KIT-Kalaignarkarunanidhi Institute of Technology

(An Autonomous Institution)

Coimbatore – 641402.

B. Tech - Artificial Intelligence and Data Science

REGULATIONS – 2019

Conceptual Frame work

(For Students admitted from the Academic Year 2021-22 onwards)

Semester	Level of Course	Hours / Week	No of Courses	Range of Credits/ Courses	Total Credits
PART I					
A - Foundation Courses					
I to II & VI	Humanities and Social Sciences **(HS)**	3	3	3	9
I to V	Basic Sciences **(BS)**	3-4	8	2-4	28
I to II	Engineering Sciences **(ES)**	3-4	9	2-4	24
B - Professional Core Courses					
III to VII	Professional Core**(PC)**	3-4	24	1-4	62
C - Elective Courses					
V to VIII	Professional Elective**(PE)**	3	6	3	18
V to VIII	Open Elective **(OE)**	3	4	3	12
D – Project Work					
V, VII & VIII	Project Work **(PW)**	4 -16	3	2 - 8	12
E - Mandatory Courses Prescribed by AICTE/UGC (Not to be Included for CGPA)					
I, III & IV	Mandatory Course**(MC)**	3	3	NC	NC
Total Credit					**165**
PART II - Career Enhancement Courses (CEC)					
II	Soft Skills – I	2	1	1	1
III	Soft Skills – II	2	1	1	1
	Professional Certificate Course- I	2	1	1	1
III or IV	NPTEL like Online Certificate Courses	-	-	-	NC
IV	In-plant Training	-	-	-	NC
IV	Career Ability Course- I	2	1	-	NC
V	Career Ability Course – II	2	1	-	NC
	Professional Certificate Course - II	2	1	1	1
	Summer Internship	-	1	1	1
V or VI	NPTEL like Online Certificate Courses	-	-	-	NC
VI	Career Ability Course – III	2	1	-	NC
Total Credit					**05**
Total Credit to be Earned					**170**

PART III (Additional Credit Course - Not to be Included for CGPA)

Semester	Course Code	Level of Course	Hours /Week	No. of Courses	Range of Credits/ Courses	Total Credits
III	B19ADA301	Hands on Training	20-30	1	-	1
IV	B19ADA401	Hands on Training	20-30	1	-	1
V	B19ADA501	Emerging Technology - Certificate Course - I	40-60	1	-	1
VI	B19ADA601	Emerging Technology - Certificate Course – II	40-60	1	-	1
VII	B19ADA701	Emerging Technology - Certificate Course – III	30-40	1	-	1

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Scheme of Instructions and Examinations

(For Students admitted from the Academic Year 2021-22 onwards)

Semester I											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
Induction Program											
B19ENT101	Functional English	HS	3	3	0	0	3	40	60	100	3
B19MAT101	Matrices and Differential Calculus	BS	4	3	0	1	3	40	60	100	4
B19PHT101	Engineering Physics	BS	3	3	0	0	3	40	60	100	3
B19ADT101	Computer Programming in C	**ES**	**3**	**3**	**0**	**0**	**3**	**40**	**60**	**100**	**3**
B19MET101	Engineering Graphics	ES	6	2	4	0	3	40	60	100	4
B19PHP101	Physics Laboratory	BS	4	0	4	0	3	60	40	100	2
B19ADP101	Computer Programming in C Laboratory	**ES**	**4**	**0**	**4**	**0**	**3**	**60**	**40**	**100**	**2**
B19MCP101	Life Skills	MC.	2	0	2	0	-	100	-	100	NC
Total Contact Hours/ Week			**29**	**14**	**14**	**1**	**Total Credits**				**21**

Semester II											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ENT201	Professional English	HS	3	3	0	0	3	40	60	100	3
B19MAT201	Integral Calculus and Complex Analysis	BS	4	3	0	1	3	40	60	100	4
B19EET202	Basic Electrical, Electronics and Instrumentation	ES	3	3	0	0	3	40	60	100	3
B19ECT203	Digital Logic and System Design	ES	3	3	0	0	3	40	60	100	3
B19ADT201	Python Programming	ES	3	3	0	0	3	40	60	100	3
B19MEP201	Basic Workshop Practice Laboratory	ES	4	0	4	0	3	60	40	100	2
B19EEP202	Basic Electrical, Electronics & Instrumentation Engineering Laboratory	ES	4	0	4	0	3	60	40	100	2
B19ADP201	Python Programming Laboratory	ES	4	0	4	0	3	60	40	100	2
B19CEP201	Soft Skills – I	CEC	2	0	2	0	-	100	-	100	1
Total Contact Hours/ Week			**30**	**15**	**14**	**1**	**Total Credits**				**23**

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Semester III											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT301	Discrete Mathematics	BS	4	3	0	1	3	40	60	100	4
B19MAT305	Linear Algebra	BS	3	3	0	0	3	40	60	100	3
B19CST302	Data Structures	PC	4	3	0	1	3	40	60	100	4
B19ADT301	Fundamentals of Data Science	PC	3	3	0	0	3	40	60	100	3
B19CST401	Computer Networks	PC	3	3	0	0	3	40	60	100	3
B19MCT301	Environmental Sciences	MC	3	3	0	0	3	-	-	-	NC
B19CSP301	Data Structures Laboratory	PC	2	0	2	0	3	60	40	100	1
B19ADP301	Data Science Laboratory	PC	2	0	2	0	3	60	40	100	1
B19CEP301	Soft Skills- II	CEC	2	0	2	0	-	100	-	100	1
B19CEP302	Professional Certificate Course-I	CEC	2	0	2	0	-	100	-	100	1
Total Contact Hours/ Week			**28**	**18**	**8**	2	**Total Credits**				**21**
In-plant Training: Minimum ONE week duration has to be completed (Review will be conducted in first week of Sem IV and its credit will be included in Sem IV)											

Semester IV											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT401	Probability and Queuing Theory	BS	4	3	0	1	3	40	60	100	4
B19CST402	Database Management Systems	PC	3	3	0	0	3	40	60	100	3
B19ADT401	Fundamentals of Artificial Intelligence	PC	3	3	0	0	3	40	60	100	3
B19ADT402	Analysis of Algorithms	PC	4	3	0	1	3	40	60	100	4
B19ADT403	Data Mining and Data Warehousing	PC	3	3	0	0	3	40	60	100	3
B19MCT302	Indian Constitution	MC	3	3	0	0	3	-	-	-	NC
B19CSP401	Database Management and Systems Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ADP401	Artificial Intelligence Laboratory	PC	4	0	4	0	3	60	40	100	2
B19CEP401	Career Ability Course - I	CEC	2	0	2	0	-	100	-	100	NC
B19CEP402	In-plant Training	CEC	-	-	-	-	-	-	-	-	NC
B19CEP403	Online Certificate Course	CEC	-	-	-	-	-	-	-	-	NC
Total Contact Hours/ Week			**30**	**18**	**10**	**2**	**Total Credits**				**21**

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Summer Internship - Duration 15 days (Review will be conducted in first week of semester V and its credit will be included in semester V)

Online Certificate Course (like NPTEL, Course era, Udemy) has to be completed within second year (NC)

Semester V											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT501	Statistics for Data Analytics	BS	4	3	0	1	3	40	60	100	4
B19ADT501	Data Privacy and Security	PC	3	3	0	0	3	40	60	100	3
B19ADT502	Machine Learning	PC	3	3	0	0	3	40	60	100	3
B19CST504	Web Technology	PC	3	3	0	0	3	40	60	100	3
	Professional Elective- I	PE	3	3	0	0	3	40	60	100	3
	Open Elective –I	OE	3	3	0	0	3	40	60	100	3
B19ADP501	Machine learning laboratory	PC	4	0	4	0	3	60	40	100	2
B19CSP501	Internet Programming Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ADP502	Mini Project	PW	4	0	4	0	3	100	-	100	2
B19CEP501	Career Ability Course - II	CEC	2	0	2	0	-	100	-	100	NC
B19CEP502	Professional Certificate Course-II	CEC	2	0	2	0	-	100	-	100	1
B19CEP503	Summer Internship	CEC	-	-	-	-	-	-	-	-	1
Total Contact Hours/ Week			**35**	**18**	**16**	**1**	**Total Credits**				**27**

Semester VI											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADT601	Big Data Analytics	PC	3	3	0	0	3	40	60	100	3
B19ADT602	Deep Learning Techniques	PC	3	3	0	0	3	40	60	100	3
B19ADT603	Project Management Principles and Techniques	HS	3	3	0	0	3	40	60	100	3
	Professional Elective–II	PE	3	3	0	0	3	40	60	100	3
	Professional Elective-III	PE	3	3	0	0	3	40	60	100	3
	Open Elective-II	OE	3	3	0	0	3	40	60	100	3
B19ADP601	Big Data Analytics Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ADP602	Deep Learning Laboratory	PC	4	0	4	0	3	60	40	100	2
B19CEP601	Career Ability Course – III	CEC	2	0	2	0	-	100	-	100	NC
B19CEP602	Online Certificate Course	CEC	-	-	-	-	-	-	-	-	NC

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Total Contact Hours/ Week	28	18	10	0	Total Credits	22
Online Certificate Course (like NPTEL, Course era, Udemy) has to be completed within third year (NC)						

Semester VII											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADT701	Business Analytics	PC	3	3	0	0	3	40	60	100	3
B19ADT702	Data Visualization	PC	3	3	0	0	3	40	60	100	3
	Professional Elective-IV	PE	3	3	0	0	3	40	60	100	3
	Professional Elective-V	PE	3	3	0	0	3	40	60	100	3
	Open Elective-III	OE	3	3	0	0	3	40	60	100	3
B19ADP701	Business Analytics Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ADP702	Data Visualization Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ADP703	Project Work Phase-I	PW	4	0	4	0	-	40	60	100	2
Total Contact Hours/Week			**27**	**15**	**12**	**0**	**Total Credits**				**21**

Semester VIII											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
	Professional Elective-VI	PE	3	3	0	0	3	40	60	100	3
	Open Elective- IV	OE	3	3	0	0	3	40	60	100	3
B19ADP801	Project Work Phase-II	PW	16	0	16	0	3	40	60	100	8
Total Contact Hours/Week			**22**	**6**	**16**	**0**	**Total Credits**				**14**

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HUMANITIES AND SOCIALSCIENCES (HS)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ENT101	Functional English	HS	3	3	0	0	3	40	60	100	3
B19ENT201	Professional English	HS	3	3	0	0	3	40	60	100	3
B19ADT603	Project Management Principles and Techniques	HS	3	3	0	0	3	40	60	100	3

BASIC SCIENCES (BS)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT101	Matrix Algebra and Differential Calculus	BS	4	3	0	1	3	40	60	100	4
B19PHT101	Engineering Physics	BS	3	3	0	0	3	40	60	100	3
B19PHP101	Physics Laboratory	BS	4	0	4	0	3	40	60	100	2
B19MAT201	Integral Calculus and Complex Analysis	BS	4	3	0	1	3	40	60	100	4
B19MAT301	Discrete Mathematics	BS	4	3	0	1	3	40	60	100	4
B19MAT305	Linear Algebra for Data Science	BS	3	3	0	0	3	40	60	100	3
B19MAT401	Probability and Queuing Theory	BS	4	3	0	1	3	40	60	100	4
B19MAT501	Statistics for Data Analytics	BS	4	3	0	1	3	40	60	100	4

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ENGINEERING SCIENCES (ES)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADT101	Computer Programming in C	ES	3	3	0	0	3	40	60	100	3
B19MET101	Engineering Graphics	ES	6	2	4	0	3	40	60	100	4
B19ADP101	Computer Programming in C Laboratory	ES	4	0	4	0	3	40	60	100	2
B19EET202	Basic Electrical, Electronics and Instrumentation Engineering	ES	3	3	0	0	3	40	60	100	3
B19ECT203	Digital Logic and System Design	ES	3	3	0	0	3	40	60	100	3
B19ADT201	Python Programming	ES	3	3	0	0	3	40	60	100	3
B19MEP201	Basic Workshop Practice Laboratory	ES	4	0	4	0	3	40	60	100	2
B19EEP202	Basic Electrical, Electronics & Instrumentation Engineering Laboratory	ES	4	0	4	0	3	40	60	100	2
B19ADP201	Python Programming Laboratory	ES	4	0	4	0	3	40	60	100	2

PROFESSIONAL CORE (PC)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CST302	Data Structures	PC	4	3	0	1	3	40	60	100	4
B19ADT301	Fundamentals of Data Science	PC	3	3	0	0	3	40	60	100	3
B19CST401	Computer Networks	PC	3	3	0	0	3	40	60	100	3
B19CSP301	Data Structures Laboratory	PC	2	0	2	0	3	40	60	100	1
B19ADP301	Data Science Laboratory	PC	2	0	2	0	3	40	60	100	1
B19CST402	Database Management Systems	PC	3	3	0	0	3	40	60	100	3

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B19ADT401	Fundamentals of Artificial Intelligence	PC	3	3	0	0	3	40	60	100	3
B19ADT402	Analysis of Algorithms	PC	4	3	0	1	3	40	60	100	4
B19ADT403	Data Mining and Data Warehousing	PC	3	3	0	0	3	40	60	100	3
B19CSP401	Database Management and Systems Laboratory	PC	4	0	4	0	3	40	60	100	2
B19ADP401	Artificial Intelligence Laboratory	PC	4	0	4	0	3	40	60	100	2
B19ADT501	Data Privacy and Security	PC	4	3	0	1	3	40	60	100	4
B19ADT502	Machine Learning	PC	3	3	0	0	3	40	60	100	3
B19CST504	Web Technology	PC	3	3	0	0	3	40	60	100	3
B19ADP501	Machine learning laboratory	PC	2	0	2	0	3	40	60	100	1
B19CSP501	Internet Programming Laboratory	PC	2	0	2	0	3	40	60	100	1
B19ADT601	Big Data Analytics	PC	4	3	0	1	3	40	60	100	4
B19ADT602	Deep Learning Techniques	PC	3	3	0	0	3	40	60	100	3
B19ADP601	Big Data Analytics Laboratory	PC	4	0	4	0	3	40	60	100	2
B19ADP602	Deep Learning Laboratory	PC	4	0	4	0	3	40	60	100	2
B19ADT701	Social Media Analytics	PC	3	3	0	0	3	40	60	100	3
B19ADT702	Data Visualization	PC	3	3	0	0	3	40	60	100	3
B19ADP701	Social Media Analytics Laboratory	PC	4	0	4	0	3	40	60	100	2
B19ADP702	Data Visualization Laboratory	PC	4	0	4	0	3	40	60	100	2

PROFESSIONAL ELECTIVE (PE)
Semester – V

Elective – I

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADE501	Graphics and Visual Computing	PE	3	3	0	0	3	40	60	100	3
B19ADE502	Neural Networks and Fuzzy Systems	PE	3	3	0	0	3	40	60	100	3
B19ADE503	Fundamentals of Operating Systems	PE	3	3	0	0	3	40	60	100	3
B19ADE504	Java Programming	PE	3	3	0	0	3	40	60	100	3

B19CSE505	Natural Language Processing	PE	3	3	0	0	3	40	60	100	3
B19CST702	Internet of Things	PE	3	3	0	0	3	40	60	100	3

Semester - VI
Elective – II

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Tot al	
B19ADE601	Optimization Techniques	PE	3	3	0	0	3	40	60	100	3
B19ADE602	Machine Learning Design Patterns	PE	3	3	0	0	3	40	60	100	3
B19ADE603	Ethics for Data Science	PE	3	3	0	0	3	40	60	100	3
B19CSE503	Distributed Systems	PE	3	3	0	0	3	40	60	100	3
B19CSE607	Agile and Xtreme Programming	PE	3	3	0	0	3	40	60	100	3
B19ECE702	Digital Image Processing	PE	3	3	0	0	3	40	60	100	3

Semester – VI
Electives – III

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADE604	Knowledge Engineering	PE	3	3	0	0	3	40	60	100	3
B19ADE605	Digital Business Management	PE	3	3	0	0	3	40	60	100	3
B19ADE606	Multivariate Data Analysis	PE	3	3	0	0	3	40	60	100	3
B19ADE607	Advanced Predictive Analytics	PE	3	3	0	0	3	40	60	100	3
B19CSE601	Software Testing	PE	3	3	0	0	3	40	60	100	3
B19CSE606	Speech Processing	PE	3	3	0	0	3	40	60	100	3

Semester - VII
Electives – IV

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADE701	Blockchain technology	PE	3	3	0	0	3	40	60	100	3
B19ADE702	Computer Vision	PE	3	3	0	0	3	40	60	100	3
B19ADE703	Quantum Computing	PE	3	3	0	0	3	40	60	100	3

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B19ADE704	Scalable Systems for Data Science	PE	3	3	0	0	3	40	60	100	3
B19ADE705	Image and Video Analytics	PE	3	3	0	0	3	40	60	100	3
B19ADE706	Augmented Reality / Virtual Reality	PE	3	3	0	0	3	40	60	100	3

Semester - VII
Electives - V

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADE707	Reinforcement and Ensemble learning	PE	3	3	0	0	3	40	60	100	3
B19ADE708	Human Computer Interaction	PE	3	3	0	0	3	40	60	100	3
B19ADE709	JavaScript Framework	PE	3	3	0	0	3	40	60	100	3
B19CSE703	High Performance computing	PE	3	3	0	0	3	40	60	100	3
B19CSE710	Real Time Systems	PE	3	3	0	0	3	40	60	100	3
B19CSE711	Agent Based Intelligent Systems	PE	3	3	0	0	3	40	60	100	3

Semester - VIII
Electives - VI

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ADE801	Pattern Recognition	PE	3	3	0	0	3	40	60	100	3
B19ADE802	AI for Medical Science	PE	3	3	0	0	3	40	60	100	3
B19ADE803	Cognitive Science and Analytics	PE	3	3	0	0	3	40	60	100	3
B19ADE804	DevOpS	PE	3	3	0	0	3	40	60	100	3
B19ADE805	Game Development	PE	3	3	0	0	3	40	60	100	3
B19CSE805	Digital Forensics	PE	3	3	0	0	3	40	60	100	3

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Open Elective (OE)
Semester – V

Elective – I

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO501	Basics of Flight Mechanics	OE	3	3	0	0	3	40	60	100	3
B19AGO501	Environment and Agriculture	OE	3	3	0	0	3	40	60	100	3
B19BMO501	Introduction to Medical Physics	OE	3	0	3	0	3	40	60	100	3
B19BTO501	Food Processing and Preservation	OE	3	3	0	0	3	40	60	100	3
B19EEO501	Rotating Machines & Transformers	OE	3	3	0	0	3	40	60	100	3
B19ECO501	Logic and Distributed Control Systems	OE	3	3	0	0	3	40	60	100	3
B19MEO501	Robotics	OE	3	3	0	0	3	40	60	100	3

Semester – VI
Elective – II

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO601	Aircraft Electrical and Electronic Systems	OE	3	3	0	0	3	40	60	100	3
B19AGO601	Integrated Water Resources Management	OE	3	3	0	0	3	40	60	100	3
B19BMO601	Introduction To Biomedical Engineering	OE	3	0	3	0	3	40	60	100	3
B19BTO601	Basic Bioinformatics	OE	3	3	0	0	3	40	60	100	3
B19EEO601	Fundamentals of Power Electronics	OE	3	3	0	0	3	40	60	100	3
B19ECO601	Geographic Information System	OE	3	3	0	0	3	40	60	100	3
B19MEO601	Entrepreneurship Development	OE	3	3	0	0	3	40	60	100	3

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Semester – VII

Elective – III

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO701	Basics of Rocket and Missiles	OE	3	3	0	0	3	40	60	100	3
B19AGO701	Production Technology in Agricultural Machinery	OE	3	3	0	0	3	40	60	100	3
B19BMO701	Telemedicine	OE	3	0	3	0	3	40	60	100	3
B19BTO701	Fundamentals of Nano Biotechnology	OE	3	0	3	0	3	40	60	100	3
B19CSO701	Fundamentals of Cloud Computing	OE	3	3	0	0	3	40	60	100	3
B19EEO701	Hybrid Electric Vehicles	OE	3	3	0	0	3	40	60	100	3
B19MEO701	3D Printing and Design	OE	3	3	0	0	3	40	60	100	3
B19ECO701	Introduction to Communication Systems	OE	3	3	0	0	3	40	60	100	3
B19CBO701	Software Engineering Fundamentals	OE	3	3	0	0	3	40	60	100	3

Semester – VIII

Elective – IV

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO801	UAV System Design	OE	3	3	0	0	3	40	60	100	3
B19AGO801	Agricultural Finance, Banking and Co-operation	OE	3	3	0	0	3	40	60	100	3
B19BMO801	Medical Imaging Techniques	OE	3	0	3	0	3	40	60	100	3
B19BTO801	Bioreactor Design	OE	3	0	3	0	3	40	60	100	3
B19CSO801	Internet of Things	OE	3	3	0	0	3	40	60	100	3
B19EEO801	Energy Conservation and Management	OE	3	3	0	0	3	40	60	100	3
B19MEO801	Lean Six Sigma	OE	3	3	0	0	3	40	60	100	3
B19ECO801	Wireless Technologies	OE	3	3	0	0	3	40	60	100	3
B19CBO801	Business Strategy	OE	3	3	0	0	3	40	60	100	3

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PROJECT WORK (PW)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CEP501	Mini Project	PW	4	0	4	0	3	100	-	100	2
B19ADP703	Project Work Phase – I	PW	6	0	6	0	3	40	60	100	2
B19ADP801	Project Work Phase - II	PW	16	0	16	0	3	40	60	100	8

CAREER ENHANCEMENT COURSE (CEC)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CEP201	Soft Skills -I	CEC	2	0	2	0	-	100	-	100	1
B19CEP301	Soft Skills - II	CEC	2	0	2	0	-	100	-	100	1
B19CEP302	Professional Certificate Course-I	CEC	2	0	2	0	-	100	-	100	1
B19CEP401	Career Ability Course - I	CEC	2	0	2	0	-	100	-	100	NC
B19CEP402	In plant Training	CEC	-	-	-	-	-	-	-	-	NC
B19CEP403	Online Certificate Course	CEC	-	-	-	-	-	-	-	-	NC
B19CEP501	Career Ability Course - II	CEC	2	0	2	0	-	100	-	100	NC
B19CEP502	Professional Certificate Course-II	CEC	2	0	2	0	-	100	-	100	1
B19CEP503	Summer Internship	CEC	-	-	-	-	-	-	-	-	1
B19CEP601	Career Ability Course - III	CEC	2	0	2	0	-	100	-	100	NC
B19CEP602	Online Certificate Course	CEC	-	-	-	-	-	-	-	-	NC

MANDATORY COURSE (MC)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MCP101	Life Skills	MC	2	0	2	0	-	100	-	100	NC
B19MCT301	Environmental Sciences	MC	3	3	0	0	-	100	-	100	NC
B19MCT302	Indian Constitution	MC	3	3	0	0	-	100	-	100	NC

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Semester - I

B.E / B.Tech	B19ENT101-FUNCTIONAL ENGLISH (Common to all Branches)	T	P	TU	C
		2	0	1	3

Course Objectives:

1. To develop the basic reading and writing skills of first year engineering and technology students.
2. To help learners develop their listening skills, which will, enable them listen to lectures
3. and comprehend them by asking questions; seeking clarifications.
4. To help learners develop their speaking skills and speak fluently in real contexts.
5. To help learners develop vocabulary of a general kind by developing their reading skills.
6. To enhance their basic grammatical knowledge and Vocabulary skills.

UNIT- I **12**

Reading: Short comprehension passages, practice in skimming-scanning

Writing: Instructions, developing hints.

Listening: Listening to peer group

Speaking: Self Introduction, introducing others

Language development: Parts of Speech, Wh-Questions, asking and answering-yes or no questions

Vocabulary development: Prefixes-suffixes, articles.

UNIT- II. **12**

Reading: Skimming and Scanning - Pre & post reading, comprehension questions, including dialogues and conversations

Writing: Paragraph writing, free writing, day to day events

Listening: Telephonic conversations, conceptual conversations

Speaking: Sharing information of a personal kind, greeting, taking leave

Language development: Regular & Irregular Verbs, tenses

Vocabulary development: Guessing meanings of words in context.

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UNIT- III. **12**

Reading: Short texts and longer passages, note making

Writing: Understanding text structure, use of reference words and discourse markers, jumbled sentences

Listening: Listening to longer texts and filling up the table, product description, narratives from different sources.

Speaking: Short presentation, asking about routine actions and expressing facts and opinions

Language development: Idioms and Phrases, Degrees of comparison, sentence pattern and types of sentences

Vocabulary development: single word substitutes

UNIT- IV **12**

Reading: Intensive and Extensive reading, reading longer texts, reading different types of texts-magazines,

Writing: letter writing, informal or personal letters, e-mails

Listening: listening to dialogues or conversations and completing exercises based on them

Speaking: speaking about oneself, speaking about one's friend, conceptual conversations

Language development: direct/indirect questions

Vocabulary development: synonyms-antonyms, phrasal verbs

UNIT- V. **12**

Reading: longer texts-close reading

Writing: writing short essays, developing an outline, identifying main and subordinate ideas, dialogue writing

Listening: listening to talks, conversations

Speaking: participating in conversations, short group conversations

Language development: Spelling and Punctuations, modal verbs

Vocabulary development: collocations

Total Instructional hours: 60

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Course Outcomes:

Students will be able to

CO1 : Develop basic reading and effective reading skills

CO2: Build their grammatical understanding.

CO3 : Explain their opinions efficiently in writing in formal and informal contexts through letters

CO4 : Develop their vocabulary skills

CO5 : Develop their knowledge through LSRW skills

Text Books:

1. Board of Editors Using English, “A Course book for Undergraduate Engineers and Technologists”, Orient Black Swan Limited, Hyderabad: 2015
2. Richards, C. Jack, “Interchange Students’ Book-2”,New Delhi, CUP, 2015.

Reference Books:

1. Bailey, Stephen, “A practical guide for students”, New York Rutledge, 2011.
2. Comfort, Jeremy,et al, “Speaking Effectively: Developing Speaking Skills for Business English”, Cambridge University Press, Cambridge, Reprint 2011
3. Dutt P. Kiranmai and Rajeevan Geeta, “Basic Communication Skills”, Foundation Books, 2013

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B.E / B.Tech	B19MAT101 - MATRICES AND DIFFERENTIAL CALCULUS (Common to all Branches)	T	P	TU	C
		3	0	1	4

Course Objectives:

1. Matrix algebra is one of the powerful tools to handle practical problems arising in the field of engineering.
2. The goal of this course is to achieve conceptual understanding and to retain the best traditions of differential calculus.
3. This is a foundation course which mainly deals with topics such as single variable and multivariable differential calculus and plays an important role in the understanding of science, engineering, medical and business among other disciplines.
4. To provide the basic tools of differential calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
5. To make the student appreciate the purpose of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT- I MATRICES 12

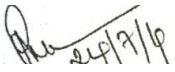
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem –Quadratic form: Nature, Reduction to canonical form by orthogonal transformation.

UNIT-II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation –Total derivative – Change of variables – Jacobians – Taylor‘s series expansion for functions of two variables – Maxima and minima of functions of two variables – Lagrange‘s method of undetermined multipliers.

UNIT-III ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear ordinary differential equations with constant coefficients - Higher order linear ordinary differential equations with variable coefficients Cauchy Euler‘s and Cauchy Legendre‘s type - Method of variation of parameters (ordinary differential equations with constant coefficients) - Simultaneous differential equations.



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UNIT-IV APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS 12

Solution of specified differential equations connected with electric circuits, Bending of beams and simple harmonic motion (Differential equations and associated conditions need to be given).

UNIT-V LAPLACE TRANSFORMS 12

Existence conditions - Properties (excluding proofs) - Transform of standard functions - Transforms of derivatives and integrals - Periodic function – Inverse Laplace transform - Applications to solution of linear second order ordinary differential equations with constant coefficients.

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Make use of Eigen values and Eigen vectors to reduce the quadratic form into canonical form and to find the powers of a square matrix.

CO2: Determine solution for maxima and minima problems.

CO3: Solve differential equations which existing in different engineering disciplines.

CO4: Develop the applications of differential equations in various engineering field.

CO5: Apply Laplace transform and inverse transform to solve differential equations with constant coefficients.

Text Books:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media -An imprint of Lakshmi Publications Pvt., Ltd., New Delhi, 7th Edition, 2017.
3. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

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Reference Books:

1. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2018.
2. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics", Oxford University Press, 2015.
3. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.
4. Veerarajan T., “Engineering Mathematics for Semester I and II”, Tata Mc Graw Hill Publishing Company, New Delhi,2015.
5. Gean Duffy., “Advanced_Engineering_Mathematics with MATLAB”, A CRC Press Company, Boca Raton London , New York Washington, D.C, 2nd edition 2009.

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B.E / B.Tech	B19PHT101 - ENGINEERING PHYSICS (Common to all Branches)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To gain knowledge on the basics of properties of matter and its applications.
2. To acquire knowledge on the concepts of Photonics and their applications in fiber optics.
3. To have adequate knowledge on the concepts of Ultrasonics and their applications.
4. To get knowledge on advanced physics concepts of quantum theory and its applications in SEM, TEM.
5. To make the students enhance the fundamental knowledge in Crystal Physics and its
6. applications relevant to various streams of Engineering and Technology.

UNIT- I PROPERTIES OF MATTER 9

Elasticity-Modulus, types of modulus, Stress-strain diagram and its uses-factors affecting elastic modulus and tensile strength-Twisting couple, torsion pendulum; theory and experiment.

Bending of beams- Bending moment- cantilever; theory and experiment- uniform and non-uniform bending; theory and experiment- I-shaped girders.

UNIT- II PHOTONICS AND FIBER OPTICS 9

Lasers; Population of energy levels, Einstein‘s A and B coefficients derivation- resonant cavity, optical amplification (qualitative) – Types; Nd-YAG Laser, Semiconductor lasers; homojunction and heterojunction, Industrial and Medical Applications.

Fibre Optics; Principle, Numerical Aperture and Acceptance Angle - Types of optical fibres (material, refractive index, mode) – Applications; Fibre optic communication system-Block diagram, fibre optic sensors- pressure and displacement sensors –Endoscopy.

UNIT- III ULTRASONICS 9

Classification of Sound, Production of ultrasonics - Magnetostriction generators, Piezoelectric generators- acoustic grating – cavitation- ultrasonic cleaning.

Applications; Non Destructive Testing, pulse echo system through transmission and reflection modes, A, B and C, scan displays- Engineering applications; SONAR,- Medical applications; Sonograms.

UNIT- IV QUANTUM PHYSICS 9

Black body radiation; Planck's theory (derivation) - wave particle duality- debroglie wavelength- electron diffraction - Davisson-Germer experiment -concept of wave function and its physical significance.

Wave equation; Schroedinger's time independent and time dependent equations, particle in a one-dimensional rigid box- Applications; Scanning Electron Microscope(SEM) and Transmission Electron Microscope (TEM).

UNIT- V CRYSTAL PHYSICS 9

Crystal Structures; Single crystalline, polycrystalline and amorphous materials - unit cell-crystal systems- Bravais lattices- Miller indices- inter-planar distances – coordination number and packing factor for SC, BCC, FCC and HCP structures -Crystal imperfections; Point and Line defects.

Growth of single crystals; Solution and melt growth techniques (Bridgeman & Czhochralski).

Total Instructional hours: 45

Course Outcomes:

Students will be able to

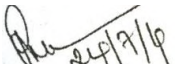
CO1: Explain the basics of Properties of matter and its applications.

CO2: Illustrate the basics of Laser, Fiber optics and their applications.

CO3: Infer the concepts of ultrasonics and its applications.

CO4: Interpret the basic knowledge of Quantum theory that could be helpful in understanding the wave functions of a particle.

CO5: Classify and compare the different types of crystals, their structures and its preparation techniques.



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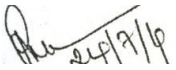
Text Books:

1. Bhattacharya, D.K. & Poonam, T, “Engineering Physics”, Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. “Engineering Physics”, Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. “Engineering Physics”, Cengage Learning India, 2012.
4. Rajendran V, ‘Engineering Physics”, Tata McGraw Hill, Publishing Company, New Delhi, 2011.

Reference Books:

1. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics’’, Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”, Cengage Learning, 2010.
3. Tipler, P.A. &Mosca, G. “Physics for Scientists and Engineers with Modern Physics”, W.H.Freeman, 2007.

   Avadhanulu M.N**, “**Engineering Physics - Volume 1”, S.Chand & Company Ltd.,New Delhi, 2010.



BoS CHAIRMAN

B.E.	B19ADT101 - COMPUTER PROGRAMMING IN C (Common to AI&DS and CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives:

The syllabus is designed to:

1. To make the students understand the fundamentals of problem solving using Algorithm, Pseudo code and Flowchart
2. To learn the basic programming constructs
3. To develop an application using arrays and functions.
4. To introduce the concepts of arrays and functions.
5. To impart knowledge on the concepts of Structures, Unions and Files

UNIT- I PROBLEM SOLVING AND BASICS OF C PROGRAMMING 9

Introduction to computer system - Block diagram – Algorithmic problem solving concepts: pseudo code, Algorithms and Flow chart for problem solving – Syntax and Constructs of specific language (ANSI C) – Types - Variable names - Data Types and sizes- Constants- Declarations – Basic Input / output statements.

UNIT- II OPERATOR PRECEDENCE AND CONTROL FLOW STATEMENTS 9

Operators- Expressions – Operators Precedence, Associativity – Statements and Blocks – Decision making statement – Switch statements – Looping Statements – Preprocessor directives – Compilation process.

UNIT- III ARRAYS AND FUNCTIONS 9

Introduction to Arrays – One dimensional and Two dimensional arrays: Declaration – Initialization – Accessing elements – Operations: Insertion, Deletion, Linear Search, Binary Search – Matrix Operations (Addition and Subtraction) – Basics of Functions Parameter passing and returning types – Block structure – recursion – Storage classes.

UNIT- IV STRING AND POINTERS 9

Defining a string – NULL character – Initialization of Strings – Reading and Writing Strings: Processing Strings –Searching and Sorting of Strings – Introduction to pointers – Pointers and Arrays – Pointers and Function arguments – Passing Pointer to functions – Command line arguments.

UNIT- V STRUCTURES, UNIONS AND FILES 9

Introduction to structures – Array of Structures – Structures and functions – Passing an entire structure – Unions – Files – file access including FILE structure, fopen, fread, fwrite, stdin, sdtout and stderr, File Types – Processing a data file – Unformatted data files – Concept of binary files – Accessing a file randomly using fseek.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Develop an algorithmic solutions for simple computational problems

CO2: Develop a Simple applications using basic constructs

CO3: Experiment with different arrays and functions

CO4: Experiment with the usage of string and pointers

CO5: Organize the data by using structures, unions and files

Text Books:

1. Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2016.
2. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2016.

Reference Books:

1. Byron S Gottfried, “Programming with C”, Schaum‟s Outlines, Fourth Edition, Tata McGraw-Hill, 2018
2. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
3. Dromey R.G., “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007.
4. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.

B.E / B.Tech	B19MET101 – ENGINEERING GRAPHICS (Common to all Branches)	T	P	TU	C
		2	4	0	4

Course Objectives:

1. Understand the basic principles of engineering drawing and construction of curves used in engineering field.
2. To explain about standard principles of orthographic projection of points, lines and planes
3. Enable the students to be familiar with various positions of simple solids and disseminate them into different orthographic views
4. Create intricate details of components through sections and develop its surfaces
5. To improve visualization skills in developing pictorial and perspective views.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 2

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT-I PLANE CURVES AND FREE HANDSKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

UNIT-II PROJECTION OF POINTS, LINES AND PLANE SURFACE 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT-IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones

UNIT-V ISOMETRIC AND PERSPECTIVE PROJECTIONS 14

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-prisms, pyramids and cylinders by visual ray method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

Total Instructional Hours: 75

Course Outcomes:

Students will be able to

CO1: Construct the basic engineering curves and freehand sketching of basic geometrical constructions and multiple views of objects.

CO2: Draw problems related to projections of points, straight lines and planes.

CO3: Build the projection of simple solids.

CO4: Apply the knowledge acquired on practical applications of sectioning and development of solids.

CO5: Construct simple solids and its sections in isometric view and projections and to draw its perspective views.

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Text Books:

1. N.D. Bhattand V.M. Panchal, “Engineering Drawing”, Charotar Publishing House, 53rdEdition, 2014.
2. K. Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International Publishers, 2017.

Reference Books:

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol.I&II combined) SubhasPublications, Bangalore, 2018.
2. K.V.Natarajan, “A text book of Engineering Graphics”, 28th Edition, Dhana Lakshmi Publishers, Chennai, 2015.
3. N.S Parthasarathy and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.

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B.E/ B.Tech	B19PHP101 - PHYSICS LABORATORY (Common to all Branches)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To introduce different experiments to test basic understanding of physics concepts applied in properties of matter, optics, thermal physics, and liquids

List of Experiments:

Expt. No.	Description of the Experiments
1.	Determination of rigidity modulus – Torsion pendulum
2.	Determination of Young's modulus by non-uniform bending method
3.	Determination of Young's modulus by uniform bending method
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of Refractive index of a prism – spectrometer
6.	Determination of thickness of a thin wire – Air wedge method
7.	(a) Determination of wavelength, and particle size using Laser (b) Determination of acceptance angle in an optical fiber.
8.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
9.	Determination of band gap of a semiconductor
10.	Determination of specific resistance of the wire using Carey Foster's Bridge
11.	Experiment with Poiseuille's apparatus to determine the viscosity of liquids
12.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer

Total Instructional hours:60

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Course Outcomes:

Students will be able to

CO1: Classify the elastic properties of the materials by using uniform, non- uniform Bending method and torsional pendulum apparatus.

CO2: Illustrate the Optical properties of light with the help of LASER, Spectrometer and to determine the thickness of the wire using air wedge.

CO3: Interpret the thermal conductivity of bad conductor using Lee's Disc apparatus.

CO4: Utilize the band gap apparatus to find the band gap a semiconductor and determine the specific resistance of the wire using Carey Foster's Bridge.

CO5: Make use of Poiseuilles's apparatus to determine the viscosity of liquid and to determine the velocity of sound and compressibility of liquid by using ltrasonic Interferometer.

Reference Books:

1. Senthil Kumar, G. Physics Laboratory I & II, VRB publishers Pvt. Ltd., Chennai (2016).

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B.Tech	B19ADP101 – COMPUTER PROGRAMMING IN C LABORATORY (Common to AI&DS and CSBS)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To understand the loops and decision-making statements to solve the problem.
2. To develop the programs using one dimensional and two-dimensional arrays.
3. Use functions to solve the given problem.
4. To familiarize the concepts of strings, pointers, functions and structures.
5. To equip the students on the knowledge of file processing concepts.

List of Experiments

Expt. No.	Description of the Experiments
1.	Writing algorithms, flowcharts and pseudo codes for simple problems.
2.	Develop a C program by using if, if-else, switch and nested if statements.
3.	Construct a C Program by using while, do-while and for loops.
4.	Implement the Menu-driven program to find the area of different shapes.
5.	Develop a C program for simple applications making use of basic concept of arrays.
6.	Implement one dimensional array to perform array operations insertion, deletion, searching.
7.	Implement one dimensional arrays and passing 1D arrays to functions.
8.	Implement two dimensional arrays and passing 2D arrays to functions.
9.	Develop a C program to perform various string handling operations using build-in-functions.
10.	Develop a C program to perform various string handling operations without using build-in functions
11.	Construct a C program using function calls, recursion and call by value.
12.	Generate a simple application using pointers, call by reference and pointers with arrays.
13.	Develop a C simple application using structure and union concepts.
14.	Write a C Program to perform the file operations and modes.
15.	Working with text files, random files and binary files.

Total Instructional hours: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Build an algorithms, flowcharts and pseudo code for simple problems.

CO2: Develop a C program using control structures.

CO3: Build simple applications by making use of basic constructs, arrays and strings**.**

CO4: Develop C programs by involving functions, recursion, pointers, and structures.

CO5: Construct simple applications by using sequential and random access file processing.

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B.E/ B.Tech	B19CEP101 - LIFE SKILLS (Common to all Branches)	T	P	TU	C
		0	2	0	0

Course Objectives:

1. To make the students to enhance their attitude, confidence and communication.

UNIT-I TRANSITION MANAGEMENT 6

Getting started-Getting involved- being responsible-adapting to the new environment.

UNIT-II VISION AND GOAL 6

Defining Vision and designing Goals in accordance-Seeing College life as a path towards Lifetime Goals.

UNIT-III VALUES VIRTUES 6

Not as preaching but a way of life to succeed in all aspects of life.

UNIT-IV FOCUS 6

Focus on basic quality in all activities .Tips to enhance memory and focus skills.

UNIT-V LEARNING SKILLS AND PASSIONATE LEARNER 6

Transforming information into knowledge and learning to read people like a book - hedding out inhibitions- Blossoming with talent and leadership abilities.

Total Instructional Hours: 30

Course Outcomes

Students will be able to

CO1: Develop the adapting skills to various environments.

CO2: Identify the Vision and Goal towards success.

CO3: Build Values and Virtues to succeed in life

CO4: Develop focus in all activities

CO5: Develop knowledge to understand various kinds of people

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Semester – II

B.E/ B.Tech	B19ENT201-PROFESSIONAL ENGLISH (Common to all Branches)	T	P	TU	C
		2	0	1	3

Course Objectives:

1. Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
2. Foster their ability to write convincing job applications and effective reports.
3. Develop their speaking skills to make technical presentations, participate in group discussions.
4. Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
5. Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.

UNIT- I **12**

Listening: Listening to motivational speech

Speaking: Asking for and giving directions

Reading: Reading short technical texts from newspapers and magazines

Writing: Extended definitions, Gerunds & Infinitives, writing checklists, recommendation

Vocabulary Development: Technical vocabulary, abbreviations

Language Development: Subject verb agreement

UNIT- II **12**

Listening: Listening to TED talks

Speaking: Describing a process, narrating a story

Reading: Reading longer technical texts, summarizing

Writing: Interpreting charts, graphs

Vocabulary Development: Vocabulary used in formal letters/emails and reports

Language Development: British and American spelling, numerical adjectives.

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UNIT- III **12**

Listening: Listening to classroom lectures, commentaries and announcements

Speaking: Oral presentations

Reading: Longer texts both general and technical, practice in speed reading

Writing: process writing, use of sequence words, analytical essays and issue based essays

Vocabulary Development: Sequence words, misspelled words.

Language Development: Identifying different types of sentences.

UNIT- IV **12**

Listening: Listening to documentaries, listening to resume preparation and making notes.

Speaking: Techniques of effective presentations

Reading: Reading for detailed comprehension

Writing: email etiquette, job application- cover letter, résumé preparation, Vocabulary

Development: Finding suitable synonyms, paraphrasing

Language Development: Clauses, if conditionals

UNIT- V **12**

Listening: Listening to talks based on profession

Speaking: Participating in a group discussion

Reading: Reading and understanding technical articles

Writing: Writing reports, minutes of a meeting, writing feasibility, survey and industrial reports

Vocabulary Development: Verbal analogies

Language Development: Reported speech, active and passive voice, impersonal passive

Total Instructional hours: 60

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Course Outcomes:

Students will be able to

CO1: Develop their Vocabulary skills

CO2: Develop their grammatical proficiency

CO3: Develop strategies and skills to enhance their ability to read and comprehend

CO4: Interpret graphical representation by comparing and contrasting the information

CO5: Extend their knowledge through LSRW skills

Text Books:

1. Board of editors, “Fluency in English A Course book for Engineering and Technology”, Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C, “English for Technical Communication”, Cambridge University Press: New Delhi, 2016.

Reference Books:

1. Raman, Meenakshi and Sharma, Sangeetha “Technical Communication Principles and Practice” Oxford University Press: NewDelhi, 2014.
2. Kumar, Suresh. E, “Engineering English”, Orient Blackswan: Hyderabad, 2015
3. Booth-L. Diana, “Project Work”, Oxford University Press, Oxford: 2014.

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B.E / B.Tech	B19MAT201 - INTEGRAL CALCULUS AND COMPLEX ANALYSIS (Common to all Branches)	T	P	TU	C
		3	0	1	4

Course Objectives:

1. To provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
2. To make the student understand the mathematical tools needed in evaluating multiple integrals and their usage.
3. To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
4. To use the various methods of complex analysis efficiently for solving the problems that occurs in various branches of engineering disciplines.
5. To develop an understanding of the standard techniques of complex integration so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.

UNIT- I DEFINITE AND INDEFINITE INTEGRALS 12

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions..

UNIT-II MULTIPLE INTEGRALS 12

Double integrals: Change of order of integration – Double integrals in polar coordinates - Area enclosed by plane curves – Triple integrals: Evaluation of triple integrals-Volume as triple integral (Simple problems).

UNIT-III VECTOR CALCULUS 12

Gradient and directional derivative - Divergence and curl - Solenoidal and Irrotational vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and applications (for cubes and rectangular parallellopipeds).

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UNIT-IV COMPLEX DIFFERENTIATION 12

Analytic functions - Cauchy-Riemann equations (excluding proof) – Properties of analytic function – Harmonic conjugate- Construction of analytic function by Milne Thomson method – Bilinear transformation.

UNIT-V COMPLEX INTEGRATION 12

Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor’s and Laurent’s series - Singularities – Residues – Cauchy‘s Residue theorem –Evaluation of real integrals – use of circular contour and semicircular contour (excluding poles on real axis).

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Develop Fundamental Theorem of Calculus, techniques of Integration such as substitution, partial fractions and integration by parts.

CO2: Make use of integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and

CO3: Apply the line, surface and volume integrals for verification of Green‘s, Gauss and Stokes theorems.

CO4: Construct Analytic function and develop Conformal Mapping.

CO5: Identify infinite series of a complex function within the contour and types of the singularities, finding of complex integrals.

Text Books:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. Kreyszig Erwin, “Advanced Engineering Mathematics '', John Wiley and Sons, 10th Edition, New Delhi, 2016.

Reference Books:

1. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media-An imprint of Lakshmi Publications Pvt., Ltd., New Delhi, 7th Edition,2015.
4. 2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition 2016.

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5. O'Neil, P.V.,"Advanced Engineering Mathematics", Cengage Learning India Pvt.Ltd, New Delhi, 7th Edition 2017.
6. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
7. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
8. Gean Duffy., "Advanced Engineering Mathematics with MATLAB", A CRC Press Company, Boca Raton London, New York Washington, D.C, 2nd edition 2009.

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B.E	B19EET202 - BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING (Common to AERO, AI&DS,CSBS & MECH)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To Understand the Electric circuit laws.
2. To Understand the single and three phase circuits and wiring.
3. To Understand the Working principles of Electrical Machines.
4. To Understand the Working principle of various electronic devices.
5. To Understand the Working principle of measuring instruments.

UNIT- I ELECTRICAL CIRCUITS 9

Basic circuit components -Ohms Law - Kirchoff's Law – Instantaneous Power – Inductors - Capacitors – Independent and Dependent Sources. Steady state solution of DC circuits - Nodal analysis, Mesh analysis. Theorem's-Thevinin's Theorem, Norton's Theorem, Maximum Power transfer theorem- Superposition Theorem.

UNIT- II AC CIRCUITS 9

Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads. Housing wiring, industrial wiring, materials of wiring.

UNIT- III ELECTRICAL MACHINES 9

Principles of operation and characteristics of; DC machines, Transformers (single and three phase). Principles of operation, characteristics and speed control of Synchronous machines, three phase and single phase induction motors. **(Qualitative)**

UNIT- IV ELECTRONIC DEVICES AND CIRCUITS 9

Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction– Forward and Reverse Bias –Semiconductor Diodes. Bipolar Junction Transistor – Characteristics – Field Effect Transistors – Transistor Biasing. Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier –DAC – ADC. **(Qualitative)**

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UNIT-V MEASUREMENTS AND INSTRUMENTATION 9

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical. Classification of instruments - Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters - three-phase power measurements – instrument transformers (CT and PT). **(Qualitative)**

Total Instructional hours : 45

Course Outcomes:

Students will be able to

CO1 : Apply Ohms law , Kirchhoff's laws and Theorems to analyze the given electrical circuits.

CO2 : Interpret waveforms, RMS value, Power and power factor in AC Circuits.

CO3 : Outline the basic construction of wiring and materials.

CO4 : Explain the construction and operation of dc machines, transformers, Induction motors and synchronous Machines.

CO5 : Explain the operation and characteristics of basic semiconductor devices.

CO6 : Explain the construction and working principle of various measuring instruments & Indicating instruments.

Text Books:

1. Leonard S Bobrow, Foundations of Electrical Engineering‖, Oxford University Press, 2013.
2. Kothari D P and Nagarath I.J ,Electrical Machines —Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint ,2016 .
3. Sawhney A.K, Dhanpat Rai, 'A Course in Electrical & Electronic Measurements & Instrumentation', 2010.

Reference Books:

1. N K De, Dipu Sarkar, Basic Electrical Engineering‖, Universities Press (India) Private Limited 2016.
2. Vincent Del Toro, Electrical Engineering Fundamentals‖, Pearson Education, Second Edition New Delhi, 2015.
3. John Bird, Electrical Circuit Theory and Technology‖, Elsevier, Fifth Edition, 2014.
4. Murthy D.V.S. 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.

BoS CHAIRMAN

B.E.	B19ECT203 - DIGITAL LOGIC AND SYSTEM DESIGN	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To design digital circuits using simplified Boolean functions
2. To analyze and design combinational circuits
3. To analyze and design synchronous and asynchronous sequential circuits
4. To understand Programmable Logic Devices
5. To write HDL code for combinational and sequential circuits

UNIT- I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT- II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT- III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

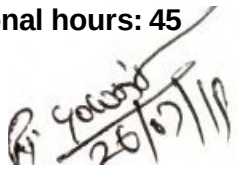
UNIT- IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT- V MEMORY AND PROGRAMMABLE LOGIC 9

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

Total Instructional hours: 45



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Course Outcomes:

Students will be able to

CO1: Simplify digital circuits using Boolean function and K-Map

CO2: Analyze and design of combinational circuits

CO3: Analyze and design of Synchronous sequential circuits

CO4: Analyze and design of Asynchronous sequential circuits

CO5: Develop combinational and sequential circuits using HDL codes.

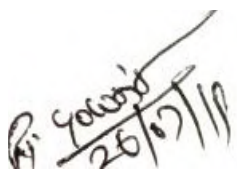
CO6: Explain the concept of memories and programmable logic devices

Text Books:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2017.

Reference Books:

1. G. K. Kharate, “Digital Electronics”, Oxford University Press, 2010.
2. John F. Wakerly,“Digital Design Principles and Practices”, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, “Fundamentals of Logic Design”, Sixth Edition, Cengage Learning, 2013.
4. Donald D. Givone, “Digital Principles and Design”, Tata Mc Graw Hill, 2003.



BoS CHAIRMAN

B.Tech	B19ADT201 - PYTHON PROGRAMMING (Common to AI&DS and CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To read and write simple python programs using data types and control statements
2. To develop a python programs using Strings and functions
3. To use Python data structures such as lists, tuples, and Dictionaries
4. To define python modules and packages
5. To develop an applications using Numerical Python

UNIT- I PYTHON OVERVIEW, DATA TYPES, AND EXPRESSIONS 9

Python Overview, Data Types, and Expressions Python programming - Strings, Assignment and Comments - Numeric Data Types and Character Sets - Expressions - Using Functions and Modules – Control Statements.

UNIT- II STRINGS & FUNCTIONS 9

Accessing characters and substrings in strings - Data Encryption - Strings and Number System – String methods.

Functions: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

UNIT- III LISTS, TUPLES & DICTIONARIES 9

Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods

Tuple: Introduction, Accessing tuples, Operations, Working, Functions and Methods.

Dictionaries: Introduction, Accessing values in dictionaries, working with dictionaries, Properties and Functions

UNIT IV MODULES & PACKAGES 9

Modules: Importing module, Math module, Random module.

Python packages: Simple programs using the built-in functions of packages packages matplotlib, Numpy, pandas etc.

UNIT V DATA MANIPULATION WITH PYTHON 9

Jupyter and Colab Notebook System- Python Demonstration: Reading and Writing CSV files- Advanced Python Lambda and List Comprehensions- Numerical Python Library (NumPy)- NumPy array creation- reading arrays from disk- I/O with NumPy.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Make use of basic elements of Python programming to develop an applications

CO2: Experiment with the various Strings and functions in Python.

CO3: Develop Python programs to implement the operations in Lists, Tuples & Dictionaries.

CO4: Construct a simple application by using modules and packages.

CO5: Build an application using Jupyter or Colab notebook in Python

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, O Reilly Publishers, 2016.
2. Reema Thareja, "Python Programming using Problem Solving Approach", 4th Impression , Oxford University Press, 2019.

Reference Books:

1. John V Guttag, "Introduction to Computation and Programming Using Python", 3rd illustrated edition, MIT Press, 2021.
2. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python", Network Theory Ltd., 2011.
3. Robert Sedgewick, Kevin Wayne and Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd, 2015.
4. Timothy A. Budd, "Exploring Python", Tata Mc-Graw Hill Education (India) Private Ltd, 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning India, Pvt. Ltd. Second Edition, 2019.

B.E / B.Tech	B19MEP201 – BASIC WORKSHOP PRACTICE LABORATORY (GROUP-A&B) (Common to all Branches)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical Engineering.
2. To provide exposure to the students with hands on experience on various basic engineering practices in Electrical Engineering.
3. To provide exposure to the students with hands on experience on various basic engineering practices in Electronics Engineering.

List of Experiments:

GROUP – A (CIVIL & MECHANICAL)

I Civil Engineering Practices **12**

Plumbing and Carpentry Works

1. Making basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings.
2. Preparation of wooden joints by sawing, planning and cutting
   (i) Planning & Polishing operation
   (ii) Half lap joint
   (iii) Cross lap joint

II Mechanical Engineering Practices **18**

Welding Workshop

Study of welding tools and equipment's - Study of various welding methods - Instruction of BI standards and reading of welding drawings.

Exercise in arc welding for making

1. Lap joint
2. Butt joint
3. Demonstration of gas welding and cutting.

Machine Shop

1. Drilling and Tapping
2. Lathe Exercise – Facing operation
3. Lathe Exercise – Straight turning and Chamfering

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Sheet metal

Making of small parts using sheet metal

1. Tray Funnel
2. Funnel

Machine assembly practice and Demonstration

1. Machine assembly practice on:
2. Study of centrifugal pump
3. Study of air conditioner

GROUP – B (ELECTRICAL & ELECTRONICS)

List of Experiments:

Expt. No.	Description of the Experiments	
1.	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	
2.	Fluorescent lamp and Stair case wiring.	
3.	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	
4.	Measurement of energy using single phase energy meter.	**30**
5.	Measurement of resistance to earth of an electrical equipment.	
6.	Study of Electronic components and equipment's – Resistor color coding	
7.	Measurement of AC signal parameter (Peak-Peak, RMS period, Frequency) using CRO.	
8.	Study of logic gates AND, OR, EX-OR and NOT.	
9.	Soldering & Desoldering practices.	
	Total Instructional hours:	**60**

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Course Outcomes:

Students will be able to

CO1: Explain the pipe connections and identify the various components used in plumbing.

CO2: Develop simple wooden joints using wood working tools and simple components using lathe and drilling machine.

CO3: Construct simple lap, butt and tee joints using arc welding equipment and simple parts using sheet metal.

CO4: Construct Residential house wiring, Fluorescent lamp wiring and Stair case wiring.

CO5: Measure electrical quantities such as voltage, current, power & power factor in RLC Circuit, resistance to earth, AC signal parameter (peak-peak, RMS period, frequency) and ripple factor.

CO6: Examine logic gates (AND, OR, EOR and NOT), Electronic components and equipment's.

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B.E/ B.Tech	B19EEP202 - BASIC ELECTRICAL, ELECTRONICS & INSTRUMENTATION ENGINEERING LABORATORY (Common to AERO and MECH, AI & DS)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To gain practical experience on electric circuits and verification of Theorems.
2. To train the students in performing various tests on electrical drives.
3. To train the students in performing various tests on Transducers & Sensors.

List of Experiments:

Expt. No.	Description of the Experiments
1.	Verification of Circuit Laws.
2.	Verification of Circuit Theorems
3.	Measurement of three phase power
4.	Diode based application circuits.
5.	Transistor based application circuits.
6.	Calibration of Rotometer.
7.	RTD and Thermistor
8.	Load test on DC shunt motor.
9.	Speed control of DC shunt motor.
10.	Load test on Single phase Transformer.
11.	Load test on single phase Induction motor.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Analyze the Performance characteristics of different electrical machines.

CO2: Analyze the concept of circuit laws and theorems in an electric circuit.

CO3: Use Wattmeters for measuring three phase power.

CO4: Design simple circuits involving diodes and transistors.

CO5: Analyze the characteristics of transducers and sensors.

CO6: Analyze the various electrical parameters of ac signals using Oscilloscope

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B.Tech	B19ADP201 - PYTHON PROGRAMMING LABORATORY (Common to AI&DS and CSBS)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To create the Python programs by using built-in data types and their methods.
2. To identify and execute the various string handling operations and it's functions in Python.
3. To learn about python data structures concepts like list, tuples and dictionaries
4. To know about various modules and packages in python
5. To develop an application using NumPy in Python

List of Experiments:

Expt. No.	Description of the Experiments
1.	Write a program to demonstrate different basic data types in python.
2.	Create a menu driven program for reading the input from console and to perform different arithmetic operations on numbers in python.
3.	Write a Programs using Decision statements and looping statements
4.	Write a Python program to demonstrate various built-in string handling function
5.	Construct a Python program to implement various string operations without using built-in function.
6.	Create Python Programs using user-defined functions with different types of function arguments.. a) Create a simple calculator that can add, subtract, multiply and divide using functions. b) Implement the above concept by using pass by value and pass by reference.
7.	a) Implement linear search and binary search using list. b) Matrix operations using Nested List.
8.	Create a tuple and perform the following methods 1) Add items 2) len() 3) check for item in tuple 4)Access items
9.	Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()
10.	Write a python program to create a package (college), sub - package (all

	dept), modules (AI&DS, CSE) and create admin and cabin function to module.
11.	Simulate bouncing ball using Pygame and elliptical orbits in Pygame
12.	Write a Python program to perform read and write operations in a file, and find the occurrence of a given word in the text file using Jupitor / Lamda notebook
13.	Write a Python program to perform various array operations using Jupitor or Lamda note Book
14.	Write a Python program for sorting numbers and Strings using Jupiter or Lamda notebook

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Develop basic Python programs and control statements.

CO2: Construct Python programs for string handling functions.

CO3: Make use of Lists, tuple and Dictionaries.

CO4: Build python programs with modules and packages.

CO5: Develop a Python application by using NumPy

B.E/ B.Tech	B19CEP201-SOFT SKILLS I	T	P	TU	C
		0	2	0	1

Course Objectives:

1. To Develop the inter personal skills
2. To Develop creativity skills
3. To Enhance communication and problem solving skills
4. To Improve emotional maturity and emotional health
5. To Enhance the Employability and Career Skills of students

.

UNIT-I SELF EVALUATION 6

Introducing to soft skills, Familiarize yourself, Self-understanding, SWOT analysis, Goal Setting

UNIT- II INNOVATIVE THINKING 6

Divergent thinking, Encourage curiosity, Write your story, Poster making

UNIT- III COMMUNICATION SKILLS 6

Just a Minute, workplace communication, Role Play, Extempore, Effectiveness of body language

UNIT- IV EMOTIONAL INTELLIGENCE 6

Personal etiquette and relationship, Stress and Time Management

UNIT- V PERSONALITY DEVELOPMENT 6

Leadership skills, Managerial skills, corporate etiquette, Team Building Language Development:

Total Instructional hours: 30

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Course Outcomes:

Students will be able to

CO1: Develop the Interpersonal Skills

CO2: Show the creative skill in different aspects.

CO3: Explain their ideas through conversations.

CO4: Develop adequate Soft Skills required for the workplace

CO5: Develop leadership qualities

Reference Books:

1. Butterfield, Jeff “Soft Skills for Everyone” Cengage Learning, New Delhi, 2015
2. S.Hariharanetal”Soft Skills” MJP Publishers: Chennai, 2010.
3. Peter, Francis “Soft Skills and Professional Communication” New Delhi: Tata McGraw Hill.2012. Print.

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B.E. CSE	B19MAT301 - DISCRETE MATHEMATICS	T	P	TU	C
		3	0	1	4

Course Objective:

1. To extend student‘s logical and mathematical maturity and ability to deal with abstraction.
2. To solve counting problems involving the Combinatorics.
3. To understand the basic concepts of graph theory.
4. To familiarize the applications of algebraic structures.
5. To understand the concepts of lattices and boolean algebra.

UNIT- I LOGIC AND PROOFS 12

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers -Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT- II COMBINATORICS 12

Mathematical induction – Strong induction and well ordering – The basics of counting – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT- III GRAPHS 12

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism - Euler and Hamilton Paths.

UNIT- IV ALGEBRAIC STRUCTURES 12

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem - Definition and examples of rings and fields.

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UNIT- V LATTICES AND BOOLEAN ALGEBRA 12

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Construct the Propositional and Predicate Calculus.

CO2: Solve the Mathematical Induction and recurrence relation.

CO3: Make use of Graph models and special types of graphs.

CO4: Develop the concepts of groups.

CO5: Identify the Lattice and Boolean algebra.

Text Books:

1.Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

2. Rosen, K.H., "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Pub.Co. Ltd., New Delhi, Special Indian Edition, 2018.

3. NarsinghDeo, Graph Theory with Applications to Engineering and computer Science, Prentice – Hall of India, 2016.

Reference Books:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2007.

2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

BOS CHAIRMAN

B. Tech (AI&DS & CSBS)	B19MAT305 – LINEAR ALGEBRA	T	P	TU	C
		3	0	0	3

Course Objective:

1. Analyze the matrices and system of linear equations.
2. Understand the principles of matrix algebra and decomposition.
3. Enhance the knowledge of vector space and its properties.
4. Use transformation techniques in diagonalization of matrices.
5. Introduce inner product spaces and orthogonalization.

UNIT I **MATRICES AND SYSTEM OF LINEAR EQUATIONS** **9**

Matrices - Row reduction and echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method.

UNIT II **EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION** **9**

Eigen value Problems : Jacobi rotation method - Power method - Singular value decomposition - QR decomposition.

UNIT III **VECTOR SPACES** **9**

Definition and examples - Vector spaces over Real and Complex fields - Subspace - Linear space - Linear independence and dependence - Basis and dimension.

UNIT IV **LINEAR TRANSFORMATION** **9**

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigen values and eigen vectors of linear transformation - Diagonalization : Similarity transformation - Orthogonal transformation.

UNIT V **INNER PRODUCT SPACES** **9**

Inner product and norms - Definition and properties – Length and Orthogonality - Orthogonal sets - Orthogonal projections - Orthonormal sets - Gram Schmidt process - Least square problems.

Total Instructional hours: 45

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Course Outcomes:

Students will be able to

CO1: Make use of Matrix to test the consistency and solve linear equations.

CO2: Solve eigen values of a matrix using numerical techniques and perform matrix decomposition

CO3: Apply the knowledge of vector spaces in solving engineering problems.

CO4: Illustrate the matrix of linear transformation and diagonalization.

CO5: Improve skills in applications of inner product spaces and orthogonality.

Text Books:

1. Friedberg, A.H., Insel, A.J. and Spence, L., - "Linear Algebra", Pearson Education Limited, 2nd Edition, 2014.
2. Lay, D.C., - "Linear Algebra and its Applications", 5th Edition, Pearson Education, 2015.

Reference Books:

1. Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons,10th Edition,2018.
2. James, G. - "Advanced Modern Engineering Mathematics", Pearson Education, 2007.
3. Veerarajan T., "Linear Algebra and Partial Differential equations", Tata McGraw Hill Publications, 2019.
4. Gilbert Strang, "Introduction to Linear Algebra", 5th edition Wellesley- Cambridge Press, 2017.
5. Kolman, B. Hill, D.R., - "Introductory Linear Algebra", Pearson Education, New Delhi, First Reprint, 2009.

BOS CHAIRMAN

B.E-CSE	B19CST302 - DATA STRUCTURES	T	P	TU	C
		3	0	1	4

Course Objectives:

1. To understand the concepts of ADTs.
2. To design and implement stacks, queues and linked lists.
3. To understand the complex data structures such as trees and graph.
4. To understand sorting and searching algorithms.
5. To understand various hashing Techniques.

UNIT- I LISTS **9**

Abstract Data Types (ADTs) , List ADT, Linked list, Singly linked lists - Representation in memory - Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list - Doubly linked list - operations on it with their algorithms - Circular Linked Lists -all operations and their algorithms.

UNIT- II STACKS AND QUEUES **9**

Stack ADT - Operations - Applications: Evaluating arithmetic expressions, Conversion of Infix to postfix expression - Queue ADT - Types of Queue: Simple Queue, Circular Queue, Priority Queue, deQueue - Operations on each types of Queues– applications of queues.

UNIT- III TREES **9**

Basic Tree Terminologies-Tree Traversals-Different types of Trees: Binary Tree, Expression tree, Threaded Binary Tree, Binary Search Tree, AVL Tree - Tree operations on each of the trees and their algorithms - Applications of Binary Trees - B Tree, B+ Tree: definitions and algorithms.

UNIT- IV GRAPHS **9**

Definition – Representation of Graph - Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort- Applications of graphs: Shortest path algorithms(Dijkstra’s and Floyd’s algorithms); Minimum spanning tree (Prim’s and Kruskal’s algorithms).

UNIT- V SEARCHING, SORTING AND HASHING TECHNIQUES **9**

Searching: Linear Search - Binary Search. Sorting: Bubble sort - Selection sort - Insertion sort -Quick Sort-Merge Sort -Heap Sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Total Instructional hours: 60

BoS -Chairman

Course Outcomes:

Students will be able to

CO1: Build programs to implement linear data structures such as list.

CO2: Apply the linear data structures such as stacks and queues to problems.

CO3: Apply the concept of tree data structure in real world scenarios.

CO4: Develop programs to implement nonlinear data structures such as graph to solve problems.

CO5: Analyze the various searching, sorting and hashing algorithms.

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2010.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.
2. Reema Thareja, —"Data Structures Using C", Second Edition, Oxford University Press, 2011.
3. M. Tenenbaum and Augestien, "Data Structures using C", Third Edition, Pearson Education 2007.
4. J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with applications", Second Edition, Tata McGraw Hill, 2007
5. Aho, Hopcroft and Ullman, —Data Structures and Algorithms‖, Pearson Education,1983.

BoS -Chairman

Semester - III

B.TECH	B19ADT301 – FUNDAMENTALS OF DATA SCIENCE	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To introduce the basic concepts of Data Science.
2. To understand the mathematical skills in statistics
3. To acquire the skills in data pre-processing steps.
4. To learn the concepts of feature selection algorithms in machine learning.
5. To learn the concept of clustering approaches and to visualize the processed data using visualization techniques.

UNIT- I INTRODUCTION 9

Need for Data Science – Benefits and uses – Facets of data – Types of data- Organization of data- Data Science process- Data Science life cycle- Role of Data Science- Big Data – sources and characteristics of Big Data

UNIT- II DESCRIBING DATA 9

Frequency distributions – Outliers – Relative frequency distributions – Cumulative frequency distributions – Frequency distributions for nominal data – Interpreting distributions – Graphs – Averages – Mode – Median – Mean – Averages for qualitative and ranked data – Describing variability Tentative– Range – Variance – Standard deviation – Degrees of freedom – Interquartile range – Variability for qualitative and ranked data

UNIT III DATA PREPROCESSING 9

Data pre-processing: Data cleaning - Data integration and Data transformation - Data Reduction - Data Discretization

Exploratory Data Analysis - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA - The Data Science Process

UNIT- IV SUPERVISED MACHINE LEARNING ALGORITHMS 9

Supervised learning: Linear Regression- Regression Trees -Non-Linear Regression- Bayesian Linear Regression - Polynomial Regression

Classification: Random Forest- Decision Tree- Evaluation of Classification, Confusion matrix

UNIT- V CLUSTERING AND DATA VISUALIZATION 9

Clustering: Choosing distance metrics - Different clustering approaches - Hierarchical and agglomerative clustering - k-means – Applications – Visual Analytics.

Visualization with Matplotlib – Line plots – Scatter plots – Visualizing errors – Density and contour plots– Histograms, Binnings and density – Three dimensional plotting.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Summarize the data science basics and its life cycle.

CO2: Outline the relationship between data dependencies using statistics

CO3: Summarize the data pre-processing methods and implement the EDA

CO4: Apply the various feature selection algorithms.

CO5: Build the visualization of data using the visualization tools.

Text Books:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

Reference Books:

1. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2017.
2. Mario Dobler and Tim Großmann, “The Data Visualization Workshop”, O’Reilly Media, 2020.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Relly,2017.
4. Cathy O'Neil and Rachel Schutt, “Doing Data Science, Straight Talk from The Frontline”, O'Reilly, 2014.

B.E-CSE	B19CST401 - COMPUTER NETWORKS	T	P	TU	C
		3	0	0	3

Course Objective:

1. To study the foundational principles, architectures, and techniques employed in computer networks.
2. To study the concepts of communication networks, protocols and their performance.
3. To understand the protocol layering and physical level communication.
4. To analyze the performance of a network.
5. To learn the functions of network layer and the various routing protocols.

UNIT- 1 INTRODUCTION 9

Data Communications - Data Flow - Networks - The Internet - Protocols and Standards - Network Models: Layered Tasks - The OSI Model - TCP/IP Protocol Suite - Addressing - Transmission Media – Connecting LANs, Backbone Networks, and Virtual LANs: Connecting Devices-Circuit Switching and Packet Switching.

UNIT- 2 DATA LINK LAYER 9

Introduction - Block Coding - Cyclic codes - Checksum -Data Link Control: Framing - Flow and Error Control - Noiseless Channels - Noisy Channels - HDLC -Multiple Access: Random Access – Channelization-Wired LANs: IEEE Standards- Standard Ethernet

UNIT- 3 NETWORK LAYER 9

IPv4 Addresses- IPv6 Addresses - Internetworking - IPv4 - IPv6 - Transition from IPv4 to IPv6 –Network Layer: Delivery, Forwarding, and Routing: Address Mapping - Internet Control Message Protocol (ICMP) -Internet Group Management Protocol (IGMP) - Network Layer: Delivery, Forwarding, and Routing.

UNIT- 4 TRANSPORT LAYER 9

Process-to-Process Delivery - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP)-Stream Control Transmission Protocol (SCTP) - Congestion Control and Quality of Service: Data Traffic -Congestion Control - Quality of Services (QoS)-POP3-IMAP.

UNIT- 5 APPLICATION LAYER 9

Domain Name System (DNS): Domain Name Space - Distribution of Name Space - DNS in the Internet World Wide Web and HTTP - Simple Mail Transfer Protocol - File Transfer Protocol – Security –IPSec – SSL services- Secure Shell (SSH)-TELNET - PGP - Firewalls.

BoS -Chairman

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Illustrate the basic concept in modern data communication and computer networking.

CO2: Apply the functions of different layers and in depth knowledge of data link layer.

CO3: Analyze the different protocols and network layer components

CO4: Outline the basic functions of transport layer and congestion in networks.

CO5: Analyze the working of application layer along with the protocols used.

Text Books:

1. Behrouz A.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2014
2. Larry L.Peterson and Bruce S.Davie, Computer Networks, Elsevier, 2009

Reference Books:

1. James F.Kurose and Keith W.Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2005
2. Andrew S.Tanenbaum, Computer Networks, Pearson Education, 2008
3. William Stallings, Data and Computer Communication, Pearson Education, 2007
4. Douglas E.Comer and M.S.Narayanan, Computer Networks and Internets, Pearson Education, 2008

BoS -Chairman

B.E/ B.Tech	B19MCT301- ENVIRONMENTAL SCIENCES	T	P	TU	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

23/9/2020

BOS CHAIRMAN

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife protection Act – Forest conservation Act – enforcement machinery involved in environmental legislation- Central and State pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

23/9/2020
BOS CHAIRMAN

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1: Explain the basic concepts of environment, ecosystem and biodiversity.

CO2: Recognize the different types of pollution and their control measures.

CO3: Illustrate various natural resources.

CO4: Summarize the development and improvement in the standard of living that has lead to serious environmental disasters.

CO5: Explain the causes of population and role of Information technology in environment.

TEXT BOOK:

T1 - Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

T2 - Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nedition,Pearson Education, 2004.

REFERENCES:

R1 - Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.

R2 - Erach Bharucha, —Textbook of Environmental Studiesll, Universities Press (I) PVT, LTD, Hydrabad, 2015.

R3 - Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

R4 - G.Tyler Miller and Scott E. Spoolman, —'Environmental Science',Cengage LearningIndia Pvt, Ltd, Delhi, 2014

23/9/2020

BOS CHAIRMAN

B.E-CSE	B19CSP301- DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	2	2

Course Objectives:

1. To understand the practical application of linear data structures.
2. To understand the different operations of search trees.
3. To familiarize graphs and their applications.
4. To demonstrate different sorting and searching techniques.
5. To implement the different hashing techniques.

List of Experiments:

Expt. No	Description of the Experiments
1	Implementation of Singly, Doubly and Circular Linked list.
2	Array implementation of Stack and Queue ADTs.
3	Linked list implementation of Stack and Queue ADTs.
4	Applications of Stack and Queue ADTs.
5	Implementation of Binary Search Trees.
6	Implementation of AVL Trees.
7	Graph representation and Traversal algorithms.
8	Applications of Graphs.
9	Implementation of searching and sorting algorithms.
10	Hashing – collision resolution techniques.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Develop functions to implement linear and non-linear data structure Operations.
CO2: Choose the appropriate linear data structures for solving a given problem.
CO3: Select, implement and use the appropriate non-linear data structures for solving a given problem.
CO4: Design and development of optimal algorithms for searching and sorting.
CO5:Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

BoS -Chairman

Semester - III

B.TECH	B19ADP301 – DATA SCIENCE LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To understand the Python Programming packages like Numpy, Pandas and Matplotlib.
2. To prepare data for data analysis through understanding its distribution.
3. To understand and implement the Classification and Regression Model.
4. To learn the concept of Clustering model
5. To acquire knowledge in plotting using visualization tools.

List of Experiments:

Expt. No.	Description of the Experiments
1.	Working with Jupyter Notebook on fundamental Concepts.
2.	Computations using NumPy functions – Computation on Arrays, Aggregation, Indexing and Sorting.
3.	Data manipulations using Pandas – Handling of missing data and hierarchical indexing
4.	Case study to demonstrate Curve Fitting.
5.	Regression model for prediction
6.	Classification Model
7.	Find the outliers using plot.
8.	Plot the histogram, bar chart and pie chart on sample data
9.	Clustering model
10.	Data Visualization using Matplotlib – Implementation of 2D plotting and 3D plotting

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Experiment with Jupyter Notebook, Pandas and Matplotlib for data analysis.

CO2: Apply statistical methods to hypotheses testing and inference problems.

CO3: Build a regression model to predict the data.

CO4: Make use of packages for classification and evaluate the performance of the classifier.

CO5: Apply different visualization techniques on various massive datasets.

S.NO	Description of the Equipment	Required numbers (for a batch of 30 students)
1	Python 3 interpreter for Windows/Linux Numpy, SciPy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh	30

B.E./B.TECH	B19CEP301 - SOFT SKILLS -II (Common to all Branches)	T	P	TU	C
		0	2	0	1

OBJECTIVES

1. To enhance communication skills through LSRW skills.
2. To enrich interpersonal skills through integrated activities.
3. To develop social and professional etiquette.
4. To identify and apply employability skills for professional success.

UNIT- I COMMUNICATION SKILLS **6**

Define Listening-Types of Listening—Listening and Filling Information- –Basis of Phonetics- Strategies of Effective Reading – Reading & Responding to Business Communications- E-mail

UNIT- II INTERPERSONAL SKILLS **6**

Interpersonal Skills -Need & Components – Understanding Intercultural Competence – Team Work- Problem Solving Skills – Workplace Conflict Management & Resolutions

UNIT- III EMOTIONAL INTELLIGENCE **6**

Key Elements of Emotional Intelligence- Self Awareness – Self Performance- -Psychometric Analysis - Relationship Management -Critical Thinking & Reasoning

UNIT- IV BUSINESS ETIQUETTE **6**

Define Etiquette–Types & Importance of Workplace Etiquette – Basic Corporate Etiquette- Telephone Etiquette- Meeting & E- mail Etiquette- Customer Service Etiquette

UNIT- V CORPORATE SKILLS **6**

Work Ethics- Adaptability-Analytical Reasoning- Lateral Thinking-Stress &Time Management- Professionalism in Today's Workforce

TOTAL: 30 PERIODS

BOS CHAIRMAN

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1: Develop professional communication through LSRW skills.

CO2: Apply systematic approach in problem solving skills

CO3: Utilize leadership skills with ability to work in a team.

CO4: Demonstrate employability skills.

CO5: Analyze & adapt work place etiquette.

REFERENCES:

R1 - Meenakshi Raman, Shalini Upadhyay, 'Soft Skills', Cengage Learning India Pvt. Ltd, Delhi, 2018.

R2 - M.S.Rao, 'Soft Skills Enhancing Employability', I. K. International Publishing House Pvt. Ltd, New Delhi, 2010.

R3 - Sabina Pillai, Agna Fernandez, 'Soft Skills and Employability Skills', Cambridge University Press, 2018.

R4 - John Peter.A, 'Self – Development and Professional Excellence', Cengage Learning India Pvt. Ltd, Delhi, 2019.

BOS CHAIRMAN

B.E	B19MAT401 - PROBABILITY AND QUEUEING THEORY (AI&DS and CSE)	T	P	TU	C
		3	0	1	4

Course Objective:

The aim of this course is to

- Understand and conduct computer systems modeling and performance analysis.
- Expose to the concepts of one and two dimensional random variables and apply in engineeringdomain.
- Introduce the basic probability tools and concepts useful in modeling, such as Markov models.
- Develop the fundamental knowledge of basic characteristic features of a queuing systemand acquire skills in analyzing queueing models.
- Provide the significance of advanced queueing models.

UNIT- I PROBABILITY AND DISTRIBUTIONS 12

Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson,Geometric, Uniform, Exponential and Normal distributions.

UNIT- II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent andidentically distributed random variables – without proof).

UNIT- III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

BOS CHAIRMAN

UNIT- IV QUEUEING MODELS 12

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms – Queues with impatient customers: Balkingand reneging.

UNIT- V ADVANCED QUEUEING MODELS 12

Finite source models - M/G/1 queue – PollaczekKhinchin formula (including proof) - M/D/1 and $M/E_K/1$ as specialcases – Series queues – Open Jackson networks

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Interpret the concepts of probability andstandard distributions..

CO2: Develop the concepts of one and two dimensional random variables and apply inengineering domain.

CO3: Identify the concept of random processes in engineering disciplines.

CO4: Apply the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

CO5: Construct the network of queues with Poisson external arrivals, exponential service requirements and Jackson networks.

Text Books:

1. Gross,D.,Shortle,J.F,Thompson,J.M andHarris.C.M.,—FundamentalsofQueueingTheory", Wiley Student 4th Edition,2014.

2. Ibe,O.C.,—FundamentalsofAppliedProbabilityandRandomProcesses ",Elsevier,2nd Indian Reprint,2014.

BOS CHAIRMAN

Reference Books:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variablesand Random Processes", Tata McGraw Hill Edition, New Delhi, 2011.
2.Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2016.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition,WileyIndia Pvt. Ltd., Bangalore, 2012.

BOS CHAIRMAN

B.E-CSE	B19CST402 - DATABASE MANAGEMENT SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basic concepts of Database Management Systems.
2. To know different normalization techniques
3. To learn about the Structured Query Language (SQL)
4. To provide knowledge in PL/SQL.
5. To provide knowledge of transaction, locks and recovery strategies of DBMS.

UNIT 1 INTRODUCTION TO DATABASE 9

Databases and Database Users - Actors on the Scene - Advantages of Using the DBMS Approach ; Database System Concepts and Architecture - Data Models, Schemas, and Instances - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs

UNIT 2 DATA MODELING AND DATABASE DESIGN 9

Entity-Relationship model - Entity Types, Entity Sets, Attributes, and Keys - Conceptual Design of the COMPANY Database - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Functional dependencies and normalization for relational databases (up to BCNF)

UNIT 3 UNDERSTANDING SQL 9

SQL Data Definition and Data Types - SQL - Specifying Constraints - Key and Referential Integrity Constraints - Basic Retrieval Queries in SQL- Joins –Sub queries –Nested subquery - Single row subquery –Multiple row sub query –Correlated sub query - Views –Index –Different types of indexes

UNIT 4 ADVANCED SQL 9

Basics of PL/SQL variables –Constants –Procedures parameters –Procedures –Functions – Triggers –Embedded SQL –Case study for NOSQL databases –Cassandra and Mongo DB

UNIT 5 TRANSACTION PROCESSING **9**

Transaction processing: Introduction – ACID Properties -Need for concurrency control – Desirable properties of transaction –Schedule and recoverability - RAID –Shadow paging – Types of locks –Two phase locking –Deadlock –Timestamp based concurrency control – Recovery techniques –Concepts –Immediate update –Deferred update

Total Instructional hours: 45

Course Outcome:

Upon completion of the course, students will be able to

CO1: Understand the basics of database management systems.

CO2: Translate ER model to Relational model to perform database design effectively.

CO3: Apply various normalization techniques on database table.

CO4:.Understand the SQL for DB creation and updation.

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017.

REFERENCES:

1. Understanding SQL – Martin Gruber (3rd unit 50%)
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
3. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.

Semester - IV

B.Tech	B19ADT401 – FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE (Common to AI&DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the characteristics of an intelligent agent
2. To learn the problem-solving and searching strategies in Artificial Intelligence (AI).
3. To describe logical agents and first-order logic.
4. To understand the problem solving strategies with knowledge representation and planning.
5. To learn about the various applications of AI

UNIT- I INTRODUCTION 9

Introduction to AI - Future of AI – Applications of AI – History of AI- Types of AI- Intelligent Agent: Types of Agents- Characteristics of Intelligent Agents - Structure of Agents - Agents and Environments- Examples of AI.

UNIT- II PROBLEM SOLVING BY SEARCHING ALGORITHMS 9

Solving problems by searching: Problem Solving agents - Example Problems- Uninformed (Blind) search strategies: Breadth First Search- Uniform Cost Search- Depth First Search Informed (Heuristics) Search Strategies: Greedy Best-first Search- A* search- Memory bounded Heuristic search - Heuristics Functions.

UNIT- III LOGICAL AGENTS 9

Knowledge Based Agents - Propositional Logic - Agents based on Propositional Logic – First-order Logic - Propositional vs. First-order Inference - Knowledge Representation and Engineering - Unification and First-order Inference - Forward Chaining - Backward Chaining - Resolution.

UNIT- IV KNOWLEDGE REPRESENTATION AND PLANNING 9

Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

Classical Planning - Algorithms for Classical Planning - Heuristic for planning - Hierarchical planning - non-deterministic domains – time, schedule, and resources -- analysis.

UNIT- V APPLICATIONS 9

AI Applications – Natural Language processing: Language Models - Information Retrieval - Natural language Communication: Machine Translation - Speech Recognition – Robotics: Robot hardware-Robotic Perception-planning-moving – Application Domains.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings

CO2: Utilize search techniques when problem solving and playing games.

CO3: Develop agents capable of logical reasoning.

CO4: Apply problem solving strategies with knowledge representation and planning for solving AI problems

CO5: Build applications for NLP that use Artificial Intelligence.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach”, Pearson Publishers, Fourth Edition, 2021.
2. Kevin Knight, Elaine Rich and Shivashankar B Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition, 2017.

Reference Books:

1. Amit Konar, "Artificial Intelligence and Soft Computing: Behavioural and Cognitive Modeling of the Human Brain", CRC Press, 2018.
2. Dan W Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning Pvt. Ltd., 2015.
3. David Poole and Alan Mackworth, “Computational Intelligence: Logical Approach", Oxford Publishing, 2010.

Semester - IV

B. TECH	B19ADT402 - ANALYSIS OF ALGORITHMS	T	P	TU	C
		3	0	1	4

Course Objectives:

1. To provide a mathematical foundation for analysing and proving the efficiency of an algorithm.
2. To understand and apply the algorithm design techniques
3. To analyse the efficiency of alternative algorithmic solutions for the same problem
4. To understand and implement different algorithm design techniques.
5. To analyse algorithms using various methods

UNIT- I INTRODUCTION TO ALGORITHMS AND ANALYSIS 9

Stages of algorithm development for solving a problem: Describing the problem – Identifying a suitable technique – Design of an algorithm – Proof of correctness of the algorithm – Fundamentals of algorithm analysis – Space and Time complexity of an algorithm – Types of asymptotic notations and orders of growth – Algorithm efficiency – best case, worst case, average case.

UNIT- II ALGORITHM DESIGN TECHNIQUES 9

Brute Force – String matching - Closest-Pair and Convex-Hull problems - Exhaustive search - Travelling salesman problem - Knapsack problem - Assignment problem.

Divide and conquer methodology – Binary search – Merge sort – Quick sort - Strassen’s matrix multiplication.

UNIT- III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – All pair shortest path- Matrix chain multiplication- Travelling salesperson problem- Longest common sequence.

Greedy Technique – General characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Prim’s algorithm - Kruskal's algorithm – 0/1 Knapsack problem- Huffman code

UNIT- IV BACKTRACKING, ITERATIVE IMPROVEMENT, AND BRANCH & BOUND 9

Backtracking – 8-queens problem – Hamiltonian circuit problem – best-first search -- Iterative improvement: Stable marriage -- Maximum matching in bipartite graphs – maximum flow - Branch and Bound: 0/1 Knapsack problem - Traveling salesman problem.

UNIT- V INTRACTABILITY 9

Introduction to intractability -- Polynomial reductions – SAT and 3-SAT – NP-complete and NP Hard problems -- Approximation algorithms: Traveling salesman problem -- Knapsack problem – Introduction to randomized and parallel algorithms

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Demonstrate the mathematical analysis of various algorithms.

CO2: Apply the different algorithmic design techniques for a given problem.

CO3: Identify different solution for the given problem using dynamic programming and greedy approach.

CO4: Make use of existing algorithm to improve efficiency

CO5: Solve the hardness of real-world problems with respect to algorithmic efficiency.

Text Books:

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2013.

Reference Books:

1. Amrinder Arora, “Analysis and Design of Algorithms”, Cognella Academic Publishing, 2021
2. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford university press, 2016
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
4. .Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia publications, New Delhi, 2013.

Semester - IV

B.TECH	B19ADT403 – DATA MINING AND DATA WAREHOUSING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To introduce the fundamental processes of data warehousing and major issues in data mining,
2. To understand about data mining and preprocessing techniques,
3. To impart knowledge on various data mining concepts and techniques
4. To understand and apply various classification techniques.
5. To learn clustering methods for grouping of data

UNIT- I DATA WAREHOUSING 9

Different data repositories- Data warehouse- Data warehouse architecture: Multi-tiered Architecture-Data warehouse models - Extraction, Transformation, and Loading- Metadata repository - Data warehouse modeling: Data cube and OLAP-Data warehouse design and usage- OLAP Operations, OLAP and OLTP

UNIT- II DATA MINING 9

INTRODUCTION: Data Mining Functionalities, Data mining Techniques- Data mining architecture- Classification of Data mining Systems- Confluence of Data Mining: Machine Learning - Deep Learning- Data Preprocessing overview - Data similarity and dissimilarity measures.

UNIT- III ASSOCIATION RULE MINING 9

Basic Concepts- Types of Association rules- Efficient and scalable frequent item set mining methods: Apriori algorithm, FP-Growth algorithm- Mining frequent itemsets using vertical data format- Mining closed and max patterns- Advanced Pattern Mining: Pattern Mining in Multilevel, Multidimensional Space

UNIT- IV CLASSIFICATION AND PREDICTION 9

Decision Tree Induction, Bayesian Classification, Rule based classification - Neural Networks: Architecture - Perceptron - Back propagation, k-Nearest Neighbor, Linear Regression, Support Vector Machine, Accuracy measures, Model Evaluation.

UNIT- V CLUSTERING AND WEKA 9

Clustering Techniques: Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints - Outlier analysis- Data Mining Applications. Introduction to WEKA: Datasets - The Explorer – Getting started, exploring the explorer, learning algorithms, Clustering algorithms, Association–rule learners.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Interpret the details of a data warehouse system and perform business analysis with OLAP tools.

CO2: Organize the data needed for data mining using preprocessing techniques.

CO3: Identify interesting patterns from large amounts of data using Association Rule Mining.

CO4: Apply appropriate classification techniques for data analysis.

CO5: Build an unlabeled dataset into clusters by applying various clustering algorithms.

Text Books:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier , Third Edition, 2012.

Reference Books:

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining OLAP”, Tata McGraw Hill Education, 35th Reprint, 2017.
2. Pang-Ning Tan,Michael Steinbach, Anuj Karpatne, Vipin Kumar, “Introduction to Data Mining, second edition, Pearson, 2019

Semester - III

B.Tech.	B19MCT302 - INDIAN CONSTITUTION	T	P	TU	C
		2	0	3	0

Course Objectives:

1. To understand the constitutional organization of India.
2. To understand the hierarchy of Union Government of India.
3. To know the hierarchy and systems of state Governments.
4. To know the power, role of local administration in Government sectors.
5. To understand role, function of Election Commission of India.

Unit – I **THE CONSTITUTION - INTRODUCTION**

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

Unit – II **UNION GOVERNMENT**

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

UNIT III **STATE GOVERNMENT**

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

UNIT IV **LOCAL ADMINISTRATION**

- District Administration
- Municipal Corporation
- Zila Panchayat

CHAIRMAN, BoS

UNIT – V ELECTION COMMISSION

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

Total Instructional hours: 30

Course Outcomes:

Students will be able to

CO1: Develop the knowledge on organization of Indian constitution.

CO2: Explains the hierarchy organization of Indian Government.

CO3: Explain various systems and applications of State Governments.

CO4: Understand the power and functional systems of local administration.

CO5: Understand the role and administration of Indian Election Commission.

Text Books:

1. Rajeev Bhargava, “Ethics and Politics of the Indian Constitution”, Oxford University Press, New Delhi, 2008.
2. Fadia, B.L., “The Constitution of India”, Sahitya Bhawan; New edition 2017.
3. Basu, D.D., “Introduction to the Constitution of India”, Lexis Nexis; Twenty-Third 2018.

Suggested Software/Learning Websites:

1. https://www.constitution.org/cons/india/const.html
2. http://www.legislative.gov.in/constitution-of-india
3. https://www.sci.gov.in/constitution
4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/

CHAIRMAN, BoS

B.E-CSE	B19CSP401- DATABASE MANAGEMENT SYSTEMS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To understand data definitions and data manipulation commands
2. To learn the use of nested and join queries
3. To understand functions, procedures and procedural extensions of data bases
4. To be familiar with the use of a front end tool
5. To understand design and implementation of typical database applications

List of Experiments:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Views, Sequences, Synonyms.
4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Triggers.
7. Exception Handling.
8. Database Design using ER modeling, normalization and Implementation for any application.
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications

Total Instructional hours: 60

Course Outcome

Upon completion of the course, students will be able to

CO1: Utilize typical data definitions and manipulation commands.

CO2: Develop applications to test Nested and Join Queries

CO3: Build simple applications that use Views

CO4: Construct PL/SQL blocks using Cursors

CO5: Identify the use of Tables, Views, Triggers, Functions and Procedures

CO6: Make use of Front-end Tool in Database applications

BoS -Chairman

Semester - IV

B.TECH.	B19ADP401 – ARTIFICIAL INTELLIGENCE LABORATORY (Common to AI&DS & CSBS)	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To understand the different search strategies in AI.
2. To learn to represent knowledge in solving AI problems.
3. To understand fuzzy inference to solve problems with uncertain information.
4. To solve the problems using logic based techniques.
5. To know about the various applications of AI.

List of Experiments:

Expt. No.	Description of the Experiments
1.	Implementing state space search algorithms I. Hill Climbing algorithm II. A* algorithm
2.	Information retrieval using semantic search.
3.	Solve problems using Depth First Search
4.	Solve problems using Best First Search.
5.	Travelling Salesperson Problem using Heuristic approach.
6.	Knowledge representation and inference – Predicate logic.
7.	Reasoning with uncertainty - Fuzzy inference.
8.	Implement Hill climbing to solve 8-Puzzle problem.
9.	Solving 4-Queen problem
10.	Designing a Chatbot application.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Apply different search techniques in problem solving.

CO2: Make use of various problem solving techniques.

CO3: Develop the capacity to understand the problem with uncertain information using Fuzzy inference.

CO4: Apply logic based techniques to solve problems and use this to perform inference or planning.

CO5: Build an application that uses AI.

Lab Requirement:

S.NO	Description of the Equipment/ Software	Required numbers (for a batch of 30 students)
1	Python 3 interpreter for Windows/Linux	30

B.E.	B19CEP401 CAREER ABILITY COURSE- I	T	P	TU	C
		0	2	0	1

Semester -IV

Sl. No.	Topics	Hours
NUMBER SYSTEM		
1.	Numbers, HCF and LCM of Numbers, Decimal Fractions, Square Roots & Cube Roots, Problems on Numbers, Surds and Indices	6
SIMPLIFICATION		
2.	Addition, Subtraction, Multiplication, Division, Decimal Fractions BODMAS Rule.	6
ARITHMETIC ABILITY – I		
3.	Average, Problems on Ages, percentage, Profit & Loss, Ratio and Proportion, Partnership.	6
ARITHMETIC ABILITY – II		
4.	Chain Rule, Time and Work, Pipes and cisterns, Time and Distance.	6
ARITHMETIC ABILITY – III		
5.	Problems on trains, Boats and Streams, Allegation or Mixture, Simple interest, Compound Interest.	6

Total Instructional Hours: 30

BoS -Chairman

B. Tech (AI&DS & CSBS)	B19 MAT501 – STATISTICS FOR DATA ANALYTICS	T	P	TU	C
		3	0	1	4

Course Objective:

The aim of this course is to

- Introduce the testing of hypothesis for small and large samples.
- Characterize and compare different nonparametric hypothesis tests.
- Enhance knowledge in classification of design of experiments.
- Identify forecasting errors in time series analysis.
- Understand multivariate statistical techniques and methods effectively.

UNIT I **SAMPLING THEORY** **12**

Testing of hypothesis - Large sample : test for single proportion - difference of proportions - single mean - difference of means - Small sample : t-Test for single mean and difference of means - F-test for difference between population variances.

UNIT II **NON - PARAMETRIC TEST** **12**

Chi-square test : Independence of attributes and goodness of fit - Sign test for paired data : Rank sum test - Kolmogorov-Smirnov test for goodness of fit - comparing two populations - Mann – Whitney U test and Kruskal Wallis test -.One sample run test- rank correlation.

UNIT III **DESIGN OF EXPERIMENTS** **12**

ANOVA - One way and two way classifications - Completely randomized block design - Randomized block design - Latin square design - Two - square factorial design.

UNIT IV **TIME SERIES ANALYSIS** **12**

Variations in time series -Trend analysis - Cyclical variations - Seasonal variations and Irregular variations - Forecasting errors.

UNIT V **MULTIVARIATE ANALYSIS** **12**

Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density and its properties - Principal components : Population principal components - Principal components from standardized variables.

Course Outcomes

Students will be able to

CO1: Identify large and small samples of testing of hypothesis for means, proportions and variances.

CO2: Apply different nonparametric tests in estimation, testing, model fitting and in analyses.

CO3: Construct the ANOVA tables for CRD,RBD and LSD.

CO4: Demonstrate the knowledge of critical understanding of time series analysis.

CO5: Apply the multivariate distribution and principal component analysis.

Text Books:

1. Gupta. C., Kapoor V. K., "Fundamental of Statistics", Sultan Chand Publications, Edition 2017.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Sixth Edition, 2019.

Reference Books:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. B. L. Agarwal., "Basic Statistics", New Age International publications, 6th Edition, 2013.
3. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2013.
4. Kandasamy P., Thilagavathy K., and Gunavathy K., "Statistics and Numerical Methods" S. Chand & Company Ltd., 2018
5. Anderson. T.W., "An introduction to Multivariate Statistical Analysis", John wiley and sons, 2003.

Semester - V

B.TECH.	B19ADT501 - DATA PRIVACY AND SECURITY	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics of Number Theory and Security
2. To know the principles of different encryption Techniques
3. To learn about various Internet security protocols and standards
4. To understand about the importance of data privacy and methods of protection
5. To gain knowledge on data privacy and preservation.

UNIT- I BASICS OF SECURITY AND NUMBER THEORY 9

Computer security concepts – attacks – services – mechanisms – a model for network security – introduction to number theory and finite fields - Divisibility and the Division algorithm – Euclidean algorithm – modular arithmetic – groups, rings and fields – Finite fields of the form GF(P) and GF(2^n) –polynomial arithmetic – prime numbers – Fermat's and Euler's theorems – testing for primality – Chinese remainder theorem – discrete logarithms.

UNIT- II SYMMETRIC AND ASYMMETRIC CIPHERS 9

Classical encryption Techniques –Block ciphers - AES – DES – block cipher operation - Pseudorandom Number Generation based on symmetric ciphers – stream ciphers – Public key cryptography and RSA - DIFFIE-Hellman Key exchange – Elgamal Cryptographic system – Elliptic curve Arithmetic – Elliptic Curve Cryptography - Pseudorandom Number Generation based on asymmetric ciphers – security Hash Functions – HMAC.

UNIT- III WEB SECURITY 9

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure Communication - Protocols - Transport Level Security. Secure Electronic Transaction-Entities DS Verification-SET processing.

UNIT- IV INTRODUCTION TO DATA PRIVACY 9

Introduction – methods of protecting Data – importance of Balancing Data privacy and utility – privacy regulations – nature of data in enterprise – static data anonymization on multidimensional data, transactional data and complex data structures – dynamic data protection – Tokenization.

UNIT- V PRIVACY PRESERVATION 9

Introduction to privacy preserving data mining –association Rule Mining – clustering - privacy preserving Test Data Manufacturing – privacy preservation of Test data – protecting explicit identifiers – protecting quasi identifiers – protecting sensitive data – quality of test data – synthetic data generation.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1 : Demonstrate the fundamentals of security and number theory.

CO2 : Apply the cryptographic standards and authentication scheme.

CO3 : Make use of security frameworks for real time applications.

CO4 : Apply the various methods of data protection.

CO5 : Apply the data privacy preservation for real time applications.

Text Books:

1. Stallings William, “Cryptography and Network Security Principles and Practice”, seventh Edition, Pearson Education, 2017.
2. Michael E Whitman and Herbert J Mattord, “Principles of Information Security, Course Technology, 6th Edition, 2017

Reference Books:

1. Harold F. Tipton, Micki Krause Nozaki,, “Information Security Management Handbook,Volume 6, 6th Edition, 2016.
2. Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography And network security, 3rd Edition, . McGraw-Hill Education, 2015.
3. William Stallings and Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015.

1. Data Privacy Principles and Practice by Nataraj Venkataramanan, Ashwin Shriram , 2016.

Semester - V

B.TECH	B19ADT502 MACHINE LEARNING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics concepts of machine learning.
2. To provide knowledge on supervised learning.
3. To learn the concepts of unsupervised learning.
4. To develop skills on neural networks.
5. To learn about the advanced trends in machine learning.

UNIT- I INTRODUCTION 9

Machine learning – Types – applications – preparing to model – Activities - Data – exploring structure of data – Data Quality and remediation – Data preprocessing – modeling and evaluation – selecting a model – Training a model – model representation and Interpretability – evaluating performance of a model – Improving performance

UNIT- II SUPERVISED LEARNING 9

Linear models for regression – Linear models for classification – Discriminant functions, probabilistic Generative models, probabilistic Discriminative models – Decision tree learning – Bayesian learning – Naïve Bayes – Ensemble methods, Bagging, Boosting.

UNIT- III UNSUPERVISED LEARNING 9

Clustering – Types – applications – partitioning methods – K-means algorithm – K-mediods – Hierarchical methods – Density based methods – DBSCAN – finding patterns – using association rules – Hidden Markov model

UNIT- IV NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural network representation – problems – perceptron's – multilayer networks and back propagation algorithms – Advanced topics – Genetic algorithms – Hypothesis space search – Genetic programming – models of evaluation and learning.

UNIT- V ADVANCED LEARNING 9

Sampling – Basic sampling methods – Monte Carlo, Gibbs sampling – computational learning theory – mistake bound analysis – Reinforcement learning – Markov decision processes, Deterministic and Non-deterministic rewards and actions, Temporal difference learning exploration.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the basic concepts of machine learning.

CO2: Apply the supervised learning for real time applications

CO3: Make use of unsupervised learning techniques for real time applications

CO4: Apply the concept of neural networks and genetic algorithms.

CO5: Build the skills in advanced machine learning techniques.

Text Books:

1. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, “Machine Learning”, Pearson, 2019.
2. Mettusrinivas, G.Sucharitha and Anjana Matta, “Machine learning algorithms and applications”, Cambridge University Press,1st Edition, Wiley, 2017.

Reference Books:

1. Ethem Alpaydin, “Introduction to Machine Learning, Adaptive Computation and Machine Learning Series”, Third Edition, MIT Press, 2014.
2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman and Hall, CRC Press, Second Edition, 2014.
3. Anuradha Srinivasaraghava and Vincy Joseph, “Machine Learning”, First Edition, Wiley, 2019.
4. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Semester - V

B.TECH	B19ADT502 MACHINE LEARNING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics concepts of machine learning.
2. To provide knowledge on supervised learning.
3. To learn the concepts of unsupervised learning.
4. To develop skills on neural networks.
5. To learn about the advanced trends in machine learning.

UNIT- I INTRODUCTION 9

Machine learning – Types – applications – preparing to model – Activities - Data – exploring structure of data – Data Quality and remediation – Data preprocessing – modeling and evaluation – selecting a model – Training a model – model representation and Interpretability – evaluating performance of a model – Improving performance

UNIT- II SUPERVISED LEARNING 9

Linear models for regression – Linear models for classification – Discriminant functions, probabilistic Generative models, probabilistic Discriminative models – Decision tree learning – Bayesian learning – Naïve Bayes – Ensemble methods, Bagging, Boosting.

UNIT- III UNSUPERVISED LEARNING 9

Clustering – Types – applications – partitioning methods – K-means algorithm – K-mediods – Hierarchical methods – Density based methods – DBSCAN – finding patterns – using association rules – Hidden Markov model

UNIT- IV NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural network representation – problems – perceptron's – multilayer networks and back propagation algorithms – Advanced topics – Genetic algorithms – Hypothesis space search – Genetic programming – models of evaluation and learning.

UNIT- V ADVANCED LEARNING 9

Sampling – Basic sampling methods – Monte Carlo, Gibbs sampling – computational learning theory – mistake bound analysis – Reinforcement learning – Markov decision processes, Deterministic and Non-deterministic rewards and actions, Temporal difference learning exploration.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the basic concepts of machine learning.

CO2: Apply the supervised learning for real time applications

CO3: Make use of unsupervised learning techniques for real time applications

CO4: Apply the concept of neural networks and genetic algorithms.

CO5: Build the skills in advanced machine learning techniques.

Text Books:

1. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, “Machine Learning”, Pearson, 2019.
2. Mettusrinivas, G.Sucharitha and Anjana Matta, “Machine learning algorithms and applications”, Cambridge University Press,1st Edition, Wiley, 2017.

Reference Books:

1. Ethem Alpaydin, “Introduction to Machine Learning, Adaptive Computation and Machine Learning Series”, Third Edition, MIT Press, 2014.
2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman and Hall, CRC Press, Second Edition, 2014.
3. Anuradha Srinivasaraghava and Vincy Joseph, “Machine Learning”, First Edition, Wiley, 2019.
4. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

B.E- C.S.E	B19CST504- WEB TECHNOLOGY	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To introduce the basic concepts of websites basics, HTML and WEB 2.0
2. To study the about the client side scripting with JavaScript and DHTML.
3. To understand about Web data representation.
4. To study about the server side scripting with PHP.
5. To develop web applications dynamically using the database connectivity.

UNIT- I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Forms- Tables – Lists – Image – HTML5 control elements – Audio – Video controls - CSS3 – Inline, embedded and external style sheets

UNIT- II JAVASCRIPT AND DHTML 9

JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web.

UNIT- III REPRESENTING WEB DATA 9

XML-Documents and Vocabularies-Versions and Declaration -Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template-based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study.

UNIT- IV PHP 9

PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT- V MYSQL 9

Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs- case study

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Develop an application using HTML

CO2: Build an application using JavaScript and DHTML

CO3: Construct a web page using XML

CO4: Develop an web applications using PHP.

CO5: Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Text Books:

1. Kogent Learning Solutions Inc., “Web Technologies Black Book”, Dreamtech Press, 2018.
2. Robin Nixon, “Learning PHP, MySQL & JavaScript With JQuery, CSS & HTML5”, O'Reilly Media, Incorporated, Sixth Edition 2020.

Reference Books:

1. P.J. Deitel & H.M. Deitel, “Internet and World Wide Web How to program”, Pearson, 2020.
2. B. M. Harwani, “Developing Web Applications in PHP and AJAX”, McGraw-Hill Education (India) Pvt Limited, 2010
3. Luke Welling, Laura Thomson, “PHP and MySQL Web Development”, 5th Edition, Pearson Education, 2016.

B.E-C.S.E	B19CSP501 - INTERNET PROGRAMMING LABORATORY	T	P	TU	C
		0	3	0	3

Course Objectives:

1. To understand Web page design using HTML/XML and style sheets
2. To create user interfaces using Java frames and applets.
3. To learn to create dynamic web pages using server side scripting.
4. To learn to write Client Server applications and MySQL.
5. To learn PHP and Java Script programming.

List of Experiments:

Expt. No.	Description of the Experiments
1.	Write HTML Program using standard Tags, Table Tags, List Tags, Image Tags and Forms
2.	Create a home page development for any simple application using HTML, FRAMES and CSS.
3.	Client Side Scripts for Validating Web Form Controls using DHTML
4.	Create and save an XML document at the server, which contains 10 users' information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document
5.	Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file.
6.	Create a valid XML document containing details of a car like: id, company name, model, engine and mileage using XML Schema.
7.	Create a XML program for Information Retrieval From Xml Document
8.	Create a form validation using PHP and Javascript
9.	Create a web application for implementation of student information system using PHP and MYSQL
10.	Create a web application for implementation of Employee information system using PHP and MYSQL

Total Instructional hours: 60

BOS CHAIRMAN

Course Outcomes:

Students will be able to

CO1: Construct Web pages using HTML/XML and style sheets.

CO2: Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.

CO3: Develop dynamic web pages using server side scripting.

CO4: Use PHP programming to develop web applications.

CO5: Construct web applications MySQL.

B.TECH	B19ADP501– MACHINE LEARNING LABORATORY	T	P	TU	C
		0	2	0	2

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the linear models.
- To study the various probability-based learning techniques.
- To understand graphical models of machine learning algorithms.
- To gain knowledge on deep learning.

List of Experiments:

Expt. No.	Description of the Experiments
1.	Analysis the different types of discriminant function to perform machine learning classification
2.	Construct a Prune Classification tree by varying the fitting parameters to calculate the model accuracy
3.	Implementation of Candidate Elimination algorithm
4.	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.
5.	Implement and demonstrate the working of the decision tree-based ID3 algorithm
6.	Build a Simple Support Vector Machines using a data set
7.	Implement sentiment analysis using random forest optimization algorithm
8.	Implement a k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
9.	Construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using a standard Heart Disease Data Set
10.	Construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of kidney disease patients using a standard Kidney Disease Data Set

Total Instructional hours: 60

Course Outcomes:

Students will be able to

CO1: Develop supervised, unsupervised or semi-supervised learning algorithms for any given problem.

CO2: Apply the appropriate linear models for any given problem.

CO3: Build the foundation of probabilistic models and apply unsupervised algorithms for clustering.

CO4: Develop the appropriate graphical models of machine learning.

CO5: Apply deep learning algorithms to improve efficiency.

List of Equipment's Required:

Requirements for a batch of 30 students

S.NO.	Description of the Equipment	Quantity required (Nos.)
1	Python 3 interpreter for Windows/Linux	30

B.Tech AI&DS	B19ADP502- Mini Project	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To understand the project domain selection process
2. To analyze the problem both theoretically and practically.
3. To prepare a plan to develop product using schedule and plan.
4. To work individually or in a team towards project involving design, modelling, simulation and or fabrication.
5. To motivate the students to involve in research leading to innovative solutions for industrial and societal problems.

Description:

Mini Project work shall be carried out by maximum three-member batch of students under the supervision of a faculty of the department. The student batch shall meet the supervisor periodically and attend the reviews for evaluating the progress.

Mini Project work will be carried out in single phase during the entire semester. There will be three reviews for continuous assessment and one final review and viva-voce at the end of the semester. The Mini Project report prepared according to the approved guidelines and duly signed by the supervisor(s) and the Head of the department shall be submitted to the department.

Total Instructional hours: 30

Course Outcomes:

Students will be able to

CO1: Survey the area of the work to be done.

CO2: Inspect the problem thoroughly and provide an appropriate solution.

CO3: Examine systematic literature survey which helps to build the knowledge in the chosen field using existing models and references.

CO4: Analyze the system under study.

CO5: Choose and get proficiency over the software and or hardware for analysis.

B.E/ B.Tech	B19CEP501- Career Ability Course II	T	P	TU	C
		0	2	0	1

Sl. No.	Topics	Hours
	GENERAL MENTAL ABILITY- I	
1	Analogy, Classification, Series Completion, Coding and Decoding, Blood Relations.	6
	GENERAL MENTAL ABILITY- II	
2	Direction Sense Test, Logical Venn Diagram, Data Sufficiency, Assertion and Reason.	6
	NON VERBAL REASONING – I	
3	Mirror Images, Water Images, Embedded Figures, Paper folding and paper cutting, Cubes and Dice	6
	NON VERBAL REASONING – II	
4	Completion of incomplete pattern, Dot Situation, Construction of Squares and Triangles.	6
	DATA INTERPRETATION	
5	Tabulation, Bar Graphs, Pie Chart, Line Graphs	6

Total Instructional Hours: 30

BOS CHAIRMAN

Semester - V

B.TECH.	B19ADE504 - JAVA PROGRAMMING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand Object Oriented Programming concepts and basics of Java
2. To know the principles of inheritance and interfaces
3. To develop a java application with threads
4. To define exceptions and use I/O streams
5. To design an applications using java database connectivity

UNIT- I INTRODUCTION TO JAVA 9

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors Methods -Access specifiers - Static members- Java Doc comments

UNIT- II INHERITANCE AND INTERFACE 9

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT- III EXCEPTION HANDLING AND MULTITHREADING 9

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads – Multithreading. Wrappers – Auto boxing.

UNIT- IV I/O, GENERICS, STRING HANDLING 9

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT- V JAVA DATABASE CONNECTIVITY AND EVENT HANDLING 9

Introduction to Java Database connectivity – JDBC – ODBC – working with JDBC & ODBC connection with MS-Access and Oracle – JDBC vs ODBC – Event Handling – controls and buttons

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO 1 : Apply the concepts of classes and objects to solve simple problems

CO2 : Develop programs using inheritance, packages and interfaces

CO3 : Make use of exception handling mechanisms

CO4 : Build Java applications with I/O packages, string classes, Collections

CO5 : Developing GUI based applications

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 12th Edition, McGraw Hill Education, New Delhi, 2021.
2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015

Reference Books:

1. Cay S. Horstmann, “Core Java Fundamentals, 11th Edition, Pearson, 2018.

Semester - V

B.Tech	B19ADE501 – GRAPHICS AND VISUAL COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To introduce the basic concepts of Graphics and visual computing.
2. To study the transformations and clippings in 2D.
3. To provide the knowledge on the curved line concepts and transformations in 3D.
4. To understand the concepts of visualization techniques and different color mappings.
5. To learn about the high dimensional data techniques.

UNIT- I FUNDAMENTALS OF COMPUTER GRAPHICS AND PRIMITIVES 9

Applications of computer graphics in various Video display devices, Intutive color models : RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Algorithms for drawing: line, circle, ellipse, arcs & secotors, boundary fill & flood fill algorithm, colour tables.

UNIT- II TRANSFORMATIONS & PROJECTIONS AND CLIPPING 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing : viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT- III THREE DIMENSIONAL GRAPHIC REPRESENTATION 9

Curved lines & Surfaces - Spline-representations, specifications - Bezier Curves & surfaces, B-spline curves & surfaces, 3D Transformation and Viewing: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, coordinates, Projections, Clipping.

UNIT- IV VISUALIZATION TECHNIQUES AND IMAGE SEGMENTATION 9

Visualization of 2D/3D scalar fields: colour mapping, iso surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of: Vector fields and

flow data, Time-varying data - Image Restoration - Optimum Notch Filtering - Wiener filtering - basic concepts - Dam construction – Watershed segmentation algorithm.

UNIT- V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Outline the concepts related to basics of computer graphics and visualization.

CO2: Demonstrate various graphics primitives 2-D and 3-D geometric transformations and clipping techniques.

CO3: Summarize the concepts related to three dimensional object representations.

CO4: Apply various hidden surface removal techniques.

CO5: Make use of OpenGL to create interactive computer graphics applications.

Text Books:

1. Donald D Hearn, M. Pauline Baker, “Computer Graphics C version”, Pearson Education, 1997.
2. Aditi Majumder, M. Gopi, “Introduction to Visual Computing- Core Concepts in Computer Vision, Graphics, and Image Processing”, CRC Press, 2018.
3. Rafael C.Gonzalez and Richard Woods, “Digital Image Processing”, Pearson 2017.

Reference Books:

1. Ioannis Brilakis, Carl Thomas Michael Haas, “Infrastructure Computer Vision”, Elsevier Science, 2019.
2. Chopra Rajiv, “Computer Graphics with an Introduction to Multimedia”, 4th Edition, S CHAND & Company Limited, 2017.
3. Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Macro Di Benedetto, “Introduction to Computer Graphics”, CRC Press, 2014.

Semester - V

B.TECH.	B19ADE502 – NEURAL NETWORKS AND FUZZY SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To impart knowledge of artificial neural networks and its algorithms.
2. To understand about various Neural Networks architecture.
3. To provide knowledge on associative memories and their applications.
4. To study the different competitive neural networks.
5. To introduce Fuzzy Logic, Fuzzy relations and Fuzzy mathematics.

UNIT- I INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9

Artificial neural networks and their biological motivation – characteristics of Artificial neural networks – models of neuron – Topology - Back propagation algorithms and its variants – types of activation functions.

UNIT- II NEURAL NETWORKS ARCHITECTURE 9

Architecture: Motivation for the development of natural networks – artificial neural networks – biological natural networks – area of applications – typical architecture – setting weights – Basic learning rules – Mcculloch – pitts neuron – architecture, algorithm – single layer net for pattern classification – Hebb's rule – convergence theorem – Delta rule.

UNIT- III SUPERVISED LEARNING IN NEURAL NETWORKS 9

Back propagation neural net: Standard back propagation – architecture algorithm – momentum factor – Radial basis function network – Associative memory: hetro associative memory neural net, auto associative memory net – Bidirectional associative memory – recall and cross talk, Recurrent Neural network – Hopfield neural network – Boltzman machine.

UNIT- IV UNSUPERVISED LEARNING IN NEURAL NETWORKS 9

Neural network based on competition: fixed weight competitive nets – Max net – Mexican Hat – Hamming net – Kohonen self-organizing feature map – counter propagation nets

and its applications – adaptive resonance theory: basic architecture and operation – performance of SOH.

UNIT- V FUZZY SETS, RELATIONS AND INFERENCE SYSTEMS 9

Introduction – Classical sets and Fuzzy sets – Classical relations and Fuzzy relations – Fuzzy system architecture – Fuzzification: Fuzzy arithmetic numbers, extension, principle – Fuzzy Inference System – Defuzzification: Fuzzy rule based systems – Fuzzy decision making – Fuzzy optimization – ANFIS – CANFIS.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Outline the use of artificial neural network to analyze the neural topology.

CO2: Summarize about various Neural Networks architecture.

CO3: Solve problems in neural networks using back propagation algorithms

CO4: Apply various learning laws of neural networks.

CO5: Identify fuzzy fundamentals and their applications.

Text Books:

1. Lakhmi C. Jain, N.M. Martin, Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms Industrial Applications, CRC Press, 2020.
2. Ke-Lin.Du.M.N.S.Swamy, “Neural Networks and Statistical Learning”, Springer, 2nd Edition 2019.

Reference Books:

1. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, John Wiley and sons, 2010.
2. LaureneFausett, “Fundamentals of Neural Networks-Architectures, algorithms and applications”, Pearson Education Inc., 2008 (reprint).
3. Jacek. M. Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishing House, 2007.
4. J.S.R. Jang, C.T. Sun, E. Mizutani, “Neuro Fuzzy and Soft Computing - A computational Approach to Learning and Machine Intelligence”, Pearson Education Inc., 2007
5. SimonHaykin, “Neural Networks and Learning Machines”, Mac Millen College Pub co., New York, 2011.

Semester - V

B.TECH.	B19ADE503 – FUNDAMENTALS OF OPERATING SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To study the basic concepts and functions of operating system.
2. To learn about the processes, threads and scheduling algorithms.
3. To learn the various memory management schemes with examples.
4. To understand the I/O management and file systems.
5. To study the basics of Linux system and perform administrative tasks on Linux servers.

UNIT- I OPERATING SYSTEM OVERVIEW 9

Computer System Overview - Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT- II PROCESS MANAGEMENT 9

Processes — Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling — Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization — The critical-section problem, Synchronization hardware, Semaphores, Critical regions, Monitors; Deadlock — System model, Methods for handling deadlocks.

UNIT- III STORAGE MANAGEMENT 9

Main Memory — Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory — Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT- IV FILE SYSTEM AND I/O SYSTEMS 9

Mass Storage system — Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management; File-System Interface — File concept, Access methods, File system mounting, File Sharing and Protection; File System Implementation- Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems — I/O Hardware, Application I/O interface.

UNIT- V CASE STUDY 9

Linux System — Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS — iOS and Android — Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Apply the principles of elements and structures.

CO2: Experiment with various scheduling algorithms.

CO3: Compare and contrast various memory management.

CO4: Design and implement a prototype file systems.

CO5: Perform administrative tasks on Linux servers.

Text Books:

1. Bhatt, Pramod, Chandra P, “An Introduction to Operating System” Fifth Edition, PHI Learning Pvt Ltd, 2019.
2. Silberschatz and Galvin, “Operating System Concepts”, Ninth Edition, John Wiley and Sons, 2012.

Reference Books:

1. Stevens W. R. And Rago S.A., “Advanced Programming in the Unix Environment”, Second Edition, Addison-Wesley, 2013.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall,2011.
3. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2009.

Semester - V

B.E-C.S.E	B19CSE505 - NATURAL LANGUAGE PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To learn the fundamentals of natural language processing
2. To understand the use of CFG and PCFG in NLP
3. To implement basic grammar rules for English Language
4. To understand the role of semantics and pragmatics
5. To study the variety of NLP applications.

UNIT I INTRODUCTION **9**

Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of Speech – Tagging - Hidden Markov and Maximum Entropy Models.

UNIT II SPEECH **9**

Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology

UNIT III SYNTAX **9**

Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity.

UNIT IV SEMANTICS AND PRAGMATICS **9**

The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse

UNIT V APPLICATIONS **9**

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Infer the given text with basic language features

CO2: Construct an innovative application using NLP components

CO3: Develop a rule based system to tackle morphology/syntax of a language

BOS CHAIRMAN

CO4:Build a tag set to be used for statistical processing for real-time applications
CO5: Compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXT BOOKS:

1. Richard M Reese, “Natural Language Processing with Java”, O’Reilly Media, 2015.
2. Daniel Jurawsky, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Pearson Publication,2014.

REFERENCES:

1. Breck Baldwin, “Language Processing with Java and LingPipe Cookbook”, Atlantic Publisher, 2015.
2. Nitin Indurkhya and Fred J. Damerau, “Handbook of Natural Language Processing”, Second Edition, Chapman and Hall/CRC Press, 2010.
3. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, First Edition, O’Reilly Media, 2009.

Semester – VII

B.E.	B19CST702 – INTERNET OF THINGS	T	P	TU	C
		3	0	0	3

Course Objectives:

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

UNIT- I FUNDAMENTALS OF IoT 9

Introduction to Computer Networks - Evolution of Internet of Things - Enabling Technologies - IoT Architectures: oneM2M - IoT World Forum (IoTWF) and Alternative IoT models - Simplified IoT Architecture and Core IoT Functional Stack - Cloud in IoT - Functional blocks of an IoT ecosystem - Sensors - Actuators - Smart Objects and Connecting Smart Objects.

UNIT- II IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers - topology and Security of IEEE 802.15.4 - 802.15.4g - 802.15.4e - 1901.2a - 802.11ah and LoRaWAN - Network Layer: IP versions - Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo - Routing over Low Power and Lossy Networks - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT.

UNIT- III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller - System on Chips - IoT system building blocks - Arduino Board details - IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT- IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of Machine Learning - No SQL Databases - Hadoop Ecosystem - Apache Kafka - Apache Spark - Edge

Streaming Analytics and Network Analytics - Xively Cloud for IoT - Python Web Application Framework - Django AWS for IoT – System Management with NETCONF-YANG.

UNIT- V APPLICATIONS OF IoT 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) - Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture – Smart Lighting - Smart Parking Architecture and Smart Traffic Control.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the basic concepts of IoT

CO2: Analyze various network protocols used in IoT

CO3: Design a PoC of an IoT system using Rasperry Pi/Arduino

CO4: Apply data analytics and use cloud offerings related to IoT

CO5: Analyze applications of IoT in real time scenario

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017.

.

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”,1st Ed, VPT, 2014
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons 2014.
3. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, A press Publications, 1st Ed, 2013.

B.E. / B.TECH	B19AEO501- BASICS OF FLIGHT MECHANICS (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understands of basic concepts like lift, drag, pressure distribution and airfoil characteristics.
2.	To understand the effect of weight and height, range and endurance of the aircraft.
3.	To know about the different aerobatics and maneuvers performance in the aircraft.
4.	To get introduce to the basic concepts of shock waves, vortex formation and its effects on the aircraft.
5.	To understand the nature of supersonic flow, C-D nozzle expansion and Flight at hypersonic speeds.

UNIT - I	SUBSONIC SPEED AERO FOILS	9

Introduction to Lifting Surfaces - Lift and drag - Airflow and pressure over Airfoil - Chord line and angle of attack - Pressure distribution- Airfoil characteristics - Camber - Design and nomenclature of airfoil sections.

UNIT - II	LEVELING OF FLIGHT	9

Forces Acting on the Aircraft - Balancing the four forces- Loads on tail plane - Effects of downwash - Tail load determination - Relation between air speed and angle of attack - Effect of Weight and Height - Flying for maximum Range and Endurance.

UNIT - III	MANEUVERS	9

Introduction to Degrees of freedom - Diving - Turning - Angles of bank - Turning Problems - Controls on Steep Banks - Aerobatics - Loops, Spins, Rolls, Sideslips, and Nose-Dives- Inverted maneuvers.

UNIT - IV	TRANSONIC FLIGHTS	9

Speed of Sound - Compressibility and Incompressibility - Shock waves Effects of shock waves - Mach Number Critical Mach Number - Drag rise in the Transonic Region - Drag and Power Required - Behavior of airplane at shock stall - Shock – wave patterns - Pressure distribution-Slimness and Sweep Back - Area rule - Vortex generators.

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UNIT - V	SUPERSONIC FLIGHTS	9
Introduction to Supersonic flow - Supersonic flow over an aero foil - Convergent divergent nozzle Expanding – contracting duct - Supersonic wing shapes - Supersonic Wing and body shapes - Kinetic heating - Flight at hypersonic speeds.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Explain the Characteristics, Design and Nomenclature of Airfoil Sections
CO2	Identify the Forces Acting on the Aircraft and Its Effects to make the Aircraft Flying for Maximum Range and Endurance
CO3	Illustrate the different types of Aircraft maneuvering during flight
CO4	Outline the effect of shock waves, critical Mach number during transonic
CO5	Identify the supersonic flow over an Aero foil and able to examine its effects

Text Books	
1.	A.C. Kermode cbe, Ma, Ceng, Fraes, “Mechanics of flights”, .revised by R.H. barnard phd, Ceng, Fraes and D. R. Philpott Phd, Ceng, Mraes, Maiaa, 11th edition.

Reference Books	
1.	Hull DG, “Fundamentals of airplane flight mechanics”, Berlin: Springer, 2007.
2.	Cook MV, “Flight dynamics principles: a linear systems approach to aircraft stability and control”, Butterworth-Heinemann, 2012.
3.	Miele A, “Flight mechanics: theory of flight paths”, Courier Dover Publications, 2016.
4.	Kermode AC, “Mechanics of flight”, Longman Scientific & Technical, 1987.
5.	Von Mises R, “Theory of flight ”,Courier Corporation, 1959.

BoS Chairman

B.E. / B.TECH	B19AG0501 - ENVIRONMENT AND AGRICULTURE (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the importance of land, water and social structure in agriculture.
2.	To remember the impacts of mechanization, irrigation and urbanization in agriculture.
3.	To know the ecological issues, climate change, environmental policies and sustainable agriculture.
4.	To learn about the Ecological diversity in agricultural applications.
5.	To understand the emerging issues in environment and agriculture.

UNIT - I	ENVIRONMENTAL CONCERNS	9

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT - II	ENVIRONMENTAL IMPACTS	9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT - III	CLIMATE CHANGE	9

Global warming and changing environment – Ecosystem changes – Changing blue-green - grey water cycles – Water scarcity and water shortages – Desertification.

UNIT - IV	ECOLOGICAL DIVERSITY AND AGRICULTURE	9

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

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UNIT - V	EMERGING ISSUES	9
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural Biodiversity. Agricultural environment policies and its impacts – Sustainable agriculture.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the environmental concerns and impacts in agriculture
CO2	Outline about the interventions like mechanization, watershed development and irrigation in agriculture
CO3	Summarize about the climate change and its issue in agriculture
CO4	Illustrate a capacity building on the focus areas for ecological farming and agriculture biotechnology issues
CO5	Explain the agriculture environmental policies for sustainable agriculture

Text Books	
1.	M.Lakshmi Narasaiah, “Environment and Agriculture”, Discovery Pub. House, 2006.
2.	Arvind Kumar, “Environment and Agriculture”, ABH Publications, New Delhi, 2005.

Reference Books	
1.	T.C. Byerly, “Environment and Agriculture”, United States. Dept. of Agriculture. Economic Research Service, 2006.
2.	Robert D. Havener, Steven A. Breth, “Environment and agriculture: rethinking development issues for the 21st century: proceedings of a symposium”, Winrock International Institute for Agricultural Development, 1994.
3.	“Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium”, Bangkok, Thailand. 1989.
4.	https://nptel.ac.in/courses/126/105/126105014/

BoS Chairman

B.E. / B.TECH	B19BMO501 – INTRODUCTION TO MEDICAL PHYSICS (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To outline the effects of non ionizing radiation and its application.
2.	To summarize the principles of radioactive nuclides.
3.	To explain the interaction of radiation with matter.
4.	To illustrate the radiation detectors.
5.	To explain the radiation quantities.

UNIT - I	NON IONIZING RADIATION AND ITS MEDICAL APPLICATION	9

Overview of non-ionizing radiation effects - Low Frequency Effects - Higher frequency effects. Thermography – Application. Ultrasound Transducer - Interaction of Ultrasound with matter; Cavitations, Conditions for reflection, Transmission-Scanning systems – Artefacts - Ultrasound Doppler - Double Doppler shift Clinical Applications.

UNIT - II	PRINCIPLES OF RADIO ACTIVE NUCLIDES	9

Radioactive Decay – Spontaneous Emission – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture, Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology ,Decay series, Production of radionuclides – Cyclotron produced Radionuclide - Reactor produced Radio- nuclide-fission and electron Capture reaction, radionuclide Generator - Milking process (Technetiumgenerator).

UNIT - III	INTERACTION OF RADIATION WITH MATTER	9

Interaction of charged particles with matter – Specific ionization, Linear energy transfer range, Bremsstrahlung, Annihilation, Interaction of X and Gamma radiation with matter- Photoelectric effect, Compton Scattering, Pair production, Attenuation of Gamma Radiation, Interaction of neutron with matter and their clinical significance.

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UNIT - IV	PRINCIPLES OF RADIATION DETECTION AND DOSIMETERS	9
Principles of radiation detection, Properties of dosimeters, Theory of gas filled detectors, Ionization Chamber, Proportional chamber, G.M. Counter, Film dosimetry, luminescence dosimetry, scintillation detectors, Radiation detection instruments, Area survey meters, Personal Radiation monitoring device, Film badge, TLD, OSLD.		

UNIT - V	BASIC RADIATION QUANTITIES	9
Introduction - exposure - Inverse square law-KERMA-Kerma and absorbed dose – stopping power - relationship between the dosimetric quantities – Bremsstrahlung radiation, Bragg‟s curve- concept of LD 50- Stochastic and Non-stochastic effects, Different radiation Unit, Roentgen, gray, Sievert.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Recall the effect of non ionising radiation in human body and applications in the field of medicine
CO2	Interpret radioactive decay and production of radio nuclides
CO3	Discuss the interaction of radiation with matter
CO4	Illustrate the measurement of ionizing radiation
CO5	Summarize about the radiation quantities

Text Books	
1.	John. R Cameron, James G Skofronick, “Medical Physics”, John-Wiley & Sons, 1978.
2.	Muhammad Maqbool, “An Introduction to Medical Physics”, Springer International Publishing AG 2017.

Reference Books	
1.	P. Uma Devi, A.Nagarathnam, BS Satish Rao, “Introduction to Radiation Biology”, B.I Chur Chill Livingstone Pvt. Ltd, 2000.
2.	By B.H Brown, R.H Smallwood, D.C. Barber, P.V Lawford, D.R Hose J.P.Woodcock, “Medical Physics and Biomedical Engineering”, CRC Press,1998.
3.	Hylton B. Meire and Pat Farrant, “Basic Ultrasound”, John Wiley & Sons, 1995.

BoS Chairman

B.E. / B.TECH	B19BTO501 - FOOD PROCESSING AND PRESERVATION (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To make the students acquire the basics of food processing.
2.	To able to understand the food preservation techniques.
3.	To be able to understand the significance of food processing.
4.	To familiarize with the recent methods of processing of foods
5.	To understand the principles of food preservation.

UNIT - I	FOOD PROCESSING	9

Principles, importance, food processing methods : pasteurization (definition, time-temperature combination and equipments) sterilization (definition, time-temperature combination and equipments), blanching (definition, time-temperature combination and equipments, adequacy in blanching), canning (definition, time-temperature combination and equipments), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches).

UNIT - II	FOOD FREEZING AND DRYING	9

Freezing : Introduction, freezing point and freezing rate, freezing methods: Air freezing, plate freezing, liquid immersion freezing and cryogenic freezing, Freezer selection, Advantages and disadvantages of freezing.

Drying : Definition, free and bound moisture, concept of water activity, factors affecting drying, Drying methods and equipments: sun/solar drying, Cabinet drying, tunnel dryer, spray dryer, freeze dryer, fluidized bed dryer, Nutritional, physico-chemical changes during drying.

UNIT - III	PROCESSING OF FOOD PRODUCTS	9

Evaporation - Definition, types of evaporator (single effect, double effect and multiple effect evaporator); Freeze concentration - General principles and applications, basic elements, ice crystal nucleation, growth and crystallization, separation techniques (filtration and wash column).

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UNIT - IV	MEMBRANE TECHNOLOGIES IN FOOD PROCESSING	9
General principles and advantages, dead end and cross flow, Classification of membrane system: Reverse Osmosis, Nanofiltration, Ultra Filtration, Micro Filtration, Electodialysis and Pervaporation; Membrane technology comparison chart, Membrane application in the food industries and industrial effluent treatments; Membrane performance, and Limitation of membrane processes.		

UNIT - V	FOOD PRESERVATION	9
Introduction and principles. Traditional methods of preservation; Types of food based on its perishability; Importance of food preservation, Wastage of processed foods; Shelf life of food products. Advantages of food preservation.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Understand the different methods applied in the processing of foods.
CO2	Understand the significance of food processing and the role of food and beverage industries in the supply of foods.
CO3	Acquire knowledge on the changes occurring in the food during processing and storage.
CO4	Explain the food preservation and various food processing techniques.
CO5	Understand effective food preservation techniques.

Text Books	
1.	Ramaswamy H. and Marcotte M, “Food Processing: Principles and Applications”, by Taylor & Francis, 2005.
2.	Norman N Potter and Joseph H. Hotchkiss, “Food Science”, 5th Edition, CBS Publishers and Distributors, 1996.
3.	Barbosa-Canovas, “Novel Food Processing Technologies”, Tapia & Cano CRC Press, 2004.
4.	Gould GW, “New Methods of Food Preservation”, Springer Science & Business Media, 2012.

BoS Chairman

5.	Rahman MS, “Food Preservation”, In: Handbook of Food Preservation, 2nd Edition, (pp. 14-29), CRC press, 1999.
6.	Subbulakshmi G and AS Udipi, “Food Processing and Preservation”, New Age Publications, 2006.

Reference Books	
1.	Manay S and MS Swamy, “Foods: Facts and Principles”, 4th Ed., New Age Publishers, 2004.
2.	Deman JM, “Principles of Food Chemistry”, 2nd Ed., Van Nostrand Reinhold, NY., 1990.

BoS Chairman

B.E.	B19ECO501 - LOGIC AND DISTRIBUTED CONTROL SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To give an introductory knowledge on Programmable Logic Controller (PLC) and their programming languages
2. To give adequate knowledge about applications of PLC
3. To give basic knowledge about Computer Controlled Systems
4. To give basic knowledge on the architecture and local control unit of Distributed Control System (DCS)
5. To give adequate information with respect to interfaces used in DCS

UNIT- I PROGRAMMABLE LOGIC CONTROLLER 9

Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages - Ladder diagram – Function block diagram (FBD) - Programming timers and counters.

UNIT- II APPLICATIONS OF PLC 9

Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC.

UNIT- III COMPUTER CONTROLLED SYSTEMS 9

Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control- SCADA - Hardware and software, Remote terminal units, Master Station and Communication architectures.

UNIT- IV DISTRIBUTED CONTROL SYSTEM 9

DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities.

UNIT- V INTERFACES IN DCS 9

Operator interfaces - Low level and high level operator interfaces – Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS.

Total Instructional hours: 45

BoS CHAIRMAN

Course Outcomes:

Students will be able to

CO1: Understand the PLC

CO2: Apply PLC in various applications

CO3: Understand the concepts of Computer Controlled Systems

CO4: Acquire knowledge about various architectures of DCS

CO5: Analyze the various interfaces in DCS

Text Books:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar,‟ Distributed computer control for industrial Automation‟ Marcel Dekker, Inc., Newyork ,1990

Reference Books:

1. T.A. Hughes, “Programmable Controllers”, Fourth edition, ISA press, 2005
2. Krishna Kant, “Computer Based Industrial Control”, Second edition, Prentice Hall of India, New Delhi, 2010.
3. John W. Webb and Ronald A. Reis, “Programmable Logic Controllers”, Fifth edition, Prentice Hall of India, New Delhi, 2010.
4. John R. Hackworth and Frederick D. Hackworth Jr, Programmable Logic Controllers, Pearson, New Delhi, 2004.
5. Clarke, G., Reynders, D. and Wright, E., “Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems”, Newnes, 1st Edition, 2004.
6. E.A.Parr, Programmable Controllers, An Engineer‟s Guide, Elsevier, 2013

BoS CHAIRMAN

B.E./ B.TECH	B19EEO502 - ROTATING MACHINES & TRANSFORMERS (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To impact knowledge on magnetic-circuit analysis and introduce magnetic materials.
2. To Understand the Working principles of DC Generator.
3. To Understand the Working principles of DC Motor.
4. To Understand the Working principles of Induction and synchronous machines.
5. To Understand the Working principles of Transformer.

UNIT - I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 9

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-

Transformer as a magnetically coupled circuit **(Qualitative Only)**.

UNIT - II DC GENERATORS 9

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation commutation – inter poles compensating winding –characteristics of DC generators **(Qualitative Only)**.

UNIT - III DC MOTORS 9

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors starting and speed control of DC motors –Plugging, dynamic and regenerative braking testing and efficiency – Permanent Magnet DC (PMDC) motors-applications of DC Motor **(Qualitative Only).**

UNIT – IV INDUCTION AND SYNCHRONOUS MACHINES 9

Single phase motor - Double revolving field theory - starting methods - no load and block rotor test - equivalent circuit - types of single phase motor - 3 Phase induction motor – Construction – types - principle of operation - speed control of 3 phase motor - starting methods for 3 phase induction motor. Synchronous Machine Alternator, Construction and Basic principle - Synchronous motor - Basic principle, methods of starting, applications **(Qualitative Only).**

UNIT – V TRANSFORMERS 9

Transformers - Construction and types - Operation of single phase transformers - EMF equation - Voltage regulation - Losses and Efficiency - All day efficiency - Parallel operation Testing: Open circuit and Short circuit tests - 3 Phase transformers: (Construction & connections) - Autotransformers **(Qualitative Only)**.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the magnetic-circuits and materials.

CO2: Explain the construction and operation of DC Generator.

CO3: Explain the construction and operation of DC Motor.

CO4: Explain the construction and operation of induction and Synchronous machines.

CO5: Explain the construction, working principle of transformer and Autotransformer.

Text Books:

1. Nagrath, I.J. and Kothari D.P., “Electrical Machines” , Tata McGraw Hill Publishing Company Ltd., 4th Edition, 3rd reprint, New Delhi, 2011.
2. P.C.Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons; 3rd Edition 2013.

Reference Books:

1. S.K.Bhattacharya, “Electrical Machines”, McGraw – Hill Education, New Delhi, 3rd Edition,2009.
2. B.R.Gupta, “Fundamental of Electric Machines”, New age International Publishers,3rd Edition ,Reprint 2015.
3. Vincent Del Toro, “Basic Electric Machines”, Pearson India Education, 2016.
4. Surinder Pal Bali, “Electrical Technology Machines & Measurements”, Vol.II, Pearson, 2013.

B.E. / B.TECH	B19MEO501 – ROBOTICS (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the concepts of the basic components of a robot
2. To apply the distinct drive systems and end effectors to control the robot actuation
3. To study the role and application of various types of sensors and machine vision system
4. To make use of the knowledge in the robot kinematics and to write Robot Programs
5. To identify the social and economic challenges while implementing the robot systems

UNIT- I FUNDAMENTALS OF ROBOT 9

Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification - Specifications - Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions- Different Applications - A view on Global and Indian manufacturers of Robots - Need for Robots in Indian environment.

UNIT- II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

Drives - hydraulic, pneumatic, mechanical, electrical, Servo motors, Stepper motors- salient features, application; End effectors – types; Grippers- mechanical, pneumatic, hydraulic, magnetic, vacuum - limitations, Multiple grippers.

UNIT- III SENSORS AND MACHINE VI 9

Requirements of sensors, principles, types and applications of Proximity (Inductive, Hall effect, Capacitive, Ultrasonic and Optical); – Range (Triangulation, Structured light approach); Speed, Position (resolvers, optical encoders); – Force – Torque – Touch sensors (binary, analog sensor). Introduction to Machine Vision; applications, functions; image processing and analysis; training the vision system.

UNIT- IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 9

Forward kinematics and Reverse kinematics of manipulators; two, three degrees of freedom, homogeneous transformation matrix; introduction to manipulator dynamics, trajectory generator, manipulator mechanism, Degeneracy and Dexterity; Lead through programming, Robot programming languages; VAL programming, motion commands, sensor commands, end effecter commands, simple programs (for loading, unloading and palletizing operations), introduction to advances in Robot Programming.

UNIT- V APPLICATION, IMPLEMENTATION AND ROBOT ECONOMICS 9

Robot cell design; types, application of robots in processing, assembly, inspection, material handling in

automobile, medical, Nuclear Industries, RGV, AGV; Implementation of Robots in Industries; Safety considerations for robot operations, safety codes, Economic analysis of robots.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the concepts of industrial robots, classification, specifications and coordinatesystems.

CO2: Illustrate the different types of robot drive systems as well as robot end effectors.

CO3: Apply the different sensors and image processing techniques in robotics to improvethe ability of robots.

CO4. Develop robotic programs for different operations and familiarize with the kinematicsmotions of robot.

CO5: Examine the implementation of robots in various industrial sectors and interpolate theeconomic analysis of robots.

Text Books:

1. Groover M.P., “Industrial Robotics -Technology Programming and Applications”,McGraw Hill, 2012.
2. Deb S R and Deb S, “Robotics Technology and Flexible Automation”, TataMcGraw Hill Education Pvt. Ltd, 2010.
3. Saha S K, “Introduction to Robotics”, Tata McGraw Hill Education Pvt. Ltd, 2010, 2nd Ed, 2014.

Reference Books:

1. Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education,Global Edition, 3rd Edition, 2014.
2. Deb S.R., “Robotics Technology and Flexible Automation” Tata McGraw Hill BookCo., 2013.
3. Ashitava Ghoshal, “Robotics-Fundamental Concepts and Analysis”, OxfordUniversity Press, Sixth impression, 2010

BoS CHAIRMAN

Semester - VI

B.TECH.	B19ADT602 - DEEP LEARNING TECHNIQUES	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To introduce the basic concepts of Deep learning.
2. To learn about the deep networks.
3. To gain knowledge on the Convolutional neural network.
4. To understand the deep recurrent and recursive nets.
5. To study the techniques of deep learning.

UNIT- I BASICS OF DEEP LEARNING 9

Linear Algebra: Scalars- Vectors- Matrices and Eigen decomposition. Probability Distribution: Marginal probability-conditional probability-Bayes rule. Numerical computation: Gradient based optimization –constrained optimization.

UNIT- II MACHINE LEARNING AND DEEP NETWORKS 9

Machine Learning: Basics -. Learning algorithms. –Supervised learning algorithm-unsupervised learning algorithm. Deep feedforward network: Regularization for deep learning. Optimization for data models.

UNIT- III CONVOLUTIONAL NEURAL NETWORKS 9

Artificial networks: Convolutional neural networks(CNN): Structure- Operation - Pooling-convolution function -Data types- efficient convolution algorithms-features- neuro scientific basics for convolutional network.

UNIT- IV RECURRENT AND RECURSIVE NEURAL NETWORK 9

Recurrent neural network(RNN): unfolding computational graphs -Bidirectional RNN-Sequence to sequence architecture- deep recurrent network- Recursive neural network(RNN): Echo state network –strategies for multiple time scale.

UNIT- V ADVANCE TECHNIQUES IN DEEP LEARNING 9

Linear factor models-Auto encoders-Monte carlo methods- partition function: log likelihood gradient .Deep generative model: Boltzman machines-convolutional Boltzmann machines-Applications of Deep learning overview.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Summarize the concepts of Linear algebra, probability distribution and numerical computation.

CO2: Interpret the feedforward and deep networks.

CO3: Identify various classes of convolutional neural networks

CO4: Analyses recurrent and recursive concepts

CO5: Examine the performance of deep networks

Text Books:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016
2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

Reference Books:

1. Vance, William , “Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science” Joining the dotstv Limited.2020.
2. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

Semester - VI

B.TECH.	B19ADT603 – PROJECT MANAGEMENT PRINCIPLES AND TECHNIQUES	T	P	TU	C
		3	0	0	3

Course Objectives:

- To understand the software project planning and evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle.
- To learn about the planning and various managements to deliver successful projects.
- To understand the fundamental concept of project management and control.
- To study the various methods of staffing and software projects

UNIT- I PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT- II PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9

Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

UNIT- III ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – PERT technique Creation of critical paths – Cost schedules.

UNIT- IV PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change

control – Software Configuration Management – Managing contracts – Contract Management.

UNIT- V STAFFING AND SOFTWARE PROJECTS 9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Understand about project management principles while the developing software.

CO2: Interpret software process model and software estimation.

CO3: Understand about the project scheduling and risk management.

CO4: Apply the mechanisms and control to produce the successful project.

CO5: Apply methods of staff selection from design to deployment of project.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: “Software Project Management” – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Reference Books:

1. Robert K. Wysocki “Effective Software Project Management” – Wiley Publication,2011.
2. Adolfo Villafiorita, “Introduction to Software Project Management”, CRC Press, 2016.
3. Gopalaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

Semester - VI

B.TECH.	B19ADT601 - BIG DATA ANALYTICS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the competitive advantages of big data analytics.
2. To understand about Hadoop and MongoDB framework.
3. To acquire knowledge on Cassandra and Map Reduce
4. To explore the knowledge about Hive and Pig
5. To Study about Machine Learning Algorithms and Security

UNIT- I INTRODUCTION TO BIG DATA 9

Digital Data- Types of Digital Data – Characteristics of Big Data – Challenges With Big Data – Big Data Analytics – Terminologies Used in Big Data Environments - Big Data Analytics Project Life Cycle - Example Applications for Big Data - Top Analytics Tools - Big Data Technology Landscape – NOSQL and Hadoop .

UNIT- II HADOOP AND MONGODB 9

Introduction to Hadoop – processing data with Hadoop- Hadoop Distributed File System (HDFS) – HDFS Concepts- Managing Resources and applications with Hadoop, YARN- Interacting with Hadoop Ecosystem. MongoDB- Terms – MongoDB query Language.

UNIT- III CASSANDRA AND MAP REDUCE 9

Apache Cassandra – Cassandra Query Language (CQL) data types – CQLShell – Cassandra CRUD Operation – Alter commands – Querying System Tables – Map Reduce – Mapper – Reducer – Combiner partitioner – searching – storing – compression – JasperReport – Jaspersoft .

UNIT- IV HIVE AND PIG 9

Hive – Architecture – Data Types - Hive File Format - HQL- RCFile Implementation – What is pig? – pig on Hadoop – Pig Latin overview – data types in Pig – HDFS Commands –

Operators – eval function – when to use pig and when not to use pig? – Pig versus Hive.

UNIT- V MACHINE LEARNING ALGORITHMS FOR BIG DATA, SECURITY AND PRIVACY OF BIG DATA 9

Introduction – Supervised And Unsupervised Learning For Big Data - Semi Supervised Learning - Reinforcement Learning – Security In Hadoop- Issues and Challenges In Big Data Security – Encryption For Security – Privacy Protection .

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO 1: Infer the basics of big data analytics.

CO2: Explain the concepts of distributed file systems and Hadoop.

CO3: Make use of Cassandra and Map Reduce

CO4: Develop the applications using Hive and Pig

CO5: Apply Machine learning algorithms for real time applications

Text Books:

1. Seema Acharya, SubhashiniChellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2015.
2. C.S.R. Prabhu, Aneesh Sreevallabh Chivukula, Aditya Mogadala, Rohit Ghosh, L.M. Jenila Livingston, “Big Data Analytics: Systems, Algorithms, Applications”, Springer 2019.

Reference Books:

1. Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015.
2. Venkat Ankam , “Big Data Analytics”, Packt Publishing , 2016.
3. Soraya Sedkaoui, “Data Analytics and Big Data”, Wiley, 2018.

B.TECH	B19ADP602 - DEEP LEARNING LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To learn deep neural networks and apply for simple problems
2. To Learn and apply Convolution Neural Network for image processing
3. To Learn and apply Recurrent Neural Network and its variants for text analysis
4. To augment data using generative models
5. To explore real world applications with deep neural networks

List of Experiments:

1. Solving XOR problem using Multilayer perceptron
2. Implementation of Image Classification using CNN
3. Building a deep learning model
4. Implement the analysis of X-ray image using autoencoders
5. Implement Speech Recognition using NLP
6. Develop a code to design object detection and classification for traffic analysis using CNN
7. Implement online fraud detection of share market data using any one of the data analytics tools.
8. Implementation of RNN.
9. Implement image augmentation using deep RBM.
10. Implement Sentiment Analysis using LSTM.
11. Implement Variational Auto Encoders
12. Mini Project: Number plate recognition of traffic video analysis

TOTAL INSTRUCTIONAL HOURS : 60

COURSE OUTCOMES

CO1: Apply deep neural network for simple problems

CO2: Build a model using Convolution Neural Network for image processing

CO3: Make use of Recurrent Neural Network and its variants for text analysis

CO4: Experiment with generative models for data augmentation

CO5: Develop a real world applications using suitable deep neural networks

REFERENCES

1. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), "Deep Learning Applications", Volume 3, Springer Publications 2022.
2. Stone, James. (2019), " Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, United States, 2019

List of Equipment's Required:

Requirements for a batch of 30 students

S.NO.	Description of the Equipment	Quantity required (Nos.)
1	Python 3 interpreter for Windows/Linux	30

B.TECH.	B19ADP601 - BIG DATA ANALYTICS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big data analytics
2. To practice concepts required for developing map reduce programs.
3. To impart the architectural concepts of Hadoop and introducing map reduce paradigm.
4. To practice programming tools PIG and HIVE in Hadoop eco system.
5. To implement best practices for Hadoop development.

List of Experiments:

Description of the Experiments

1	Hadoop Installation
2	File Management in Hadoop
3	Map Reduce Program - Word Count
4	Map Reduce Program - Weather Data
5	Map Reduce Program – Matrix Multiplication
6	Installation of Pig and Hive
7	Pig Latin Scripts – word count & to find a max temp for each and every year
8	Hive Functions

Total Instructional hours: 60

Course Outcomes:

Students will be able to

1. Apply the Perform setting up and Installing Hadoop in its three operating modes.
2. Implement the file management tasks in Hadoop.
3. Build the Map Reduce Paradigm.
4. Make use of Pig Latin scripts sort, group, join, project, and filter your data.
5. Experiment with the installation of HIVE

List of Equipment's Required:

Requirements for a batch of 30 students

S.NO.	Description of the Equipment	Quantity required (Nos.)
1	Python 3 interpreter for Windows/Linux	30

Semester - VI

B.TECH	B19ADE601- OPTIMIZATION TECHNIQUES	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To Formulate and solve linear programming problems (LPP)
2. To optimize the function subject to the constraints.
3. To understand the dynamic programming to optimize multi stage decision problems.
4. To understand and Evaluate Genetic Algorithm and Programming.
5. To Identify and solve problems under Markovian queuing models.

UNIT I LINEAR PROGRAMMING 9

Introduction - statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Big M method, Two-Phase method

UNIT-II CLASSICAL OPTIMIZATION TECHNIQUES 9

Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT III DYNAMIC PROGRAMMING 9

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the tabular method of solution.

UNIT IV INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS 9

Integer programming: Branch and bound method- Transportation and Assignment problems - Travelling salesman problem**.**

UNIT V QUEUING MODELS 9

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

TOTAL INSTRUCTIONALPERIODS: 45

Course Outcomes:

The student will able to

CO1 : Formulate and solve linear programming problems (LPP)

CO2 : Optimize the function subject to the constraints.

CO3 : Apply dynamic programming to optimize multi stage decision problems.

CO4 : Evaluate Integer Programming Problems, Transportation and Assignment Problems.

CO5 : Identify and solve problems under Markovian queuing models.

TEXT BOOK:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
2. Engineering Optimization (4th Edition)-2015. byS.S.Rao, New Age International (P) Ltd, Publishers.

REFERENCE BOOK:

1. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill,2017.
2. Fundamentals of Optimization Techniques with Algorithms By SukantaNayak · 2020

Semester - VI

B.TECH.	B19ADE602 – MACHINE LEARNING DESIGN PATTERNS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics of machine learning design patterns.
2. To provide knowledge on Data representations and training patterns.
3. To understand the concepts of design patterns for resilient serving.
4. To develop skills on design pattern transformation.
5. To learn ML life cycle, predictive analytics and anomaly detection.

UNIT- I INTRODUCTION 9

Machine learning design patterns – Machine learning terminology – Models and Frameworks – Data and Feature Engineering – Machine learning process – Data and Model Tooling – Roles – Common Challenges in Machine learning – Data Quality – Reproducibility – Data drift – Scale – Multiple objectives.

UNIT- II DATA REPRESENTATION DESIGN AND MODEL TRAINING PATTERNS 9

Simple Data Representations – Hashed Feature – Typical training loop – useful over fitting – Check points – Transfer Learning – Distribution strategy – Hyper parameter tuning.

UNIT- III DESIGN PATTERNS FOR RESILIENT SERVING 9

Stateless Serving Function – Batch Serving – Continued Model Evaluation – Two-Phase Predictions – Keyed predictions.

UNIT- IV REPRODUCIBILITY DESIGN PATTERNS 9

Transform – Repeatable Splitting – Bridged Schema – Windowed Inference – Workflow pipeline – Model Versioning.

UNIT- V CONNECTED PATTERNS 9

Pattern Reference – Pattern Interactions – Patterns within ML Projects – ML life cycle – AI Readiness – Common patterns by use case and data types – Natural Language

Understanding – Computer Vision – Predictive Analytics – Recommendation Systems – Fraud and Anomaly Detection.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the basic concepts of machine learning design patterns.

CO2: Develop their skills on Data representations and model training.

CO3: Design and develop design patterns for resilient serving.

CO4: Apply the concept of transformation.

CO5: Build their skills in pattern recognition and anomaly detection.

Text Books:

1. Valliappa Lakshmanan, Sara Robinson, Michael Munn, “Machine Learning Design Patterns”, O Reilly, 1st Edition, 2020.

Reference Books:

1. Moritz Hardt, Benjamin Recht , “Patterns, Predictions, and Actions”, Princeton University Press, 2022.

Semester - VI

B.TECH	B19ADE603 – ETHICS FOR DATA SCIENCE	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand basics of data science and ethics.
2. To plan about engineering ethics for data science.
3. To learn about the planning engineering experimentation and honesty.
4. To understand the safety and responsibility ethics.
5. To study the global issues, leadership and social responsibility.

UNIT- I INTRODUCTION TO DATA SCIENCE AND ETHICS 9

The Risk of data science – Ethical data gatherings - Ethical data pre-processing – Ethical Modelling – Ethical evaluation – Ethical Deployment - Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT- II ENGINEERING ETHICS 9

Senses of ‗Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT- III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law - Case study: The Challenger

UNIT- IV SAFETY, RESPONSIBILITY AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT- V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Interpret ethics of data science and deployment.

CO2: Demonstrate the extensive knowledge of the engineering ethics.

CO3: Apply the experimentation in engineering ethics.

CO4: Summarize the safety, responsibility and rights.

CO5: Compare and contrast the global issues with ethics.

Text Books:

1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases, Cengage Learning, 2009.
2. R S Nagarajan, A Textbook on Professional Ethics and Human Values, New Age International (P) Limited, Publishers, 2006

Reference Books:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.
2. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003.

B.E-CSE	B19CSE503 - DISTRIBUTED SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the foundations of distributed systems.
2. To learn issues related to clock Synchronization and the need for global state in distributed systems.
3. To learn distributed mutual exclusion and deadlock detection algorithms.
4. To understand the significance of agreement, fault tolerance and recovery protocols in distributed systems.
5. To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT- I INTRODUCTION 9

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems – Message-passing systems versus shared memory systems – Primitives for distributed communication –Synchronous versus asynchronous executions – Design issues and challenges. **A model of distributed computations:** A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications.

UNIT- II MESSAGE ORDERING & SNAPSHOTS 9

Message ordering and group communication: Message ordering paradigms – Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. **Global state and snapshot recording algorithms:** Introduction –System model and definitions –Snapshot algorithms for FIFO channels.

UNIT- III DISTRIBUTED MUTEX & DEADLOCK 9

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport‘s algorithm –Ricart-Agrawala algorithm – Maekawa‘s algorithm – Suzuki–Kasami‘s broadcast algorithm. **Deadlock detection in distributed systems:** Introduction – System model – Preliminaries –Models of deadlocks – Knapp‘s classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT- IV RECOVERY & CONSENSUS 9

Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and

recovery. **Consensus and agreement algorithms:** Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT- V P2P & DISTRIBUTED SHARED MEMORY 9

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord– Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Outline the foundations and issues of distributed systems.

CO2: Explain the various synchronization issues and global state for distributed systems

CO3: Illustrate the Mutual Exclusion and Deadlock detection algorithms

CO4: Explain the agreement protocols and fault tolerance mechanisms

CO5: Illustrate the features of peer-to-peer and distributed shared memory systems.

Text Books:

1. K shemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

Reference Books:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
3. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
4. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

PROFESSIONAL ELECTIVE - II

B.E.	B19CSE607- AGILE AND XTREME PROGRAMMING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To apply agile principles and practices in an actual project
2. To provide an insight to different areas of Agile Methodologies.
3. To demonstrate the strengths and weakness of an agile approach given in a particular development context
4. To understand and apply Scrum and Extreme Programming
5. To tailor an agile method to the needs of the project.

UNIT- I AGILE AND ITS SIGNIFICANCE 9

Agile development – Classification of methods – The agile manifesto and principles – Agile project management – Embrace communication and feedback– Simple practices and project tools – Empirical vs defined and prescriptive process- Principle-based versus Rule-Based-Key motivations for iterative development – Meeting the requirements challenge iteratively – Problems with the waterfall

UNIT- II AGILE METHODOLOGY 9

Method overview – Lifecycle – Work products, Roles and Practices values – Common mistakes and misunderstandings-agile project management – agile team interactions – ethics in agile teams - agility in design- testing – agile documentations – agile drivers- capabilities and values.

UNIT-III AGILE PROCESSES 9

Lean production – SCRUM- Crystal- Feature Driven Development- Adaptive Software Development and Extreme Programming: Method overview – lifecycle – work products- roles and practices.

UNIT-IV AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile information systems – agile decision making – Earl's schools of KM – institutional knowledge evolution cycle – development, acquisition, refinement, distribution, deployment , leveraging – KM in software engineering – managing software knowledge – challenges of migrating to agile methodologies – agile knowledge sharing – role of story-cards – Story-card Maturity Model (SMM)

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UNIT-V AGILE PRACTICING AND TESTING 9

Project management – Environment – Requirements – Test – The agile alliances – The manifesto – Supporting the values – Agile testing – Nine principles and six concrete practices for testing on agile teams. Case Study: Agile – Motivation –Evidence – Scrum – Extreme Programming – Unified Process – Practice Tips.

TotalInstructionalhours:45

Course Outcomes:

Students will be able to

CO1: Outline the basics of Agile approach to software development.

CO2: Apply design principles, refactoring, version control and continuous integration to achieve Agility.

CO3: Demonstrate iterative, incremental development process for faster delivery of software.

CO4: Identify the importance of interacting with business stakeholders in determining the requirements for a software system

CO5: Apply the impact of social aspects on software development success.

Text Books:

1. Mark C. Layton, Steven J. Ostermiller, Dean J. Kynaston, “Agile Project Management”, Wiley, 2020
2. Kent Beck, Cynthia Andres, “ Extreme programming Explained”, 2nd Edition, Addison – Wesley, 2004

Reference Books:

1. Neil Perkin, Peter Abraham, “Building the Agile Business Through Digital Transformation”, Kogan Page, 2020
2. Angel Medinilla, “Agile Management: Leadership in an Agile Environment”, Springer, 2012
3. Elisabeth Hendrickson, “Agile Testing” Quality Tree Software Inc 2008.
4. James shore, Shane Warden,“The Art of Agile Development (Pragmatic guide to agile software development)” , O'Reilly Media, 2008

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B.E.	B19ECE702 – DIGITAL IMAGE PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To become familiar with digital image fundamentals.
2.	To get exposed to image enhancement techniques in Spatial and Frequency domain.
3.	To learn concepts of degradation function and restoration techniques.
4.	To study the image segmentation and representation techniques.
5.	To become familiar with image compression and recognition methods.

UNIT - I	DIGITAL IMAGE FUNDAMENTALS	9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.

UNIT - II	IMAGE ENHANCEMENT	9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT - III	IMAGE RESTORATION	9

Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT - IV	IMAGE SEGMENTATION	9

Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing - erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

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UNIT - V	IMAGE COMPRESSION AND RECOGNITION	9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching. Applications of face recognition.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the fundamental concepts of a digital image processing.
CO2	Analyze image enhancement in the spatial and frequency domain using various transforms.
CO3	Identify the techniques for image restoration.
CO4	Examine the image segmentation methods.
CO5	Interpret Image compression standards and recognition techniques.

Text Books	
1.	Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Third Edition, 2010.
2.	Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson, 2002.

Reference Books	
1.	Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2006.
2.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education Inc., 2011.
3.	D.E. Dudgeon and R.M. Mersereau, “Multidimensional Digital Signal Processing”, Prentice Hall, Professional Technical Reference, 1990.
4.	William K. Pratt, “Digital Image Processing”, John Wiley, New York, 2002.
5.	Milan Sonka et al “Image processing analysis and machine vision”, Brookes / Cole, Vikas Publishing House, 2nd edition, 1999.

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Semester - VI

B.TECH.	B19ADE604 – KNOWLEDGE ENGINEERING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics of knowledge representation and reasoning.
2. To provide knowledge on reasoning.
3. To develop skills on ontology design and development.
4. To apply reasoning with ontology and rules.
5. To understand the concepts of rule learning and refinement.

UNIT- I INTRODUCTION 9

Knowledge, representation and reasoning – need for logic – first order logic – syntax – semantics – pragmatics – Implicit and Explicit belief – Expressing Knowledge – Resolution – Prepositional case – Horn logic – Horn clauses – procedural control of reasoning.

UNIT- II REASONING 9

Abductive reasoning – subjective Bayesian view of probability – Belief functions – Baconian probability - Baconian probability of Boolean expressions – Fuzzy probability – Fuzzy force of evidence – Fuzzy probability of Boolean expressions –Evidence based reasoning – Intelligent agents – Mixed-Initiative reasoning.

UNIT- III ONTOLOGY DESIGN AND DEVELOPMENT 9

Introduction – Concepts and Instances – Generalization Hierarchies – object features – Defining features – representation of N-ary features – Transitivity – Inheritance – concepts of feature values – ontology matching – steps in ontology development – domain understanding and concept elicitation – modeling-based ontology specification.

UNIT- IV REASONING WITH ONTOLOGY AND RULES 9

Production-system architecture – complex – ontology-based concepts – reduction and synthesis rules for evidence based hypotheses analysis – Rule and ontology matching – partially learned knowledge – Reasoning with partially learned knowledge.

UNIT- V RULE LEARNING AND REFINEMENT 9

Introduction to machine learning – concepts generalization and specialization rules – types of generalizations and specialization – Inductive concept learning – Learning with an

incomplete representation language – formal definition of generalization – Rule refinement – Rule refinement problem – Rule refinement with positive examples – Rule refinement with negative examples – Hypothesis refinement.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Explain the basic concepts of knowledge representation and reasoning.

CO2: Develop their skills on reasoning.

CO3: Design and develop ontologies.

CO4: Apply reasoning with ontologies and rules.

CO5: Solve problems using rule learning and refinement.

Text Books:

1. Gheorghe Tecuci, DorinMarcu, MihaiBoicu , David A. Schum, “Knowledge Engineering: Building Cognitive Assistants for Evidence-based Reasoning” Cambridge University Press,1st Edition, Kindle Edition 2016.
2. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.

Reference Books:

1. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
2. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.
3. King (2009), Knowledge Management and Organizational Learning , Springer
4. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition,2001.

Semester - VI

B.TECH	B19ADE605 – DIGITAL BUSINESS MANAGEMENT	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the introduction to digital business.
2. To learn about fundamentals of digital marketing.
3. To learn about the financial management and decision tree rules.
4. To understand the E-business developing.
5. To study the marketing management and decision making process.

UNIT- I INTRODUCTION TO DIGITAL BUSINESS 9

Introduction, background and current status, E-market places, structures, mechanisms, economics and impacts – Management concepts and theories – management functions – Difference between physical economy and digital economy – Interpersonal behaviour – Managing change and development.

UNIT- II FUNDAMENTALS OF DIGITAL MARKETING 9

Definition of digital marketing, origin of digital Marketing - The internet micro and macro environment - The internet marketing mix: product and branding - Digital marketing tools/e-tools - the online marketing matrix including business and Consumer markets - Search engine marketing (SEM) - Design digital marketing plan, SWOT.

UNIT- III FINANCIAL MANAGEMENT 9

Introduction to finance, objectives of financial management - Changing role of finance managers - Compound interest and continuous compounding - Concepts of Risk and Return - Capital budgeting methods and their limitations - Capital budgeting decision rules - Capital structure decisions – Overview of financing choices - The financing process; internal and external financing.

UNIT- IV E-COMMERCE 9

Definitions, History and Developments - Characteristics, advantages and disadvantages impact of E- Business - Understanding Networks : routing, switching and protocols - Security : service providers, digital certificates, encryption, Digital signatures - payment service providers : PayTM etc., - Privacy, Intellectual Property Rights, trademarks, copyrights - E-Business Entrepreneurial Process: Development of E-Business Plan, Financing, Staffing, Taxation.

UNIT- V MARKETING MANAGEMENT 9

Introduction to Marketing, Role of Customer, Relationship Marketing - Consumer buyer behaviour, types, levels, decision making process - Product, Types, Branding, Packaging - Price, types of pricing strategies – Marketing management : Strategic Planning, Implementation and Control - International Vs Domestic Marketing Management

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Understand digital business management principles.

CO2: Gain extensive knowledge about the basic digital marketing tools.

CO3: Apply the mechanisms and control the financial management.

CO4: Understand the security service providers.

CO5: Compare and contrast the decision making process and marketing management.

Text Books:

1. P. T. Joseph, “E-Commerce: An Indian Perspective”, Prentice Hall India Pvt., Limited, 2019.
2. David Whiteley, “E-Commerce: Strategy, Technologies and Applications” McGraw-Hill, 2001.

Reference Books:

1. Aswath Damodaran, “Applied Corporate Finance”, Wiley India, 2018.
2. Prasanna Chandra, “Financial Management Theory and Practice”, Tata McGraw Hill; 10th edition, 2019.

Semester - VI

B.TECH.	B19ADE606 – MULTIVARIATE DATA ANALYSIS	T	P	TU	C
		3	0	0	3

Course Objectives:

CO1 : To Learn about basics of multivariate data analysis

CO2 : To understand the concept of principle component analysis

CO3 : To acquire the knowledge in Cluster Analysis

CO4 : To enable the students to understand about Discriminant and other analysis

CO5 : To know about the issues in multivariate data analysis

UNIT- I MULTIVARIATE DATA ANALYSIS – OVERVIEW 9

Introduction to multivariate data analysis – indirect observations and correlation - hidden data structures – multivariate data analysis vs. multivariate statistics – main objectives of multivariate data analytical techniques – multivariate techniques as projections – descriptive statistics.

UNIT- II PRINCIPAL COMPONENT ANALYSIS 9

Representing Data as Matrix – Variable Space –Plotting objects in variable space - the first principal component - Principal Component Models – Objectives of PCA – Score Plot – Loading Plot – PCA Modeling – NIPALS Algorithm

UNIT- III CLUSTER ANALYSIS 9

Introduction – Hierarchical Methods – Agglomerative Algorithms – Minimum Variance Method in Perspective – Mathematical Properties – Minimal Spanning Tree – Partitioning methods – Examples for cluster analysis – Program listing – Hierarchical Methods and Partitioning

UNIT- IV DISCRIMNANT METHODS AND OTHER METHODS 9

The problem – Multiple Discriminant Analysis – Linear Discriminant Analysis – Bayesian Discrimination : Quadratic – Maximum likelihood discrimination – Bayesian Equal

Covariance case – Non Parametric Discrimination – Correspondence Analysis – Principal Coordinate Analysis – Canonical Correlation Analysis – Regression Analysis

UNIT- V MULTIVARIATE DATA ANALYSIS – MISCELLANEOUS ISSUES 9

Data Constraints – Data Collection – Selecting from Abundant data – Error Sources – Replicates: Quantify Errors – Estimates of Experimental and Measurement Errors – Handling Replicates in Multivariate Modeling - Validation

.

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1 : Learnt about the basics of multivariate data analysis

CO2 : Learnt about how to work with PCA

CO3 : Analysis the concept of cluster analysis method

CO4 : Known about the concept of various multivariate data analysis methods

CO5 : Able to analysis how to handle the issues in multivariate data analysis

Text Books:

1. Joseph Hair, Rolph Anderson, Bill Black, Barry Babin, “Multivariate Data Analysis”, Perason education, 2016.
2. Joseph F. Hair, “Multivariate data analysis”, Pearson Prentice Hall, 2018.

Reference Books:

1. Kim H. Esbensen, Dominique Guyot, Frank Westad, Lars P. Houmoller, “Multivariate Data Analysis In Practice : an Introduction to Multivariate Data Analysis and Experimental Design”, CAMO, 2002.
2. Fionn Murtagh, Andre Heck, “Multivariate Data Analysis”, Springer, 2012.

Semester - VI

B.TECH.	B19ADE607- ADVANCED PREDICTIVE ANALYTICS	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To gain knowledge about terminology, technology and applications of predictive Analytics
2. To generate suitable association rule for data
3. To discuss about various descriptive modeling methods
4. To discuss about various predictive modeling methods
5. To introduce about text mining

UNIT- I INTRODUCTION TO PREDICTIVE ANALYTICS 9

Overview of Predictive Analytics – Setting Up the Problem – Predictive Analytics Processing Steps – Case Study: Fraud Detection – Data Understanding – Single Variable And Multiple Variable Summaries – Data Visualization In One Dimension, Two Dimension And Higher Dimensions- The Value Of Statistical Significance.

UNIT- II ASSOCIATION RULES 9

Data Preparation – Variable Cleaning – Feature Creation – Terminologies Used In Association Rules – Parameter Settings – Measures of Interesting Rules – Deploying Association Rules – Problems with Association Rules – Building A Classification Rules From Association Rules

UNIT- III DESCRIPTIVE MODELING 9

Data Preparation Issues With Descriptive Modeling – PCA Algorithm – Clustering Algorithms- K-Means Algorithm – Kohonen SOM Algorithm – Visualizing Kohonen Maps – Similarities with K-Means – Interpreting Descriptive Models

UNIT- IV PREDICTIVE MODELING 9

Decision Tree – Logistic Regression – Neural Networks – K-Nearest Neighbor – Naïve Bayes – Regression Models – Linear Regression – Assessing Predictive Models – Model Ensembles – Bagging – Boosting – Interpreting Model Ensembles

UNIT- V TEXT MINING USING PREDICTIVE ANALYTICS 9

Predictive Modeling Approach To Text Mining –Text mining with clustering and classification – from textual information to numerical vectors – using Text for prediction - Data Preparation Steps – Text Mining Features – Regular Expressions – Model Deployment – Case Studies: Survey Analysis and Help Desk .

Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1 : Explain Terminology and Applications of Predictive Analytics

CO2 : Apply Association Rules on Data

CO3 : Discuss Various Descriptive Models

CO4 : Discuss Various Predictive Analytics

CO5 : Illustrate The Features and Applications of Text Mining.

Text Books

1. Dean Abbott, “Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst”, Wiley, 2014
2. Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

Reference Books

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R Springer 2013
2. Conrad Carl berg, “Predictive Analytics: Microsoft Excel”, 1st Edition, Que Publishing, 2012
3. Text Mining Predictive Methods for Analyzing Unstructured Information By Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau · 2010

PROFESSIONAL ELECTIVE - I

B.E.	B19CSE601 - SOFTWARE TESTING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the basics of software testing.
2. To learn the concept of graph testing.
3. To understand the measure of problem-solving skills.
4. To verify and validate both external and internal data
5. To understand the test management process.

UNIT- I INTRODUCTION 9

Introduction to software testing and analysis – Error - Fault – Failure – Incident - Test Cases - Testing Process - Limitations of Testing - Coverage Criteria for Testing - Infeasibility and Subsumption-Characteristics of a Good Coverage Criterion. Methods of software Testing – White box testing – Black box testing – Grey box testing.

UNIT- II TESTING TYPES 9

Unit Testing: Driver- Stub- Integration Testing: Top-Down Integration – Bottom- Up Integration – Bi-Directional Integration. Performance Testing: Load Testing- Stress Testing – Security Testing – Client-server Testing. Acceptance Testing: Alpha Testing and Beta Testing – Special Tests: Regression Testing – GUI Testing.

UNIT- III LOGIC TESTING & INPUT SPACE PARTITIONING 9

Logic Predicates and Clauses - Logic Expression Coverage Criteria-Structural Logic Coverage of Programs – Specification - Based Logic Coverage - Logic Coverage of Finite State Machines -Disjunctive Normal Form Criteria. Input Domain Modeling - Combination Strategies Criteria -Constraints among Partitions

UNIT IV SYNTAX TESTING 9

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group - The Structure of Testing Group.

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UNIT- V TESTING TOOLS AND MESUREMENTS 9

Manual Testing and Need for Automated Testing Tools – Advantages and Disadvantages of Using Tools – Selecting a Testing Tool – When to use Automated Test tools – Testing Using Automated tools. Metrics and Measurement: Types of Metrics – Product Metrics and process Metrics – Object oriented metrics in testing.

Total Instructional hours: 45

Course Outcomes:
Students will be able to

CO1: Choose and conduct a software test process for a software testing project

CO2: Illustrate the different types of testing techniques.

CO3: Identify the input domain Modeling

CO4: Examine the duplication of data with test management tool.

CO5: Classify the testing tools and measurements.

Text Books:

1. Paul Ammann, Jeff Offutt, “Introduction to Software Testing”, Cambridge University Press, 2nd edition, 2016.
2. Srinivasan Desikan, Gopalaswamy Ramesh, “Software Testing: Principles and Practices”, Pearson, 2012.

Reference Books:

1. Aditya P. Mathur, “Foundations of Software Testing”, Pearson, 2008.
2. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Auerbach Publications, 2008.
3. Brian Marick, “The Craft of Software Testing”, Pearson Education, 2nd edition, 1995

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B.E.	B19CSE606 - SPEECH PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives:

1. To understand the fundamentals of the speech processing.
2. To explore the various speech models.
3. To gather knowledge about the phonetics and pronunciation processing.
4. To perform wavelet analysis of speech.
5. To understand the concepts of speech recognition.

UNIT- I INTRODUCTION 9

Introduction - knowledge in speech and language processing - ambiguity - models and algorithms - language - thought - understanding - regular expression and automata - words & transducers – N grams.

UNIT- II SPEECH MODELLING 9

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model – transformation based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling.

UNIT-III SPEECH PRONUNCIATION AND SIGNAL PROCESSING 9

Phonetics - speech sounds and phonetic transcription - articulatory phonetics - phonological categories, pronunciation variation - acoustic phonetics and signals - phonetic resources – articulatory, gestural phonology.

UNIT-IV SPEECH SYNTHESIS 9

Speech synthesis - text normalization - phonetic analysis - role of prosody - prosodic analysis – diphone waveform synthesis - unit selection waveform synthesis - Applications and present status.

UNIT-V SPEECH RECOGNITION 9

Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training – multi pass decoding: n-best lists and lattices- a* (‗stack') decoding - Language modelling. Large vocabulary recognition, Acoustic preprocessing for speech recognition.

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Total Instructional hours: 45

Course Outcomes:

Students will be able to

CO1: Demonstrate algorithms for speech processing.

CO2: Show different speech models and its issues.

CO3: Outline various phonetic models.

CO4: Analyze different speech synthesis techniques.

CO5: Build a new speech recognition system.

Text Books:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Person education, 2013.

Reference Books:

1. S.D Apte, “Speech and Audio Processing”, Wiley India Edition, 2015
2. Ikrami Eldirawy , Wesam Ashour, “Visual Speech Recognition”, Wiley publications , 2011
3. Lawrence Rabiner, Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
4. Kai-Fu Lee, “Automatic Speech Recognition”, The Springer International Series in Engineering and Computer Science, 1999
5. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.

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B.E.	B19AEO601 - AIRCRAFT ELECTRICAL AND ELECTRONIC SYSTEMS (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To know the working principles of aircraft engine and fuel systems.
2.	To understand the lighting technologies and pressurization system of the aircraft cabin.
3.	To realize the warning and protection systems of the aircraft.
4.	To expose on terrain warning systems of the safety of the aircraft.
5.	To gain knowledge on FDR and anti-fire protection system.

UNIT - I	AERO ENGINE AND FUEL MANAGEMENT SYSTEMS	9

Introduction to Starting and Ignition Systems - Primary, secondary and Electronic Indicating Systems. Fuel Management system - Fuel quantity measurement and indication - Fuel feed and distribution - Fuel transfer - Refueling and defueling - Fuel jettison - Fuel Tank Venting and Inerting.

UNIT - II	LIGHTS AND CABIN SYSTEMS	9

Overview of Lighting technologies - Flight compartment lights - Passenger cabin lights - Exterior lights. Cabin systems - Passenger address system - Galley equipment - In-flight entertainment - Satellite communications - Air conditioning – Pressurization - Airstairs.

UNIT - III	WARNING AND PROTECTION SYSTEMS	9

Stall warning and protection - Airframe ice and rain protection - Windscreen ice and rain protection - Anti-skid - Configuration warning - Aural warnings.

UNIT - IV	TERRAIN AWARENESS WARNING SYSTEM	9

System overview - System warnings and protection - External references - Ground proximity modes - Forward - looking terrain avoidance - Rotorcraft TAWS - Architecture and configurations.

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UNIT - V	FLIGHT DATA RECORDER AND FIRE PROTECTION SYSTEM	9
Introduction to FDR - Equipment Requirement - FDR Specifications - Cockpit Voice Recorders - Health and usage monitoring system. Fire Protection - Engine fire Detection - Cargo Bay Area- Fire Extinguishing systems.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the Basics of Ignition and Fuel System of an Aircraft.
CO2	Illustrate the Flight Compartment Lighting Technologies and Cabin Air Conditioning system.
CO3	Identify the Warning and Protection Systems for the Ice Formation and Rain in the Airframe of the Aircraft During Flight.
CO4	Apply the Terrain Warning Systems to avoid the Terrain Collision of an Aircraft.
CO5	Examine the FDR and Fire Protection System to Monitor the Flying Performance of the Aircraft.

Text Books	
1.	"Aircraft Electrical and Electronic Systems", Principles, operation and maintenance by Mike Tooley and David Wyatt.

Reference Books	
1.	Pallet .E.H.J., "Aircraft Instruments and Integrated Systems", Pearsons, Indian edition 2011.
2.	Spitzer, C.R. "Digital Avionics Systems", Prentice-Hall, Englewood Cliffs, N.J., U.S.A. 1993.
3.	Spitzer. C.R. "The Avionics Hand Book", CRC Press, 2000.

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B.E. / B.TECH	B19AGO601- INTEGRATED WATER RESOURCES MANAGEMENT (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the key elements of IWRM.
2.	To know about the water economics and policies related to IWRM.
3.	To understand the water supply with reference to human health.
4.	To learn the concept of water security for agriculture practices.
5.	To know the water regulation acts and international water scenarios.

UNIT - I	CONTEXT FOR IWRM	9

Water as a global issue: key challenges and needs – Definition of IWRM within the broader context of development – Complexity of the IWRM process – Examining the key elements of IWRM process.

UNIT - II	WATER ECONOMICS	9

Economic view of water issues: economic characteristics of water good and services – Non-market monetary valuation methods – Water economic instruments, policy options for water conservation and sustainable use – Private sector involvement in water resources management - PPP experiences through case studies.

UNIT - III	WATER SUPPLY AND HEALTH WITHIN THE IWRM CONSIDERATION	9

Links between water and human health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Health impact assessment of water resources development.

UNIT - IV	AGRICULTURE IN THE CONCEPT OF IWRM	9

Water for food production: blue‟ versus “green‟ water debate – Conjunctive use of surface and groundwater - Virtual water trade for achieving global water security –- Irrigation efficiencies, irrigation methods and current water pricing.

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UNIT - V	WATER LEGAL AND REGULATORY SETTINGS	9
Basic notion of law and governance: principles of international and national law in the area of water management. Understanding UN law on non-navigable uses of international water courses – Development of IWRM in line with legal and regulatory framework.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concepts of IWRM.
CO2	Build an economic conservation of water under PPP and IWRM.
CO3	Identify the linkages between human health and water
CO4	Summarize the water use effectiveness in agriculture.
CO5	Make use of knowledge on regulatory acts and policies of water

Reference Books	
1.	Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.
2.	Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003.
3.	Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.
4.	Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.

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5.	Technical Advisory Committee, Water as social and economic good: How to put the principles to practice. Technical Advisory Committee Background paper No: 2. Global water partnership, Stockholm, Sweden, 1998.
6.	Technical Advisory Committee, Effective Water Governance.Technical Advisory Committee Background paper No: 7. Global water partnership, Stockholm, Sweden, 2003.
7.	Cech Thomas V., “Principles of water resources: history, development, management and policy”, John Wiley and Sons Inc., New York, 2003.
8.	Mollinga .P. etal, “Integrated Water Resources Management”, Water in South Asia Volume I, Sage Publications, 2006.
9.	Iyer R. Ramaswamy, “Towards Water Wisdom: Limits, Justice, Harmony”, Sage Publications, New Delhi, 2007.
10.	https://nptel.ac.in/courses/105/105/105105110/

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B.E. / B.TECH	B19BMO601 - INTRODUCTION TO BIOMEDICAL ENGINEERING (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of biomedical engineering technology
2.	To learn the working principles of diagnostic devices
3.	To study the principles of therapeutic devices
4.	To know the concepts of medical imaging techniques present in biomedical field.
5.	To learn various prevention and safety tools

UNIT - I	INTRODUCTION TO BIOMEDICAL ENGINEERING	9
Introduction – History of medical devices – Characteristics of human anatomy and physiology that relate to medical devices – Electrical signals and conductivity – Physiological monitoring systems.		

UNIT - II	DIAGNOSTIC DEVICES AND MEASUREMENTS	9
ECG Machine – Blood pressure measurements – Temperature measurements – Pulse oximeters – Biochemical analysers – Blood flow detectors – Respiration monitor.		

UNIT - III	THERAPEUTIC DEVICES AND MEASUREMENTS	9
Introduction – Defibrillators- Pacemakers – Ventilators – Heart lung machine – CPAP/BPAP – Humidifiers.		

UNIT - IV	DIAGNOSTIC IMAGING	9
Basic Principles of X-ray- CT -MRI – PET – SPECT		

UNIT - V	PREVENTION AND PATIENT SAFETY TOOLS	9
Electrical Safety – testing methods – other safety considerations – Troubleshooting techniques – general test equipment – Specialized biomedical test equipment – tools.		
Total Instructional hours : 45		

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Course Outcomes : Students will be able to	
CO1	Outline the basics of biomedical Engineering
CO2	Discuss about the diagnostic devices and measurements
CO3	Summarize about the therapeutic devices and measurements
CO4	Explain about diagnostic imaging
CO5	Describe about prevention and patient safety tools

Reference Books	
1.	Laurence J. Street, “Introduction to Biomedical Engineering Technology”, 3rd Edition, CRC Press, 2017.
2.	John Enderle, “Introduction to Biomedical Engineering”, 3rd Edition, Academic Press, 2011.
3.	Germin Nisha. M, John Robert Prince. M, Sivagama Sundari Meenakshi Sundaram, “Bio-Medical Instrumentation: Medical Applications”, Lambert Academic Publishing, 2020
4.	Shakti Chatterjee, Aubert Miller, “Biomedical Instrumentation Systems”, Thomson Press (India) Ltd, 2012

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B.E. / B.TECH	B19BTO601 – BASIC BIOINFORMATICS (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the units of various physical parameters, conversion factors.
2.	To understand about the various material balances and difference between steam and heat and their balances.
3.	To explain about the application of energy balance in bioprocesses.
4.	To explain about the fluid flow in packed columns and their flow patterns.
5.	To understand about the process of agitation and various agitator vessels.

UNIT - I	BIOLOGICAL DATABASES	9

Biological databases – types of databases – DNA database: GenBank, EMBL – DNA database: ESTs, STS, HTGS- NCBI, Pubmed, Entrez, BLAST, OMIM – Protein databases: SWISSPORT, PIR – DNA and protein sequences: ExPASy, Locus link, Unigene, Entrez, EBI, IMGT.

UNIT - II	SEQUENCE ALIGNMENT	9

Multiple sequence alignment – models of sequence alighment- databases of sequence alignments: SMART, Pfam – Conserved domains in biomolecules – databases of conserved domains: PRINTS, BLOCKS – integrated multiple sequence alighment – ClustalW, ClustalX, Interpro, MetaFam, PopSet resources of sequence mining.

UNIT - III	DATABASE SEARCH	9

Sequence homology – similarity, identity and sequence gaps – Pairwise alignment, detection, significance and limitations: Needleman Wunsch, Smith Waterman Algorithm – BLAST: List, scan, extent, E value and P value, alignment, search strategies – principles of BLAST search – types of BLAST.

UNIT - IV	STRUCTURE PREDICTION TOOLS	9

Analysis of 3D protein structure data – protein data bank (PDB) – SCOB – CATH – Dali Domain directory – FSSP – Protein structure modeling – comparative modeling – Abinitio prediction – Threading – Protein folding.

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UNIT - V	EVOLUTION ANALYSIS	9
Phylogenetic analysis and molecular evolution – nomenclature of phylogenetic trees – interpretation of phylogenetic data – phenotypic and gene trees – molecular visualization – tools of visualization: Swiss PDB viewer, RasMol, QMol – applications of phylogeny and molecular visualization.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Recall the basics of about Bioinformatics tools.
CO2	Outline the numerous algorithms for sequence alignments.
CO3	Explain about a brief knowledge on similarity analysis.
CO4	Illustrate about the structural genomics of ancestry.
CO5	Make use of brief understanding of evolution study.

Text Books	
1.	David W M, “Bioinformatics: Sequence and Genome Analysis”, CBS publishers, New York, 2004.

Reference Books	
1.	Attwood TK and DJP Smith, “Introduction to Bioinformatics”, Addison Wesley Longman Limited, 1999.
2.	Mount DW, “Bioinformatics Sequence and Genome Analysis”, Cold Spring Harbour Laboratory Press, 2001.
3.	Pevsner J, “Bioinformatics and Functional Genomics”, John Wiley, 2003.
4.	Rastogi SC, Mendiratta N, Rastogi P, “Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery”, 3rd Edition, Prentice Hall Inc., 2005.

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B.E.	B19CSO601 - E-COMMERCE TECHNOLOGY AND MANAGEMENT (Common to all Except CSE, AI&DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the E-Commerce Platform and its concepts.
2.	To understand the Technology, infrastructure and Business in E-Commerce.
3.	To understand the Security and Challenges in E-Commerce.
4.	To build an own E-Commerce using Open Source Frameworks.
5.	To apply the security and learn the payment systems.

UNIT - I	INTRODUCTION	9

Infrastructure : Working of Web – Web Browsers - Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce.

UNIT - II	BUILDING E-COMMERCE SITES AND APPS	9

Systematic approach to build an E-Commerce - Planning - System Analysis - System Design - Building the system - Testing the system - Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App.

UNIT - III	E-COMMERCE SECURITY AND PAYMENT SYSTEMS	9

E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption - Securing Channels of Communication - Protecting Networks - Protecting Servers and Clients – Management Policies - Business Procedure and Public Laws - Payment Systems.

UNIT - IV	BUSINESS CONCEPTS IN E-COMMERCE	9

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical- Social - Political Issues in E-Commerce

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UNIT - V	TOOLS FOR E-COM	9
Web server – performance evaluation - web server software feature sets – web server software and tools – web protocol – search engines – intelligent agents – EC software – web hosting – cost analysis - Mini Project: Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Build Website using HTML CSS and JS.
CO2	Develop Responsive Sites.
CO3	Infer Manage, Maintain and Support Web Applications.
CO4	Choose the marketing and advertising strategies and tools for marketing.
CO5	Identify the security technique and learn the payment systems.

Text Books	
1.	Kenneth C.Laudon, Carol Guercio Traver “E-Commerce”, Pearson, 10th Edition, 2016.
2.	Harvey M. Deitel, Paul J.Deitel, Kate Steinbuhler, “E-business and E-commerce for managers”, Pearson, 2011.

Reference Books	
1.	Robbert Ravensbergen, “Building E-Commerce Solutions with Woo Commerce”, PACKT, 2nd Edition
2.	Parag Kulkarni, Sunita Jahirabad kao, Pradeep Chande, “E-business”, Oxford University Press, 2012.
3.	Kala kota et al, “Frontiers of Electronic Commerce”, Addison Wesley, 2004.
4.	Micheal Papaloelon and Peter Robert, “E-business”, Wiley India, 2006.
5.	Efraim Turban, Jae K.Lee, avid King, Ting Peng Liang, Deborrah Turban, “Electronic Commerce – A managerial perspective”, Pearson Education Asia, 2010.

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B.E. / B.TECH	B19EEO601 - FUNDAMENTALS OF POWER ELECTRONICS (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To get an overview of different types of power semiconductor devices and their switching.
2.	To understand the operation, characteristics and performance parameters of controlled rectifiers.
3.	To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
4.	To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
5.	To understand the operation of AC Voltage controller and Cyclo converter with various Configurations.

UNIT - I	POWER SWITCHING DEVICES	9

Study of switching devices - Diode, SCR, DIAC,TRIAC, GTO, BJT, MOSFET, IGBT - Static and Dynamic characteristics – Gate triggering circuit and commutation circuit for SCR - Introduction to Driver and snubber circuits - Heat sink calculation.

UNIT - II	AC TO DC CONVERTERS	9

Introduction - Single Phase and Three Phase controlled Rectifiers - Effect of source inductance – performance parameters - Firing Schemes for converter – Dual converters, Applications - Solar PV Systems, Light Dimmer.

UNIT - III	DC TO DC CONVERTER	9

Step-down and step-up chopper - control strategy – Introduction to types of choppers - A, B, C, D and E - Switched mode regulators - Buck, Boost, Buck - Boost regulator, Introduction to Resonant Converters, Applications - Battery operated vehicles.

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UNIT - IV	DC TO AC CONVERTERS	9
Single phase half bridge inverter and Full bridge inverter - Three phase voltage source inverters (both 120° mode and 180° mode) - Voltage & harmonic control - PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM - Introduction to Space Vector. Pulse Width Modulation - Current Source Inverter - Multilevel Inverter - Applications-Induction heating, UPS.		

UNIT - V	AC TO AC CONVERTERS	9
Single phase and three phase AC voltage Controllers – Control strategy - Power Factor Control – Multistage sequence control - Single Phase and Three Phase Cyclo Converters – Introduction to Matrix converters, Applications: welding.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the operation, characteristic and turn on methods of different types of Power semiconductor devices.
CO2	Explain the operation of phase controlled Converters and its performance parameters.
CO3	Classify different types of DC-DC converter and switching regulators and explain its operation with control techniques.
CO4	Choose the different modulation techniques for pulse width modulated inverters and to infer the harmonic reduction methods.
CO5	Explain the operation of AC voltage controller and Cyclo converter with various configurations.

Text Books	
1.	M.H. Rashid, “Power Electronics : Circuits, Devices and Applications”, Pearson Education, Fourth Edition, New Delhi, 2014.
2.	P.S. Bimbra, “Power Electronics”, Khanna Publishers, Fifth Edition, 2012.
3.	M.D. Singh and K.B. Khanchandani, “Power Electronics”, Mc Graw Hill India, 2013.

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Reference Books	
1.	Joseph Vithayathil, “Power Electronics, Principles and Applications”, McGraw Hill Series, 6th Reprint, 2013.
2.	L. Umanand, “Power Electronics Essentials and Applications”, Wiley, 2010.
3.	Ned Mohan Tore. M. Undel and, William. P. Robbins, “Power Electronics: Converters, Applications and Design”, John Wiley and sons, Third Edition, 2003.
4.	S.Rama Reddy, “Fundamentals of Power Electronics”, Narosa Publications, 2014.
5.	J.P. Agarwal, “Power Electronic Systems: Theory and Design”, 1e, Pearson Education, 2002.

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B.E. / B.TECH	B19MEO601 - ENTREPRENEURSHIP DEVELOPMENT (Common to all Except MECH)	L	P	TU	C
		3	0	0	3

Course Objectives	
1.	To interpret the entrepreneurial aspects.
2.	To comprehend the distinct inspirational practices to execute entrepreneurial plans.
3.	To introduce various elements involved in establishing a business.
4.	To understand the sources of finance and accounting.
5.	To throw the light on various supporting institutions for the entrepreneurs.

UNIT - I	ENTREPRENEURSHIP	9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT - II	MOTIVATION	9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT - III	BUSINESS	9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT - IV	FINANCING AND ACCOUNTING	9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

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UNIT - V	SUPPORT TO ENTREPRENEURS	9
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Classify and compare the entrepreneurship in society.
CO2	Identify the interpersonal attributes needed to become entrepreneur.
CO3	Demonstrate the various facets of business.
CO4	Summarize the components of finance and accounting.
CO5	Outline the comprehensive business entities.

Text Books	
1.	Donald F Kuratko, “Entrepreneurship – Theory, Process and Practice”, 9th Edition, Cengage Learning, 2014.
2.	Khanka. S.S., “Entrepreneurial Development”, S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.

Reference Books	
1.	Hisrich R D, Peters M P, “Entrepreneurship”, 8th Edition, Tata McGraw-Hill, 2013.
2.	Rajeev Roy, “Entrepreneurship”, 2nd Edition, Oxford University Press, 2011.

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B.E. / B.TECH	B19ECO601 – GEOGRAPHIC INFORMATION SYSTEM	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the fundamentals and components of Geographic Information System.
2.	To provide details of spatial data models.
3.	To understand the input topology.
4.	To study the data analysis tools.
5.	To introduce the marketing and business applications.

UNIT - I	FUNDAMENTALS OF GIS	9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales / levels of measurements.

UNIT - II	SPATIAL DATA MODELS	9

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models - TIN and GRID data models - OGC standards - Data Quality.

UNIT - III	DATA INPUT AND TOPOLOGY	9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input – Digitiser – Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT - IV	DATA ANALYSIS	9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

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UNIT - V	APPLICATIONS	9
GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basic idea about the fundamentals of GIS
CO2	Summarize the types of data models
CO3	Analyse about data input and topology
CO4	Analyse about tools and models used for data analysis
CO5	Interpret the data management functions and data output

Text Books	
1.	Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, 2nd Edition, 2011.
2.	Ian Heywood, Sarah Cornelius, Steve Carver, SrinivasaRaju, "An Introduction Geographical Information Systems", Pearson Education, 2nd Edition, 2007.

Reference Books	
1.	Lo.C.P, Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice - Hall India Publishers, 2006.

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