriculture for Engineers & Field Activity				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
20AG106	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To provide the fundamental knowledge concerning the agriculture related materials

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify various types of soils and their mineral content
CO 2	Estimate the amount of Dissolved oxygen and PH in water sample
CO 3	Understand the Traditional & Conventional methods used in farming
CO 4	Analyze the use of drip irrigation method in farming
CO 5	Apply the analyzed skills of students in preparation of farming lands & harvesting crops

List of experiments for Agriculture Engineering

1. Identification of Various soil types
2. Soil testing – moisture, Mineral testing
3. Water sample testing PH
4. BOD
5. COD
6. Identifying various weeds and other insects that harm the agriculture.
7. Preparation of farm land
8. Sowing of seeds and water supply
9. Observation of plant growth and removal of weeds
10. Visit of nearby farms and KrishiVigyan Kendra understating the traditional and conventional methods
11. Using of sprinklers / drip irrigation
12. Harvesting of the crop

Reference Books:

1. Laboratory Manual Engg. Chemistry, Anupma Rajput, DhanpatRai& Co.
2. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et.al., Pearson Education, Sixth Edition, 2012.
3. *Farm Mechanics Text and Handbook* (Danville, IL: The Interstate, 1946), by Glen Charles Cook, L. L. Scranton, and H. F. McColly (page images at HathiTrust)
4. *Agricultural Process Engineering* (first edition; New York: J. Wiley and Sons; London: Chapman and Hall, 1955), by S. M. Henderson and R. L. Perry (page images at HathiTrust)
5. *Farm Shop Work, Practical Manual Training* (New York et al: American Book Company, c1915), by Gerald Brace and D. D. Mayne, contrib. by Charles A. Prosser (multiple formats at archive.org)

Course Title	Introduction to Digital Manufacturing				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2003107	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To studythe Role of computer in Digital manufacturing
- ToStudy concepts of Additive Manufacturing
- To study the Concepts of powder based Digital Manufacturing
- To study the Vat Photo Polymerization Methods
- To study various Errors in steel Files and software for RP

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	At End of semester student gains knowledge Importance of computers in Digital manufacturing
CO 2	Student Gains Knowledge in Basic concepts of Additive Manufacturing
CO 3	Students Gains Knowledge in various powered based Digital Manufacturing systems
CO 4	At the end of semester student gains knowledge in Lom process and concept modelers
CO 5	Student gain knowledge in direct and indirect tooling and part building errors,software for Rp

UNIT-I

Role of computers in Industrial Manufacturing.CAD/CAM/CAE technologies and product lifecycle management (PLM). Expression of product design ideas using 2D sketches. Applications of CAD/CAM.

UNIT-II

Introduction to Additive manufacturing, Basic procedure of additive manufacturing,categories of additive manufacturing,/applications of Additive manufacturing,comparison of additive manufacturing and subtractive manufacturing,Hybrid manufacturing,Challenges and limitations of current additive manufacturing, Additive manufacturing Techniques

UNIT-III

Introduction to powder bed fusion of polymers: Introduction, Processes ,Machines and Technologies, post processing and surface treatment,Advantages and Disadvantages and Applications, Selective laser sintering concept,Applications

UNIT-IV

VAT Photo Polymerization Methods in Additive Manufacturing: Introduction ,VAT Polymerization Process, Advantages ,Disadvantages and Applications, Fusion Deposition modeling, Solid ground curing, process and Applications

UNIT-V

Software for RP: STL files, Overview of Solid view, magics, imics, magic communication, etc. Internet based software, Collaboration tools. Rapid Manufacturing Process Optimization:Factors influencing accuracy, Data preparation error, Part building error, Error in finishing,Influenceof build orientation. Concepts of cura.

TEXTBOOKS:

1. Additive manufacturing,juanpou,Antoniriveiro,J.PauloDavim,Elesevier
2. "Stereo lithographyand otherRP &MTechnologies", Paul F.Jacobs, SME, NY1996
3. "Rapid Manufacturing",Flham D.T&DinjoyS.S,VerlogLondon 2001
4. CAD/CAM P.N RAO,Tata MC Graw Hill,2015

REFERENCES:

1. Additive Manufacturing Technologies by LanGibson, DavidRosen, springer
2. Introduction to Additive manufacturing, Dr.Sridhar s NateshCPInsc International Publishers.
3. Additive Manufacturing C.P.Paul, A.N Jinoop, MCGraw Hill 2021

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Course Title	Problem Solving Using C Lab				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006108	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To make the student learn C Programming language.
- To make the students solve problems, implement them using C language

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Able to write, compile and debug programs in C language and use different data types in a computer program
CO 2	Able to implement programs involving decision structres, loops, arrays and functions on different applications.
CO 3	Able to implement the modular programming concepts, pointers, structures and unions
CO 4	Able to develop the concepts of file I/O operations and random access to files

LIST OF EXPERIME NTS:

1. Practice DOS/LINUX co mmands necessary for design of C programs.
2. Write, edit, debug, compile and execute sample C programs to understand the programming environment.
3. a) Write a C program to find the sum of the individual digits of a given number.

   b) Write a C program to c heck whether a given number is a palindrome or not.
4. a) Write a C program to g enerate& print first n terms of the Fibonacci sequence.

   b) Write a C program to find the roots of a quadratic equation.
5. a) Write a C program to c ompute the factorial of a given number.

   b) Write a C program to g enerate all the prime numbers within a given range

6. a) Write a C program to g enerate PASCAL triangle.

   b) Write a C program to find the GCD of two integers.

7. a) Write a C program to e valuate the function Sin(x) as defined by the infinite series expression.

$$\text{Sin}(x) = \frac{x}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

   b) Write a C program to find the square root of a given number.

8. a) Write a C program to find both smallest and largest number in a list of integers.

   b) Write a C program to erform multiplication of two matrices.

9. Write a C program to read a matrix and perform the following operations.

   i) Print transpose of a matrix.
   ii) Removal of duplicates from an ordered array.

10. a) Write a C program to perform arithmetic operations using functions.

    b) Write a C program to find the factorial of a given number using recursive function.

11. a) Write a C program to count the number of vowels, constants, blank spaces, digits and special characters in a given string.

    b) Write a C program to c heck whether a given string is palindrome or not.

12. Write a C program to read two strings and perform the following operations without using built-in string library functions.

    i) String length determination.
    ii) Comparison of two strings.
    iii) Concentration of two strings.
    iv) String reversing.

12. Write a C program to define a structure with the following members.

    Roll No., Name, marks in Sub1, Sub2, Sub3. Read the n students records and find the total marks of each student and print the result in the following format.

Roll No.	Name	Sub1	Sub2	Sub3	Total Marks	Result
1234	XXX	40	50	90	180	Distinction

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Course Title	Python Programming Lab				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006109	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To write, test, and debug simple Python programs.
- Know when and how to use the appropriate statements available in the python
- To implement Python programs with conditionals and loops
- Use functions for structuring Python programs
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand and solve the basics of python programming
CO 2	Learn and Implement iterative as well as recursive programs in python
CO 3	Represent heterogeneous data with right sequence in python
CO 4	Develop Programs using object-oriented features in python

List of Sample Experiments:

1. Calculate the following programs using Python
   a) Area of Circle
   b) Simple and Compound Interest
   c) Celsius to Fahrenheit
   d) Volume of Sphere

2. Write a Python program to find distance between two points (X1, Y1) and (X2, Y2).

3. Implement the following programs using Python
   a) To find given number is Even or Odd number
   b) Find Maximum of Two numbers
   c) Find given number is Zero, Positive or Negative
   d) Find Minimum of Two numbers
   e) Find given year is leap year or not

4. Write a Python program to find Roots of Quadratic equation.

5. Write a Python program to read credits and grades of five different subjects and display SGPA based on the following table.

Class	SGPA
Distinction	>=7.5
First Class	>=6.5 <7.5
Second Class	>=5.5 <6.5
Pass	>=4.5 <5.5
Fail	<4.5

$$SGPA = \frac{\Sigma(C_i * G_i)}{\Sigma C_i}$$

6. Write a Python program to design arithmetic calculator based on user choice like 1. Addition 2. Subtraction 3. Multiplication 4. Division.

7. Implement the following programs using Python
   a) Sum of Digits of a given number
   b) Given number is Palindrome or not
   c) Find given number is Armstrong number or not
   d) Factorial of a given number

8. Write a Python program to display sum of even valued terms and odd valued terms individually by considering terms of Fibonacci series upto n.

9. Using with and without Python objects on console

10. Using mathematical functions on console

11. Write an Python script, to create Python objects for calculator application and save in a specified location in disk

12. Write an Python script to find basic descriptive statistics using summary

13. Write an Python script to find subset of dataset by using subset ()

14. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.

15. Reading Excel data sheet in Python.

16. Reading XML dataset in Python

17. Find the data distributions using box and scatter plot.

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Course Title	Indian Traditional Knowledge				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
20MC110	MC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	2	--	40	--	40
Mid Exam Duration: 90 Minutes							

Course Objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots knowledge system.
- To make the students understand the traditional knowledge and analyse it and apply it to their day to day life.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Tounderstand the Indian culture and Ancient practices
CO 2	To acquire knowledge on Indigenous practices
CO 3	To illustrate the various trend changes in society
CO 4	To develop sustainable practices for future
CO 5	To impart knowledge and strive towards SDGs

UNIT-I

Overview of the Indian tradition, culture, and knowledge:

Introduction, Indian Culture, Ancient Practices, Knowledge - Scripts and sculptures.

UNIT-II

Indigenous Knowledge:

Natural Resources in India, Self -Sustaining societies, Emergence of science through tradition, Indigenous knowledge.

UNIT-III

Changing Trends:

Cultural practices, Resource Utilization, Technological Advancement, Resource exploitation & Conflicts, Current scenario – Indigenous knowledge &practices ,Climate Change & Ecological crisis.

UNIT-IV

Sustainable Solutions for Sustainable Society:

Biodiversity Conservation, Emergence of Renewable Energies, Waste Management Systems, Sustainable Livelihood Practices.

UNIT-V

Global trends for sustainable development

Case studies, Global Institutions, Indian SDGs & Action Plans

TEXT BOOKS

1. Gunde Padma and A. Uma Shankar Kumar, Indian Traditional Knowledge, Virndiya Publications, First Edition-2021.

REFERENCE TEXT BOOKS:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

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B.Tech II SEM AI&ML (R20)

Course Title	Introduction to Machine Learning				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006201	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		1	0	0	1	40	--	40
Mid Exam Duration: 90 Minutes							

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To build the various of types of machine learning models.
- To evaluate the performance of machine learning algorithms.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the machine learning concepts that are suitable for developing real time applications
CO 2	Understand the concept of decision tree classifier and develop a model for a given problem
CO 3	Apply regression based learning to solve a real time problem
CO 4	Understand the concepts of clustering based machine learning algorithms
CO 5	Understand outlier analysis and to evaluate the leaning models.

UNIT–I:

Introduction: Introduction to Machine Learning, different types of learning, Applications of Machine Learning, Data Sets, Splitting the data set into Training and test sets, cross validation. Under fitting, over fitting.

UNIT–II:

Machine learning models: Classification, Decision tree classifier ,Naïve Bayes classifier.

UNIT–III:

Regression: Regression, Types of regression, simple linear regression, Logistic Regression.

UNIT–IV:

Clustering: Introduction, K-means clustering, K-medoid clustering,, Hierarchical clustering.

UNIT– V:

Outlier analysis and confusion matrix: outlier and outlier analysis, confusion matrix, performance and error analysis.

TEXTBOOKS:

1. Machine Learning, Tom M.Mitchell, McGraw-Hill

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The Art and Science of Algorithms That Make Sense of Data, Peter Flash, Cambridge, University Press

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Course Title	Biology for Engineers				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
20BE202	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- Introduction to Basics of Biology which includes cell, the unit of life, Different types of cells and classification of living organisms.
- Understanding what are biomolecules present in a cell, their structure function and their role in a living organism. Application of certain bio molecules in Industry.
- Brief introduction to human physiology, which is essential for bioengineering field.
- Understanding the hereditary units, that is genes and genetic materials (DNA and RNA) present in living organisms and how they replicate and pass and preserve vital information in living organisms.
- How biology can be applied in our daily life using different technology, for production of medicines to transgenic plants and animals to designing new biotechnological products

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define the cells, its structure and function, and Different types of cells and basis forClassification of living organisms.
CO 2	Explain about biomolecules its structure and function and their role in a living organism. How biomolecules are useful in Industry & explain about human physiology.
CO 3	Demonstrate the concept of biology and its uses in combination with different technologies for production of medicines and production of transgenic plants and animals.
CO 4	Illustrate about genes and genetic materials (DNA & RNA) present in living organisms and how they replicate, transfer & preserve vital information in living organisms.

UNIT-I

Introduction to Basic Biology Cell:

Cell theory, Cell shapes, structure of a Cell, The Plant Cell and animal Cell ,Cell cycle, types of chromosomes, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Brief introduction to classification of Kingdoms- kingdom classification by Linnaeus.

UNIT-II
Introduction to Bio-molecules

Classification of Biomolecules-Introduction, Classification of carbohydrates-Monosaccharide's, Disaccharides, Oligosaccharides- Sources & their uses, Proteins-Amino acid-Classification based on Structure, Sources & their uses, Lipids-Definition , sources & their uses. Nucleic acid -DNA and RNA-Structure &their types.Large scale production of enzymes by Fermentation.

UNIT-III
Human Physiology

Nutrition -Classes of nutrients or food substances-Micronutrients & Macronutrients-Sources, uses & their deficiency disorders, Digestive systems-Structure & its mechanism, Respiratory system (two kinds of respiration – aerobic and anaerobic), Respiratory organs-Structure & functions, Excretory system-Structure & functions.

UNIT-IV
Genes, Replication of DNA, And Introduction to recombinant DNA Technology:

Prokaryotic gene and Eukaryotic gene structure, DNA replication, Gene expression-Transcription and Translation in Prokaryote and Eukaryote .Recombinant DNA technology (Insulin production), Mutation-definition, uses & its applications.

UNIT-V
Application of Biology

Genetic Engineering-production of vaccines, its components, types of vaccines, Enzymes and their application in industry, type of antibodies, transgenic plants (BT cotton) and animal (Dolly), Biosensors-characteristic, basic principles ,biological applications. Tissue-engineering-objective/goals, components, applications. Bio engineering-introduction to bio engineering & its applications, Bio fuels –Types and uses.

TEXT BOOKS:

1. Cell and Molecular Biology-P.K.Gupta
2. Cell Biology-Verma and Agarwal
3. Cell Biology-Rastogi
4. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
5. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications.PP 434.
6. Biotechnology U. SatyaNarayanaPublisher: Books & Allied Ltd Genre: ENGINEERING ISBN: 9780125002615, 0125002610
7. Industrial Biotechnology ,ShastriVarun Publisher: Gyan Books Genre: Science ISBN: 9788182053762, 9788182053762

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Reference Books:

1. AlbertsEt.Al. The molecular biology of the cell, 6/e, Garland Science, 2014

2. De Robertis EDP & EMF De Robertis. 2001. Cell and Molecular biology. Lippincott Williams &Wilkins.Bombay.

3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.

4. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012 Principles of Biochemistry.2nd ed. 1993. A.L. Lehninger, D.L.Nelson.M.Cox. Paniama Publications.PP. 1090.

5. Harper's biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.

6. Introductory Microbiology. 1995, by Trevor Gross.

7. Molecular Biology by G. Padmanabhan, K. SivaramSastry, C. Subramanyam, 1995, Mac Millan.

8. Biochemistry of Nucleic Acids. 1992. 11thed.R.L.P.Adams .J.T.Knowler.D.PLeader. Chapman and Hall.

9. Genetic Engineering –SandhyaMitra.

10. Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH Publishers).

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Course Title	Data Structures					B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2006203	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes						End Exam Duration: 3Hrs		

Course Objectives:

- To develop skills and analyze linear and non linear data structures.
- To understand basic concepts about linked lists, stacks, queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting, searching and hashing.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the variety of abstract data types and data structures.
CO 2	Analyze data structures such as linked list, Stacks and Queues.
CO 3	Apply and analyze tree traversal algorithms and graph traversal algorithms.
CO 4	Organize data in order using various sorting algorithms.
CO 5	Ability to understand the concept of hashing, B-Trees and B+-Trees.

UNIT-I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & Non Linear data structures, **Linear Lists:** Definition, **Arrays:** Definition, **Linked Lists:** Single Linked List-Definition, Insertion and Deletion operations, Doubly Linked List-Definition, Insertion and Deletion operations.

UNIT-II

Stacks: Definition, Array & Linked representations, Operations, Applications, **Queues:** Definition, Array & Linked representations, Operations, Circular Queues &Dequeues .

UNIT-III

Trees: Basic terminology, Binary Trees- Definition, Properties, Representation, Complete and Full Binary Tree, **Tree Traversal Algorithm:** In order, Preorder and Postorder, **Priority Queues:** Definition, Heaps, Leftist Trees, **Binary Search Tree(BST):** Definition, Operations & Implementations, BST with Duplicates, Indexed BST.

UNIT-IV

Balanced Search Trees: AVL, Red-Black & Splay Trees, Graphs: Terminology, Representations, **Graph Traversal:** Depth First Search (DFS), Breadth First Search (BFS), Minimum Spanning Tree.

UNIT-V

Sorting: Selection, Insertion, Bubble, Heap, **Searching:** Sequential & Binary Search.
Hashing:

Introduction, Hash Table representation, Hash Functions , **Collisions:** Introduction, Separate Chaining, Open Addressing , B-Trees, Operations on B-Trees, B+-Trees.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G. Sorenson, McGraw Hill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universities press.
3. Data Structures using C++, VarshaH.Patil, Oxford University Press.

Reference books:

2. Data Structures, Algorithms and Applications in C++, AnandaRaoAkepogu and RadhikaRajuPalagiri, Pearson Education.
3. Data Structures and Algorithms in C++, S.Sahni, University Press (India) Private Limited, Second Edition.
4. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGraw Hill.
5. Data Structures and Algorithms, G.A.V.Pai, Tata McGraw Hill.
6. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
7. Data Structures and algorithms in C++, Mark Allen Weiss, Pearson Education Limited, Second Edition.

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Course Title	Mathematics for Intelligent System				B.Tech AI&ML I Sem (R20)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
2021204	BS	2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hours		

Course Objectives:

- This course will illuminate the students in the concepts of application orientation of Mathematics.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes : On successful completion of this course, the students will be able to

CO 1	Develop the use of matrix techniques that is needed by engineers for practical applications.
CO 2	Utilize sequences and series to real life problems.
CO 3	Apply first order differential equations.
CO 4	Evaluate ordinary differential equations of higher order.
CO 5	Apply curvature concepts in engineering problems.

UNIT I

Gaussian Elimination: (08 Hours)

Introduction – Matrix notation and Matrix multiplication - Gaussian elimination – Triangular Factorization methods.

UNIT II

Sequences and series: (08 Hours)

Convergence of sequences and series – Comparison test – p test – D'Alemberts ratio test – Cauchy's root test (without proofs).

UNIT - III

First order ordinary differential equations: (08 Hours)

Linear,Bernoulli equations. Applications: Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

UNIT IV

Ordinary differential equations of higher order: (08 Hours)

Linear differential equations of second and higher order with constant coefficients – R.H.S term of the type e^{ax}, sinax, cosax, polynomials in x, e^{ax} V(x), xV(x).

UNIT V

Differential Calculus: (08 Hours)

Curvature: Curvature of a curve – Curvature of a circle – Radius of a curvature – Centre of Curvature – Equation to the circle of curvature.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-44 edition 2017.

2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 10th edition-Reprint 2021.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. Linear Algebra: A Modern Introduction, D Poole, 2nd Edition, Brooks/Cole, 2005.
3. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008

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Course Title	Object Oriented Programming Through JAVA					B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2006205	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes						End Exam Duration: 3Hrs		

Course Objectives:

- Understanding Object-Oriented Programming Concepts.
- Explain variables, strings, operators and datatype.
- Advantage of using Java API classes
- Understand and implement Exceptions and handling.
- Understanding and implement multithreading.
- Understand the need for Lambda expressions and implementing Java database connectivity.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	How to develop java programs using objects and classes.
CO 2	Implementing programs on arrays and static numbers.
CO 3	Implementing programs using abstract classes and interfaces.
CO 4	Understanding java threads and collection frame work.
CO 5	Implementing programs using Lambda expressions and GDBC programs using Data Access objects.

UNIT-I

Object Oriented Concepts: Introduction to all the components of Object-Orient concepts.

Overview of Java Platform: History of the Java program

Java Language Fundamentals: Datatypes, variables, operators, programming constructs and arrays.

UNIT-II

Creating Classes and Objects: About Java classes, objects, overloading, static members and initialization blocks.

Implementing OOP Concepts: About encapsulation, aggregation, inheritance, cosmic class, polymorphism, abstract classes and interfaces.

Useful Java API Classes: Java Application Programming Interfaces (API), wrapper class

UNIT-III

Exceptions: Java exception declaration and handling customer exceptions

File Handling:about files, folder, Stream API and its implementation. Also discusses about serialization.

UNIT-IV

Multithreading: Threading in java and advanced concepts of handling multi-threads in Java.

Collection Framework: generic, collection framework and how to compare objects..

UNIT-V

Lambda Expressions: About lambda expressions, type inference and its functionality

JDBC: The database connectivity and Java database connectivity API to apply in the Java programs

TextBooks:

1. Java;thecompletereference,7thEdition, HerbertSchildt, TMH.
2. UnderstandingOOPwithJava,updatededition,T.Budd,PearsonEducation.

ReferenceBooks:

1. AnIntroductiontoprogrammingandOOdesignusingJava,J.NinoandF.A.Hosch,Johnwiley& sons.
2. AnintroductiontoJavaprogrammingandObjectOrientedApplicationdevelopment,R.A.Johnson-Thomson.
3. CoreJava2,Vol1,Fundamentals,Cay.S.HorstmannandGaryCornell,eighthEdition,PearsonEducation.
4. CoreJava2,Vol2,AdvancedFeatures,Cay.S.HorstmannandGaryCornell,eighthEdition,PearsonEducation.
5. ObjectOrientedProgrammingthroughJava,P.RadhaKrishna,UniversityPress.

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Course Title	APPLIED PHYSICS				B.TechAI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
20AP206	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineeringapplications
- To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineeringapplications.
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging microdevices.
- To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory ofsolids.
- Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Study the different realms of physics and their applications in both scientific technological systems through physical optics
CO 2	Identify the wave properties of light and the interaction of energy with the matter. Asses the electromagnetic wave propagation and its power in different media.
CO 3	Understands the response of dielectric and magnetic materials to the applied electric and magnetic fields.
CO 4	Study the quantum mechanical picture of subatomic world along with the discrepancies between the classical estimates and laboratory observations of electron transportation phenomena by free electron theory and band theory.
CO 5	Elaborate the physical properties exhibited by materials through the understanding of properties of semiconductors and superconductors.

UNIT-I: Wave Optics

Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

UNIT-II: Lasers and Fiber optics

Lasers-Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Semiconductor diode laser- Applications of lasers.

Fiber optics-Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Block diagram of Optical fiber Communication system - Propagation Losses (qualitative) – Applications.

UNIT-III: Dielectric and Magnetic Materials

Dielectric Materials-Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

Magnetic Materials-Introduction to magnetic materials (Origin of magnetic moment of an atom and Classification of magnetic materials) –Weiss theory of ferromagnetism-soft ferrites and hard ferrites- Hysteresis – Soft and Hard magnetic materials-Applications magnetic materials.

UNIT IV: Quantum Mechanics, Free Electron Theory

Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory-Classical free electron theory (Merits and demerits only) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Density of states – Fermi energy.

UNIT – V: Semiconductors and Superconductors

Semiconductors- Introduction – Intrinsic semiconductors – Electrical conductivity – Fermi level – Extrinsic semiconductors –Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) –High T_c superconductors – Applications of superconductors.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu& Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering Physics – B.K. Pandey and S. Chaturvedi, Cengage Learning.

Reference Books:

1. Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018
2. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
3. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
4. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill.

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Course Title	Principles of Measurements and Sensors				B.TechAI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004207	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- Familiarize the students about a basic understanding of the principles involved in measurements.
- To know the state of the art sensors for various engineering applications.
- To learn about interface the sensors with computing platforms.
- To impart the students to understand the engineering applications of various sensors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To develop a basic understanding of the principles involved in measurements.
CO 2	To introduce the state of the art sensors for various engineering applications.
CO 3	To enable the students to interface the sensors with computing platforms
CO 4	To facilitate the students to understand the engineering applications of various sensors.

UNIT-I

Introduction to measurement systems- Generalized measurement model -Static and Dynamic Characteristics of measurement systems- Types of errors- Calibration.

UNIT-II

Principles and Applications of sensing elements- Thermal sensors, Mechanical sensors, Optical Sensors

UNIT-III

Principles of Resistive transducers- Potentiometer, Strain gauge ,Inductive transducers- LVDT , Proximity transducers capacitive transducers- Capacitor microphone, capacitive thickness Transducers

UNIT-IV

Sensors, Transducers-classification of transducers-types of sensor, smart sensors, fiber optic sensors, MEMS, nano sensors, Ultrasonic Sensors, Thin Film Sensors, Liquid Level Sensors

UNIT-V

Data Acquisition System (DAS)-Objective of DAS-Signal conditioning circuit-Multi channel DAS-Computer based DAS.

TextBooks:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, DhanpatRai& Company Private Limited,2007.
2. Renganathan. S,"Transducer Engineering", Allied Publishers, Chennai, 2003.
3. Murthy.D.V.S, "Transducers and Instrumentation", Prentice Hall of India, 2001

ReferenceBooks:

1. Doebelin. E.A, "*Measurement Systems – Applications and Design*", Tata McGraw Hill, New York, 2000.
2. Patranabis. D, "*Sensors and Transducers*", Prentice Hall of India, 1999.

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Course Title	Data Structures Lab				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006208	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To make the students learn the implementation of insertion, deletion and display operations on various linear and non linear data structures.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand and implement stack ADT, queue ADT and linked list.
CO 2	Able to understand and implement tree traversal algorithms and graph traversal algorithms.
CO 3	Able to implement various sorting algorithms
CO 4	Analyze and implement searching techniques

List of Experiments:

Sample list of Experiments:

1) Write a program for stack operations by using arrays.
2) Write a program for stack operations by using linked list.
3) Write a program to convert given infix expression to postfix expression.
4) Write a program for queue operations by using arrays.
5) Write a program for queue operations by using linked list.
6) Write a program for circular queue operations by using arrays.
7) Write a program to implement operations on single linked list.
8) Write a program to implement operations on doubly linked list.
9) Write a program to implement insertion, deletion and traversal operations on trees.
10) Write a program to implement Breadth First Search (BFS) traversal algorithm.
11) Write a program to implement Depth First Search (DFS) traversal algorithm.
12) Write a program to implement operations on AVL tree.
13) Write a program that implement selection sort, to sort a given list of elements in ascending order.
14) Write a program that implement insertion sort, to sort a given list of elements in ascending order.

15)Write a program that implement bubble sort, to sort a given list of elements in ascending order.

16)Write a program that implement merge sort, to sort a given list of elements in ascending order.

17)Write a program that implement quick sort, to sort a given list of elements in ascending order.

18)Write a program that implement heap sort, to sort a given list of elements in ascending order.

19)Write a program for linear search using arrays.

20) Write a program for binary search using arrays.

Text Books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G. Sorenson, McGraw Hill.

2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universities press.

3. Introduction to Data Structures in C, Ashok N Kamthane, Pearson Education

Reference Books:

1. Data Structures and Algorithms in C++, S.Sahni, University Press (India) Private Limited, Second Edition.

2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

3. Data Structures and Algorithms Analysis in C, Mark Allen Weiss, Pearson

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Course Title	Communication Skills Lab				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024209	HS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Expose to a variety of self instructional, learner friendly modes of language learning.
- Learn better pronunciation through stress, intonation and rhythm.
- Train the students to use language effectively to face interviews, group discussions, and public speaking.
- Make them fluent in error- free communication.
- Improve their listening skills by enhancing their accuracy in pronunciation.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop language skills and vocabulary forprofessional success
CO 2	Make the students thorough with presentation skills and become successful
CO 3	Enhanceconfidence and become effective communicator
CO 4	Heighten their fluency in communication
CO 5	Analyze interview techniques and get success at interviews

Syllabus:

Topics for the lab:

1. Listening Skills
2. Vocabulary
3. Situational Conversations
4. Interpersonal Skills

5 Introducing oneself

6. Role-play
7. Group Discussion
8. Interview Skills.

Suggested Software

- Walden Infotech
- K-Van solutions

1. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc.

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Books Suggested for Professional Communication Lab (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata McGraw-Hil 2009.
2. **Technical Communication**byMeenakshi Raman &Sangeeta Sharma, Oxford University Press 2009.
3. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010.
4. **Resume's and Interviews** by M. Ashraf Rizvi, Tata McGraw-Hill, 2008.
5. **English Language Communication: A Reader cum Lab Manual**Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

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Course Title	JAVA Programming Lab				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2006210	ES	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA. To familiarize Java environment to create, debug and run simple Java programs.
- To be able to understand Primitive data types, Java control flow, Methods, classes, packages, multithreading and exception handling
- To be able to understand and implement Java applications and applets

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Create, compile, and run Java program
CO 2	Apply the concept of inheritance and polymorphism
CO 3	Implement Packages, Interfaces and Exception handling
CO 4	Develop windows applications both for standalone and Applets programs by using awt and swings

List of Experiments:

EXERCISE 1: (Basics)

a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursivefunctions to print the nth value in the Fibonacci sequence.
b) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)

EXERCISE 2 (Basics)

a) Write a Java program to multiply two given matrices.
b) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)
c) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

EXERCISE 3:(Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.

EXERCISE 4: (Methods)

a). Write a JAVA program to implement constructor overloading.

b). Write a JAVA program implement method overloading.

EXERCISE 5: (Inheritance)

a). Write a JAVA program to implement Single Inheritance

b). Write a JAVA program to implement multi level Inheritance

c). Write a java program for abstract class to find areas of different shapes

EXERCISE 6: (Inheritance - Continued)

a). Write a JAVA program give example for "super" keyword.

b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

EXERCISE 7:(Threads & Packages)

a) . Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a Java program to implement packages.

EXERCISE 8: (Exception Handling)

a).Write a JAVA program that describes exception handling mechanism

b). Write a JAVA program that implements Runtime polymorphism

EXERCISE 9: (Applet)

a) Write a JAVA program to display analog clock using Applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

c) Write a Java program to develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

EXERCISE 10: (Event Handling)

a) Write a Java program for handling mouse events.

b) Write a Java program for handling keyboard events.

EXERCISE 11: (Swings)

a) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.(Real Time)

Write a JAVA program that to create a single ball bouncing inside a JPanel

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Course Title	Community work / NSS				B.Tech AI&ML II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
20MC211	MC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	--	--	--	40	--	40
Mid Exam Duration: 90 Minutes							

Course Objectives:

- To inculcate volunteerism concept in the young minds.
- To impart nationalism, self-sustainability and responsibilities in youth.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To recall history, objectives and principles.
CO 2	Planning and understanding the various NSS Programs.
CO 3	To inculcate volunteerism.
CO 4	To understand youth and their responsibilities towards community.
CO 5	To impart self-sustainability.

UNIT I:

- Introduction, Basic aspects of NSS, NSS programs & activities
- History, philosophy, aim & objectives of NSS, flag, emblem, song etc
- Structure, role, responsibilities of NSS functionaries and duties of NSS.
- Concept of regular, special campaign, basis of adoption of village / slum

UNIT II:

- Planning and Preparation of Special Camping Programme
- Program Planning at various levels such as state level, University /+2 level, College level. Monthly action plan.
- Other Youth supporting organizations

UNIT III:

- Volunteerism, Role of Youth leaders, Capacity building in youth
- Indian Tradition of volunteerism, needs & importance, motivation and constraints of volunteerism.

- Meaning, types of leadership, qualities of a good leader, traits of leadership, Importance and role of youth leadership.
- Understanding youth, identifying the needs draw backs in youth and impaling the youth to reach their goals.

UNIT IV:

- Youth Development programs in Indian, Youth & Environment, Youth & Health
- National Youth Policy, Youth development Programs, Youth focused and Youth led organizations.
- Environment conservation, enrichment and sustainability, climate change, waste management, natural resource management, Role of youth in disasters.
- Healthy lifestyles, HIV/Aids, Drugs and substance abuse, first aid, food nutrition, national health program, reproductive health: Yoga as a tool for healthy lifestyle.

UNIT V:

- Entrepreneurship development, resources mobilization, additional life skills, documentation and reporting
- Definition & meaning of entrepreneur, qualities of a good entrepreneur steps / ways in opening an enterprise, role of finical and support service.
- Writing a project proposal, tie upping with likeminded organizations, crowd funding.
- Positive thinking self-confidence and self-esteem, setting life goals and working to achieve them, management of stress including time management.
- Collection and data analysis, preparation of reports, dissemination of documents.

Textbooks:

1. National Service Scheme by Dr. S. Jyothi and A. Uma Shankar Kumar, first edition-2021, Professional Book Publisher.

Referencebooks:

1. National Service Scheme – A youth Volunteers Programme by J.D.S Panwar, Amit Kumar Jain and Brijesh Kumar Rathi publications: ASTRAL

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